Hawaii Range Complex

Draft

Draft Environmental Impact Statement/ Overseas Environmental Impact Statement (Draft EIS/OEIS)

Volume 1 of 3: Chapters 1-4

April 2007

Commander
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DRAFT ENVIRONMENTAL IMPACT STATEMENT/ OVERSEAS ENVIRONMENTAL IMPACT STATEMENT

Volume 1 of 3

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COVER SHEET
ENVIRONMENTAL IMPACT STATEMENT/
OVERSEAS ENVIRONMENTAL IMPACT STATEMENT
HAWAII RANGE COMPLEX (HRC)

Lead Agency for the EIS:	U.S. Department of the Navy
Title of the Proposed Action:	Hawaii Range Complex
Affected Jurisdiction:	Kauai, Honolulu, Maui, and Hawaii Counties
Designation:	Draft Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS)

Abstract

This Draft EIS/OEIS has been prepared by the Department of the Navy in compliance with the National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. § 4321 et seq.); the Council on Environmental Quality [CEQ] Regulations for Implementing the Procedural Provisions of NEPA (Title 40 Code of Federal Regulations [CFR] §§ 1500-1508); Department of the Navy Procedures for Implementing NEPA (32 CFR § 775); and Executive Order 12114 (EO 12114), Environmental Effects Abroad of Major Federal Actions. The Navy has identified the need to support and conduct current, emerging, and future training and research, development, testing, and evaluation (RDT&E) operations in the Hawaii Range Complex (HRC). The alternatives—the No-action Alternative, Alternative 1, and Alternative 2—were analyzed in this EIS/OEIS. The No-action Alternative stands as no change from current levels of training usage and include HRC training, support, and RDT&E operations, major exercises, and maintenance of the technical and logistical facilities that support these operations and exercises, and the monitoring of marine mammals. Alternative 1 includes all ongoing operations associated with the No-action Alternative, an increased tempo and frequency of such operations, enhanced and future RDT&E operations, and enhancements to optimize HRC capabilities. Alternative 2 would include all of the operations described in Alternative 1 with the addition of increasing the tempo and frequency of training operations, enhancing RDT&E operations, future RDT&E operations, and additional major exercises, such as supporting four Strike Groups training at the same time.

This EIS/OEIS addressed the potential environmental impacts that would result from activities that would occur under the No-action Alternative and Alternatives 1 and 2. Environmental resource topics evaluated include air quality, airspace, biological resources (marine, offshore, and terrestrial), cultural resources, geology and soils, hazardous materials and waste, health and safety, land use, noise, socioeconomics, transportation, utilities, and water resources.

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April 2007

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Executive Summary

EXECUTIVE SUMMARY

ES1.1 INTRODUCTION

The United States (U.S.) Department of the Navy (Navy) has prepared this Draft Environmental Impact Statement (EIS) / Overseas Environmental Impact Statement (OEIS) to assess the potential environmental impacts associated with sustainable range usage and enhancements within the Navy's Hawaii Range Complex (HRC) to support and maintain Navy Pacific Fleet training, and research, development, testing and evaluation (RDT&E) operations, and associated range capabilities (including hardware and infrastructure improvements).

This Draft EIS/OEIS has been prepared by the Department of the Navy in compliance with the National Environmental Policy Act (NEPA) of 1969 (42 United States Code [U.S.C.] § 4321 et seq.); the Council on Environmental Quality [CEQ] Regulations for Implementing the Procedural Provisions of NEPA (Title 40 Code of Federal Regulations [CFR] §§ 1500-1508); Department of the Navy Procedures for Implementing NEPA (32 CFR § 775); and Executive Order 12114 (EO 12114), *Environmental Effects Abroad of Major Federal Actions*. The NEPA process ensures that environmental impacts of proposed major Federal actions are considered in agency decisionmaking. EO 12114, which is analogous to NEPA, requires environmental consideration of environmental impacts of actions outside the United States such as non-territorial ocean areas. This Draft EIS/OEIS satisfies the requirements of both NEPA and EO 12114. It will be filed with the U.S. Environmental Protection Agency and distributed or otherwise made available to Federal, State, and local government agencies, and to the public for review and comment.

The Navy's mission is to maintain, train, and equip combat-ready naval forces capable of winning wars, deterring aggression, and maintaining freedom of the seas. Section 5062 of Title 10 of the U.S.C. directs that all naval forces be trained for combat: "The Navy shall be organized, trained, and equipped primarily for prompt and sustained combat incident to operations at sea. It is responsible for the preparation of naval forces necessary for the effective prosecution of war except as otherwise assigned and, in accordance with Integrated Joint Mobilization Plans, for the expansion of the peacetime components of the Navy to meet the needs of war." The Chief of Naval Operations meets that direction, in part, by conducting training exercises at sea and ensuring naval forces have access to viable ranges, operation areas, and airspace where skills for wartime missions can be developed and maintained and RDT&E of naval weapons systems can be conducted. For purposes of this Draft EIS/OEIS, exercises and training do not include combat operations, operations in direct support of combat, or other activities conducted primarily for purposes other than training.

The Navy remains dedicated to sustaining its ranges through robust assessment of and planning for optimal range uses while protecting human health and the environment. This nationwide effort by the Navy to fully use and enhance existing range capabilities has been initiated so that the highest levels of required readiness are maintained. A capable range facility, located in the vicinity of homeports and stations, is a critical component of naval readiness. The Navy strives, and in many cases is required by law, to track and, where possible, limit "personnel tempo," meaning the amount of time our Sailors and Marines spend deployed away from home. Personnel tempo is an important factor in family readiness, morale, and retention. The availability of a "backyard" range is critical to Navy efforts in these areas.

The EIS/OEIS study area, the HRC, covers 235,000 square nautical miles (nm^2) around the main Hawaiian Island chain and a 2.1-million nm^2 Temporary Operating Area of sea and airspace. The study area is a complex consisting of instrumented ocean areas, airspace, ocean surface operation areas, targets, and land range facilities. The operations analyzed in this Draft EIS/OEIS include current and future proposed training and RDT&E training events within these areas and Navy-funded range capabilities enhancements (including infrastructure improvements), and Navy training on other military services' training ranges.

ES1.2 BACKGROUND

One of the obligations of the Navy, pursuant to Title 10 of the U.S.C., is to ensure that the men and women, Sailors and officers, sent to sea on behalf of the United States are fully trained and ready for deployment on short notice, as a combat-ready naval force and for other non-combat missions assigned to them. In addition, combat forces must have available to them the changes and improvements that new technologies can provide. These emerging technologies must be researched, developed, tested, and evaluated before being made widely available for use. The Navy meets these training and testing responsibilities across the open oceans and on its range complexes.

For more than a century, the Navy has trained its Sailors in Hawaii and repaired and replenished the ships of the United States at Pearl Harbor. In the 1920s, a submarine base was established at Pearl Harbor, creating a need for the training of Sailors and officers serving in the undersea environment. As world tensions increased in the 1930s and early 1940s, the Navy rapidly increased its presence and number of facilities in Hawaii. The Pacific Fleet established its headquarters at Pearl Harbor on February 1, 1941. Ten months later, on December 7, the Fleet was attacked at Pearl Harbor, propelling America into World War II. The Pacific was the site of World War II's most decisive naval battles. Naval forces in Hawaii remained vital to U.S. interests throughout the mid-century, as control of the seas provided advantages to allied forces during the Korean and Vietnam Wars. Since 1968, a multinational sea-power Rim of the Pacific (RIMPCA) exercise has been conducted within the HRC, testing the abilities of a number of the navies of the Pacific Rim to function together. Today, the Navy's presence in Hawaii remains of essential strategic and operational importance to U.S. national interests.

Over 20 years ago, acoustic monitoring devices were placed at the Pacific Missile Range Facility (PMRF) on the ocean floor off the west coast of Kauai to detect and track underwater activity. These acoustic systems provide a unique evaluative tool that offers specific information in tracking participants' movements and responses during naval training exercises. PMRF is now the world's largest military test and training range capable of supporting subsurface, surface, air, and space training events. It consists of instrumented underwater ranges, controlled airspace, and the 2.1-million nm^2 Temporary Operating Area. Since its establishment, PMRF has provided major range services for training, tactics development, and RDT&E of air, surface, and subsurface weapons systems for the Navy, other Department of Defense agencies, allies, and private industry.

Today, more than 20 surface ships and submarines are homeported in Hawaii. Specialty forces, including Navy divers and explosive ordnance disposal (EOD) technicians, also conduct vital training within the HRC. The Sailors and officers assigned to these homeported ships and submarines, those awaiting sea duty, and Strike Groups transiting through the Pacific, as well as naval forces of our foreign allies, must maintain their proficiencies to allow them to be ready and qualified to be deployed when ordered to do so at short notice. The HRC provides extensive, remote and strategic training areas and facilities that enable Navy personnel to maintain and strengthen these required proficiencies. The HRC is one of the most capable and heavily used Navy range complexes in the Pacific Region.

Navy's At-Sea Policy

In December of 2000, the Under Secretary of the Navy issued a memorandum for the Chief of Naval Operations and the Commandant of the Marine Corps which has come to be known as the "At Sea Policy." This "At Sea Policy" sets forth how the Navy would update and upgrade its compliance with the body of environmental law which applies to these exercises and training operations—at sea and at the Navy's range complexes. Training at sea includes the conduct of joint (multi-service) and combined (multi-nation) exercises, which are also known as military readiness activities. Training, including joint and combined exercises, does not include combat operations, operations in direct support of combat, or other activities conducted primarily for purposes other than training.

The memorandum directed the Navy's fleet commanders to develop an approach to environmental compliance for the fleet training ranges and operational areas within their respective areas of responsibility, including ranges used for RDT&E operations. Major training exercises and those operations occurring within a range or operation area could be included with the compliance effort for the applicable range or operation area. The approach would involve a "comprehensive analysis of the environmental impacts of a class of undertakings repetitive in nature or of similar effect and recurring within the same geographical area, so as to avoid or mitigate adverse effects to the extent practicable consistent with the accomplishment of the military training and exercise activities under review." Fleet commanders were similarly directed to review RDT&E ranges to the extent they are used for fleet training.

The Commander, U.S. Pacific Fleet is conducting, for each range complex across the Pacific, that programmatic location-specific approach to environmental analysis, complying with NEPA and EO 12114, reviewing the present and reasonably foreseeable activities at each range complex. In accordance with the "At Sea Policy", this document provides a description of existing operations and reasonably foreseeable alternative levels of activity within the HRC, and an analysis of the environmental consequences of those operations and alternative levels of activity. Included are major training exercises, routine training and exercises, and RDT&E operations conducted within or projected to be conducted within the HRC, as well as planned upgrades to the HRC to ensure its sustainability.

Navy Training: Planning and Requirements

The HRC is one of the Navy's range complexes and is used for training operational forces, military systems and equipment RDT&E, and other military operations. These range complexes must be maintained to support national security objectives and to ensure a high state of readiness of Navy and Marine Corps forces. Training requirements for the Navy's operational forces are the primary reference for determining required range capabilities. Operational requirements for deployment and employment of trained naval forces, in turn, determine training requirements.

To enhance the present and future viability of its training ranges, the Navy has initiated a Range Sustainability program. Annual Sustainable Ranges Reports submitted to the Office of the

Secretary of Defense outline the Navy's ongoing Range Sustainability efforts, including execution of a comprehensive range sustainment strategy through the Tactical Training Theater Assessment and Planning (TAP) program and development of a Navy-wide range sustainment policy. The policy will maximize the use of existing range assets by assigning specific range sustainment responsibilities to each level of the range support command structure and integrating current range sustainment strategies from the test and training communities. Training requirements are supported by sustainment efforts which emphasize the full, effective, and efficient utilization of existing range capabilities.

Navy training proceeds on a continuum, from teaching an array of basic and specialized individual military skills, to intermediate skills or small unit training, to advanced, integrated training events, culminating in joint (multi-service) exercises or pre-deployment certification events. Each step on this continuum is assessed for effectiveness on an ongoing basis, as new systems, or tactics, techniques, and procedures are developed and implemented.

The deployment of naval forces, including those that train in the HRC, is determined by combatant commanders based on worldwide requirements and commitments. The dynamic requirements of national security affect the deployment of naval forces. As a result, deployment schedules are not fixed, but remain flexible, often changing to meet the Nation's security needs. Real world contingencies drive the training schedule in relation to when and where the naval forces are required. The support necessary to conduct required pre-deployment training, particularly training range support, must therefore be available when and as needed.

In furtherance of its responsibilities under Title 10, the Navy established the Fleet Readiness Training Plan (FRTP). The FRTP ensures naval units are ready to increase in response to directives from the National Command Authority. This enhanced capability provides the combatant commander with the military forces necessary to respond simultaneously to multiple contingencies as required by emerging world events.

The deployment training cycle for Strike Groups is comprised of pre-deployment training and certification, deployment, and post-deployment sustainment and maintenance. Prior to 2003, two or three Strike Groups were deployed at any one time, and the Navy had the capability to increase to a maximum of two more. Experience in the Global War on Terror and analysis of possible future campaign scenarios made clear the need for enhancing the capability of Navy ranges. The FRTP establishes the training needed to be accomplished to allow six Strike Groups to be deployed in a very short time, and two more in stages soon thereafter. This approach to fleet deployment capabilities is sometimes referred to as the 6+1+1 strategy. The FRTP implements changes in the fleet training cycle, including acceleration of the cycle and redundancy through the near-simultaneous execution of similar training events, which necessarily affects use of Navy range resources.

Tactical Training Theater Assessment and Planning Program

The Navy has historically conducted training and RDT&E training events at various range complexes in the eastern and middle Pacific, including the HRC. In 2002, Commander, U.S. Atlantic Fleet and Commander, U.S. Pacific Fleet developed the TAP Program to serve as the overarching fleet training area sustainment program. The purpose of TAP is to support Navy objectives that: (1) promote use and management of ranges (such as the HRC) in a manner that supports national security objectives and a high state of combat readiness, and (2) ensures the long-term viability of range assets while protecting human health and the environment. The TAP Program focuses specifically on the sustainability of ranges, operation areas, and airspace that support the FRTP. One element of the TAP Program is the development of Range Complex Management Plans (RCMPs). Another element is environmental planning documentation (e.g., this Draft EIS/OEIS), which will assess the potential for environmental impacts associated with certain operations/actions conducted within a range complex.

The Hawaii Range Complex Management Plan

The Final Draft RCMP for the HRC was completed in 2006. The RCMP iterates the strategic vision for the Complex, which is to provide sustainable and modernized ocean operating areas, airspace, ranges, range infrastructure, training facilities, and resources to fully support Navy training requirements in accordance with the Complex's roles and missions. In an attempt to remedy any identified shortfalls, the Hawaii RCMP makes recommendations for range enhancements—some of which may have an impact on the environment. The strategic vision for the HRC also includes eventual certification to host accredited Joint National Training Capability (JNTC) events at sea. The JNTC is a global, information age capability encompassing multiple certified training sites capable of hosting complex training events, and is a key component of Department of Defense transformation efforts.

The roles and missions for the HRC include providing training opportunities for eight naval warfare mission areas, specifically: Anti-Air Warfare, Amphibious Warfare, Anti-Surface Warfare, Anti-Submarine Warfare, Mine Warfare, Strike Warfare, Electronic Combat, and Naval Special Warfare at varying levels of training complexity. The HRC roles and missions also include providing RDT&E capabilities.

ES1.3 PURPOSE AND NEED FOR ACTION

The purpose for the proposed action is to:

- Achieve and maintain fleet readiness using the HRC to support and conduct current, emerging, and future training events and RDT&E training and testing events;
- Conduct warfare missions supported by the HRC, consistent with the requirements of the FRTP and other transformation initiatives, and;
- Upgrade/modernize existing range capabilities to enhance and ensure the sustainability of Navy training and testing.

The proposed action is needed to provide combat capable forces ready to deploy worldwide in accordance with U.S.C. Title 10, Section 5062. To implement these Congressional mandates, the Navy needs to:

- Maintain current levels of military readiness by training in the HRC;
- Accommodate future increases in operational training tempo in the HRC and support the rapid deployment of naval units or Strike Groups;
- Achieve and sustain readiness of ships and squadrons consistent with the FRTP so that the Navy can quickly increase significant combat power in the event of a national crisis or contingency operation;

- Support the acquisition and implementation into the fleet of advanced military technology. The HRC must adequately support the testing and training needed for new platforms and weapons systems (e.g., the Littoral Combat Ship and the MH-60R Seahawk helicopter); and
- Maintain the long-term viability of the HRC while protecting human health and the environment, and enhancing the quality and communication capability and safety of the range complex.

Conduct of current and emerging training and RDT&E training events, and implementation of range capabilities enhancements, includes a collection of actions which will be evaluated in this Draft EIS/OEIS. Alternative implementation scenarios involve some combination of the following:

- Increase training operations to support the FRTP and necessary force structure changes;
- Support three transient Strike Group training exercises at the same time;
- Support an additional carrier during Rim of the Pacific Exercises;
- Support increased levels of Undersea Warfare Training Exercises;
- Operate a Portable Undersea Tracking Range;
- Construct and operate an Acoustic Test Facility;
- Enhance RDT&E and training operations at PMRF;
- Construct and operate an Instrumented Minefield Training Area; and
- Use the 2.1-million nm^2 Temporary Operating Area as required.

ES1.4 PROPOSED ACTION AND ALTERNATIVES

The proposed action is to support and conduct current and emerging training and RDT&E training events in the HRC and upgrade or modernize range complex capabilities to enhance and sustain Navy training and testing. The decision to be made by the Assistant Secretary of the Navy (Installations & Environment) is to determine both the level and mix of training to be conducted and the range capabilities enhancements to be made within the HRC that best meet the needs of the Navy.

Alternatives were selected based on their ability to meet the following criteria:

- Use existing Navy ranges and facilities in and around Hawaii;
- Be consistent with the stated current and emerging requirements for the range complex;
- Achieve training tempo requirements based on Fleet deployment schedules;
- Meet the requirements of Department of Defense (DoD) Directive 3200.15, Sustainment of Ranges and operation areas;
- Implement new operational training requirements and RDT&E operations; and
- Support realistic training that replicates expected operating environments for naval forces

The No-action Alternative stands as no change from current levels of training usage. The existing level of activity is used as a benchmark with which to compare the outputs and effects of differing alternatives. If the No-action Alternative is selected, the Navy would continue its current activities at the HRC. Alternatives 1 and 2 analyze greater use of range assets to support training exercises by combining activities together to maximize training opportunities. By using the status quo as the No-action Alternative, the Navy compares the impacts of current operations to the impacts of enhanced operations presented in Alternatives 1 and 2.

Under the No-action Alternative, the current baseline of operations includes over 9,300 training and RDT&E operations being conducted in the HRC annually. Training operations including Major Exercises and RDT&E operations would continue at the baseline levels (which include RIMPAC exercises). The No-action Alternative includes the operations discussed in the following sections as well as those described in the 1998 PMRF Final EIS, the additional PMRF programs analyzed since December 1998, and the operations described in the RIMPAC 2002 Programmatic Environmental Assessment (EA) and the supplements to that document in 2004 and 2006. The No-action Alternative includes these training and test activities and also additional major range events.

- On-going training operations include Anti-Air Warfare, Amphibious Warfare, Anti-Surface Warfare, Anti-Submarine Warfare, Electronic Combat, Mine Warfare, Naval Special Warfare, and Strike Warfare exercises. The No-action Alternative also includes support operations such as Command and Control, in-port ship and aircraft support, and personnel support. RDT&E activities occur primarily at one of two locations in Hawaii; Pacific Missile Range Facility (PMRF) and Naval Undersea Warfare Center (NUWC) Detachment Pacific ranges.

- Alternative 1 includes all ongoing operations associated with the No-action Alternative, and proposes an increased number of such operations. Under Alternative 1, the Navy also proposes to increase the tempo and frequency of training exercises in the HRC. Field Carrier Landing Practice (FCLP) would be conducted for a small number of pilots each year in Hawaii. An FCLP is a series of touch-and-go landings conducted to train and field qualify pilots for aircraft carrier landings. The Navy also proposes to enhance RDT&E operations from current levels as necessary as well as add additional RDT&E operations.

- Alternative 2 would include all of the activities described in Alternative 1, with the addition of an increase in training exercises and RDT&E operations, new RDT&E activities, and additional major range events.

ES1.5 DECISIONS TO BE MADE

ES1.6 SCOPE OF THE ENVIRONMENTAL IMPACT STATEMENT/OVERSEAS ENVIRONMENTAL IMPACT STATEMENT

The geographic scope of this Draft EIS/OEIS (Study Area) includes 235,000 nm^2 of open ocean area (including subsurface) and associated special use airspace above and around the Hawaiian Islands. This Draft EIS/OEIS will also address naval operations within the offshore and onshore ranges and training areas of the HRC. This Draft EIS/OEIS will provide a programmatic evaluation of current and proposed training operations, and associated investments as identified in the Hawaii RCMP.

Under customary international law, U.S. Territory extends out into the ocean a distance of 3 nautical miles (nm) (5.6 kilometers [km]) from the coastline. By Presidential Proclamation 5928, issued December 27, 1988, the United States extended its exercise of sovereignty and jurisdiction under international law to 12 nm (22 km); but the Proclamation expressly provides that it does not extend or otherwise alter existing Federal law or any associated jurisdiction, rights, legal interests, or obligations. The Proclamation thus did not alter existing legal obligations under NEPA. As a matter of policy, however, the Department of the Navy has elected to apply NEPA to the 12 nm (22 km) limit established by the Proclamation. Impacts to areas of the HRC that lie within 12 nm (territorial seas) are subject to analysis under NEPA. Impacts in the areas that are outside U.S. territorial waters is analyzed using the procedures set out in EO 12114 and associated implementing regulations.

ES1.7 SUMMARY OF ENVIRONMENTAL IMPACTS

The Draft EIS/OEIS describes the potential environmental effects from implementing the No-action Alternative, Alternative 1, and Alternative 2. The environment is analyzed in terms of 13 resource areas: air quality, airspace, biological resources (Marine, Offshore, and Terrestrial), cultural resources, geology and soils, hazardous materials and waste, health and safety, land use, noise, socioeconomics, transportation, utilities, and water resources. Each resource area is discussed at each location unless No-action Alternative, Alternative, and Alternative 2 operations at that location would not foreseeable result in an impact.

ES1.7.1 Open Ocean Area

ES1.7.2 Northwestern Hawaiian Islands

ES1.7.3 Kauai

ES1.7.4 Oahu

ES1.7.5 Maui

ES1.7.6 Hawaii

A comparison of the environmental impacts of the No-action Alternative, Alternative 1, and Alternative 2, along with potential mitigation measures for each resource at each location, is presented in Tables ES-1 through ES-6.

Table ES-1. Summary of Environmental Impacts for the No-action Alternative, Alternative 1, and Alternative 2, Open Ocean

Resource Category	Open Ocean
Airspace	**No-action:** Impacts to airspace from continued operations and activities to controlled and uncontrolled airspace, special use airspace, enroute airways and jet routes, or airports and airfields are minimized through standard operating procedures, compliance with DoD Directive 4540.1, OPNAVINST 3770.4A, OPNAVINST 3721.20, and continued close coordination with the Federal Aviation Administration. No modifications or need for additional airspace is required. **Alternative 1:** Impacts to airspace from increased training operations, increased RDT&E activities, planned test and evaluation activities, HRC enhancements, and major fleet exercises would be minimized as described in the No-action Alternative. **Alternative 2:** Impacts to airspace from increases in training operations, additional RDT&E activities, and additional major fleet exercises would be minimized as described in the No-action Alternative.
Biological Resources (Marine)	**No-action:** The Navy has standard operating procedures and policies in place to minimize impacts to biological resources. **Alternative 1:** Impacts to biological resources from increased training operations, RDT&E operations, and major fleet exercises would be minimized as described in the No-action Alternative. **Alternative 2:** Impacts to biological resources from additional training operations and major fleet exercises would be minimized as described in the No-action Alternative.
Cultural Resources	**No-action:** Cultural resources that do occur in the Open Ocean Area are deeply submerged and inherently protected from the effect of all types of activity. Both the probability of encountering submerged resources and the probability of causing adverse effect on those resources are extremely low regardless of the action alternative being considered. To even further lower the probability of effect, areas where known submerged cultural resources exist will be avoided for operational activities involving debris dispersion or underwater detonation. Procedures are in place to minimize any affects to underwater cultural resources. **Alternative 1:** Impacts to cultural resources from increased training operations, RDT&E operations, and major fleet exercises would be minimized as described in the No-action Alternative. **Alternative 2:** Impacts to cultural resources from additional training operations and major fleet exercises would be minimized as described in the No-action Alternative.
Hazardous Materials and Waste	**No-action:** The Navy has appropriate plans in place to manage hazardous materials used and generated. Hazardous materials will continue to be controlled in compliance with OPNAVINST 5090.1B. Fragments of expended training materials (e.g. ammunition, bombs and missiles, targets, sonobouys, chaff, and flares) could be deposited on the ocean floor. The widely dispersed, intermittent, minute size of the material minimizes the impact. Wave energy and currents will further disperse the materials. **Alternative 1:** Impacts from hazardous materials and waste from increased training operations, RDT&E operations, and major fleet exercises would be minimized as described in the No-action Alternative. **Alternative 2:** Impacts from hazardous materials and waste from additional increases in training operations, RDT&E operations, and additional major fleet exercises would be minimized as described in the No-action Alternative.
Health and Safety	**No-action:** Risk to public health and safety is minimized through standard operating procedures and compliance with Dod Directive 4540.1, OPNAVINST 3770.4 and COMNAVSURFPAC Instruction 3120.8F. The Navy notifies the public of hazardous operations through the use of Notices-to-Airmen and Mariners (NOTAMs and NOTMARs). **Alternative 1:** Impacts to health and safety from the additional training operations, RDT&E operations and major fleet exercises would be minimized as described in the No-action Alternative. **Alternative 2:** Impacts to health and safety from the additional training operations, RDT&E operations and additional major fleet exercises would be minimized as described in the No-action Alternative.

Table ES-1. Summary of Environmental Impacts for the No-action Alternative, Alternative 1, and Alternative 2, Open Ocean (Continued)

Resource Category	Open Ocean
Noise	**No-action:** Activities are remote, infrequent and lack sensitive receptors. Training operations are typically conducted away from populated areas and most sensitive noise receptors. Standard operating procedures are used to ensure the area is clear of civilian vessels or other non-participants. The public is notified of the location, date, and time of the hazardous operations via NOTMARs, thereby precluding any acoustical impacts to sensitive receptors. **Alternative 1:** Impacts from noise from increased training operations, RDT&E operations and major fleet exercises would be minimized as described in the No-action Alternative. **Alternative 2:** Impacts from noise from additional training operations, RDT&E operations and additional major fleet exercises would be minimized as described in the No-action Alternative.
Socioeconomics	**No-action:** The Navy has procedures in place to minimize impacts. Long-range advance notice of scheduled operations' times and locations to be used within the HRC are made available to the public and commercial vessels via NOTMARS. These temporary range clearance procedures for safety purposes have been employed regularly over time without significant socioeconomic impacts on commercial shipping, commercial fishing, or tourist-related activities. Offshore training operations may have the potential for occasional, temporary disruptions of commercial shipping, commercial fishing, and tourism within the HRC; however, such operations would be infrequent and of very limited duration. **Alternative 1:** Impacts to socioeconomics from increased training operations and major fleet exercises would be minimized as described in the No-action Alternative. **Alternative 2:** Impacts to socioeconomics from increased training operations and additional major fleet exercises would be minimized as described in the No-action Alternative.
Water Resources	**No-action:** Impacts are not anticipated due to the small quantities of materials relative to the extent of the sea ranges and large volumes of water in which they will be dispersed. **Alternative 1:** Impacts to water resources from increase training operations, RDT&E operations, and major fleet exercises would be minimized as described in the No-action Alternative. **Alternative 2:** Impacts to water resources from increased training operations, future RDT&E operations, and major fleet exercises would be minimized as described in the No-action Alternative.

Note: No impacts to Air Quality, Biological Resources (Terrestrial and Offshore), Geology and Soils, Land Use, Transportation, and Utilities are anticipated due to site activities under the No-action Alternative, Alternative 1, or Alternative 2.

Table ES-2. Summary of Environmental Impacts for the No-action Alternative, Alternative 1, and Alternative 2, Northwestern Hawaiian Islands

Resource Category	Northwestern Hawaiian Islands
Biological Resources (Terrestrial and Offshore)	**No-action:** Some current flight trajectories could result in the Terminal High Altitude Area Defense (THAAD) missile flying over portions of the Northwestern Hawaiian Islands. Preliminary results of debris analysis indicate that debris is not expected to severely harm threatened, endangered, migratory, or other endemic species. The probability for debris to hit birds, seals, or other wildlife will be extremely low. Quantities of falling debris will be very low and widely scattered so as not to present a toxicity issue. Falling debris will also have cooled down sufficiently so as not to present a fire hazard. If feasible, consideration will be given to alterations in the missile flight trajectory, to further minimize the potential for debris impacts. **Alternative 1:** There are no proposed operations or exercises that would affect the Northwestern Hawaiian Islands; ongoing operations would be minimized as described in the No-action Alternative. **Alternative 2:** There are no proposed operations or exercises that would affect the Northwestern Hawaiian Islands; ongoing operations would be minimized as described in the No-action Alternative.
Cultural Resources	**No-action:** Missile defense activities, including THAAD, have the potential to generate debris that falls within areas of the Northwest Hawaiian Islands. Debris analyses of the types, quantities, and sizes associated with the Pacific Missile Range Facility (PMRF) missile operations indicate that the potential to impact land resources of any type is very low and extremely remote. In addition, trajectories can be altered under certain circumstances to further minimize the potential for impacts. Future missions will include consideration of missile flight trajectory alterations, if feasible, to minimize the potential for debris within the monument. As a result, impacts on cultural resources within the Northwestern Hawaiian Islands are not expected. **Alternative 1:** There are no proposed operations or exercises that would affect the Northwestern Hawaiian Islands; ongoing operations would be minimized as described in the No-action Alternative. **Alternative 2:** There are no proposed operations or exercises that would affect the Northwestern Hawaiian Islands; ongoing operations would be minimized as described in the No-action Alternative.

Note: No impacts to Air Quality, Airspace, Biological Resources (Marine), Geology and Soils, Hazardous Materials and Waste, Health and Safety, Land Use, Noise, Socioeconomics, Transportation, Utilities, Water Resources are anticipated due to site activities under the No-action Alternative, Alternative 1, or Alternative 2.

Table ES-3A: Summary of Environmental Impacts for the No-action Alternative, Alternative 1, and Alternative 2, Kauai

Resource Category	PMRF/Main Base	Makaha Ridge	Kokee
Air Quality	**No-action:** Compliance with standard operating procedures and air permits will minimize impacts. Fugitive dust from construction will be minimized by dust suppression methods. Emissions generated by base activities do not affect the regional air quality. The tempo of launch events will be managed by range operations to stay within the limits of current agreements. **Alternative 1:** Impacts to air quality from increased training operations, RDT&E operations, HRC enhancements, and major fleet exercises would be minimized as described in the No-action Alternative. Construction would create fugitive dust emissions, diesel exhaust emissions; no change in regional air quality due to compliance with standard operating procedures for construction, including implementation of dust suppression methods and a vehicle maintenance program. No change to regional air quality. **Alternative 2:** Impacts to air quality from increased training operations, RDT&E operations, and major fleet exercises would be minimized as described in the No-Action Alternative. No change to regional air quality status.	**No-action:** Infrequent emissions associated with intermittent use of diesel generators; no change in regional air quality **Alternative 1:** Increased use of diesel generators; construction would create fugitive dust emissions, diesel exhaust emissions, and Volatile Organic Compounds (VOCs); no change in regional air quality due to compliance with standard operating procedures for construction, including implementation of dust suppression methods and a vehicle maintenance program. No change to regional air quality. **Alternative 2:** Impacts from increased training operations, and major fleet exercises would be minimized as described in Alternative 1.	**No-action:** Infrequent emissions associated with intermittent use of diesel generators; no change in regional air quality **Alternative 1:** Increased use of diesel generators; construction would create fugitive dust emissions, diesel exhaust emissions, and VOCs; no change in regional air quality due to compliance with standard operating procedures for construction, including implementation of dust suppression methods and a vehicle maintenance program. No change to regional air quality. **Alternative 2:** Impacts from increased training operations, and major fleet exercises would be minimized as described in Alternative 1.

Table ES-3A: Summary of Environmental Impacts for the No-action Alternative, Alternative 1, and Alternative 2, Kauai (Continued)

Resource Category	PMRF/Main Base	Makaha Ridge	Kokee
Airspace	**No-action:** Impacts to airspace from continued operations and activities to controlled and uncontrolled airspace, special use airspace, enroute airways and jet routes, or airports and airfields are minimized through standard operating procedures, compliance with DoD Directive 4540.1, OPNAVINST 3770.4A, OPNAVINST 3721.20, and continued close coordination with the Federal Aviation Administration. No modifications or need for additional airspace is required. **Alternative 1:** Impacts to airspace from ongoing activities, increased training operations, increase RDT&E activities, planned test and evaluation activities, or HRC enhancements would be minimized as described in the No-action Alternative. **Alternative 2:** Impacts to airspace from ongoing activities, additional major range events, increased training exercises, or additional RDT&E activities would be minimized as described in the No-action alternative.	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.
Biological Resources (Terrestrial and Offshore)	**No-action:** Operations take place in current operating areas. Compliance with relevant Navy policies and procedures during these training operations would minimize the effects on vegetation and wildlife, as well as limit the potential for introduction of invasive plant species. No impacts from electromagnetic radiation generation to wildlife. **Alternative 1:** Impacts to biological resources from increased training operations, RDT&E operations, and HRC enhancements would be minimized as described in the No-action Alternative. No expansion of operating area. Because construction-related noise would be localized, intermittent, and occur over a relatively short-term, the potential for impacts on biological resources would be minimal. Additional electromagnetic radiation would not affect wildlife.	**No-action:** Training Operations and major exercises take place in current operating areas. Compliance with relevant Navy policies and procedures during these training operations would minimize the effects on vegetation and wildlife, as well as limit the potential for introduction of invasive plant species. No impacts from electromagnetic radiation generation to wildlife. **Alternative 1:** Impacts to biological resources from increased training operations and major exercises would be minimized as described in the No-action Alternative. No expansion of the operating area. Effects on wildlife from construction-related noise and presence of additional personnel would be minimal. Additional electromagnetic radiation would not affect wildlife.	**No-action:** Training Operations and major exercises take place in current operating areas. Compliance with relevant Navy policies and procedures would minimize the effects on vegetation and wildlife, as well as limit the potential for introduction of invasive plant species. No impacts from electromagnetic radiation generation to wildlife. **Alternative 1:** Impacts to biological resources from increased training operations and major exercises would be minimized as described in the No-action Alternative. No expansion of the operating area. Effects on wildlife from construction-related noise and presence of additional personnel would be minimal. Additional electromagnetic radiation would not affect wildlife

Table ES-3A: Summary of Environmental Impacts for the No-action Alternative, Alternative 1, and Alternative 2, Kauai (Continued)

Resource Category	PMRF/Main Base	Makaha Ridge	Kokee
Biological Resources (Terrestrial and Offshore) (Continued)	**Alternative 2:** Impacts to biological resources from increased training operations, RDT&E operations, and major fleet exercises would be minimized as described in the No-action Alternative. Temporary, short-term startle effects from noise to wildlife and birds. The intensity and duration of wildlife startle responses decrease with the number and frequency of exposures. Additional electromagnetic radiation would not affect wildlife.	**Alternative 2:** Impacts to biological resources from increased training operations and major exercises would be minimized as described in the No-action Alternative. No expansion of the operating area. Temporary, short-term startle effects from noise to wildlife and birds. The intensity and duration of wildlife startle responses decrease with the number and frequency of exposures. Additional electromagnetic radiation would not affect wildlife.	**Alternative 2:** Impacts to biological resources from increased training operations and additional major exercises would be minimized as described in the No-action Alternative. No expansion of the operating area. Temporary, short-term startle effects from noise to wildlife and birds. The intensity and duration of wildlife startle responses decrease with the number and frequency of exposures. Additional electromagnetic radiation would not affect wildlife.
Cultural Resources	**No-action:** Activities occur in designated areas and sensitive areas are avoided. Compliance with the PMRF Integrated Natural Resources Management Plan (ICRMP) and standard operating procedures minimizes adverse impacts. **Alternative 1:** Increases from increased training operations, RDT&E operations, and HRC enhancements would be minimized as described in the No-Action Alternative. **Alternative 2:** Increases from increased training operations, RDT&E operations, and major fleet exercises would be minimized as described in the No-Action Alternative.	**No-action:** Makaha Ridge has been surveyed for archaeological, historical, and Native Hawaiian resources and none have been identified. As a result, No-action Alternative operations will not affect cultural resources. **Alternative 1:** An increase in tempo and frequency of training operations would not affect cultural resources. Because Makaha Ridge has been surveyed for cultural resources and none were identified, no effects are expected. If archaeological or Native Hawaiian resources are unexpectedly encountered during HRC enhancements, then the Hawaii SHPO will be notified. **Alternative 2:** Impacts and mitigations would be as described in Alternative 1. .	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.
Geology and Soils	**No-action:** Ongoing training operations and exercises would have minimal direct impact on the beach and inland areas, and soils would not be permanently affected. **Alternative 1:** New construction would follow standard methods to control erosion. Soil disturbance would be limited to the immediate vicinity of the construction area and would be of short duration. Base personnel would exercise best management practices to reduce soil erosion. **Alternative 2:** Impacts would be minimized as described in Alternative 1.	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.

Table ES-3A: Summary of Environmental Impacts for the No-action Alternative, Alternative 1, and Alternative 2, Kauai (Continued)

Resource Category	PMRF/Main Base	Makaha Ridge	Kokee
Hazardous Materials and Waste	**No-action:** PMRF/Main Base has appropriate plans and standard operating procedures in place to manage hazardous materials and waste. **Alternative 1:** Impacts from hazardous materials and waste from increased training operations, RDT&E operations, and HRC enhancements would be minimized as described in the No-action Alternative. Any construction activities would comply with standard operating procedures and adhere to the existing hazardous management plans. **Alternative 2:** Impacts from hazardous materials and waste from additional increases in training operations, RDT&E operations and additional major exercises would be minimized as described in the No-action Alternative and Alternative 1.	**No-action:** Makaha Ridge has appropriate plans in place to manage hazardous materials and waste. **Alternative 1:** The increase in training operations and major exercises would be minimized as described in the No-action Alternative. Any construction activities would comply with standard operating procedures and adhere to the existing hazardous management plans. **Alternative 2:** Impacts from hazardous materials and waste from additional increases in training operations and major exercises would be minimized as described in the No-action Alternative and Alternative 1.	**No-action:** Kokee has appropriate plans in place to manage hazardous materials and waste. **Alternative 1:** The increase in training operations and major exercises would be minimized as described in the No-action Alternative. Any construction activities would comply with standard operating procedures and adhere to the existing hazardous management plans. **Alternative 2:** Impacts from additional increases in training operations and major exercises would be minimized as described in the No-action Alternative and Alternative 1.
Health and Safety	**No-action:** Risk to public health and safety is minimized through compliance with standard operating procedures, policies, and plans. **Alternative 1:** Impacts to health and safety from additional training operations, RDT&E operations, HRC enhancements, and major fleet exercises would be minimized as described in the No-action Alternative. Construction would be in accordance with USACE Safety and Health Requirements Manual. **Alternative 2:** Impacts to health and safety from additional training operations, RDT&E operations, and additional major fleet exercises would be minimized as described in the No-Action Alternative and Alternative 1.	**No-action:** Compliance with standard operating procedures would minimize impacts. Location away from the public results in no adverse public health and safety issues. **Alternative 1:** Impacts to health and safety from additional training operations and major exercises would be minimized as described in the No-action Alternative. Construction would be in accordance with USACE Safety and Health Requirements Manual. **Alternative 2:** Impacts to health and safety from additional training operations and major exercises would be minimized as described in the No-Action Alternative and Alternative 1.	**No-action:** Compliance with standard operating procedures would minimize impacts. **Alternative 1:** Impacts to health and safety from additional training operations and major exercises would be minimized as described in the No-action Alternative. Construction would be in accordance with USACE Safety and Health Requirements Manual. **Alternative 2:** Impacts to health and safety from additional training operations and major exercises would be minimized as described in the No-Action Alternative and Alternative 1.

Table ES-3A: Summary of Environmental Impacts for the No-action Alternative, Alternative 1, and Alternative 2, Kauai (Continued)

Resource Category	PMRF/Main Base	Makaha Ridge	Kokee
Land Use	**No-action:** Land uses & API are compatible with PMRF operations. The continuation of operations will be consistent to the maximum extent practicable with the Hawaii Coastal Zone Management Program. Closure of public recreational areas during hazardous operations **Alternative 1:** Land uses compatible with increased training operations, training activities, RDT&E operations, HRC enhancements, and major fleet exercises; additional closure of public recreation areas during hazardous operations. **Alternative 2:** Land uses compatible with proposed increased training operations, training activities, RDT&E activities, and additional major fleet exercises; additional closure of public recreation areas during hazardous operations.	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.
Noise	**No-action:** PMRF maintains a hearing protection program and has standard operating procedures in place that would minimize impacts. Beach access to the areas of each of the exercises will be restricted for the duration of the exercise. Launches occur infrequently, are short in duration, and noise levels are within OSHA standards. **Alternative 1:** Impacts from noise from increased training operations, RDT&E operations, and HRC enhancements would be minimized as described in the No-action Alternative. **Alternative 2:** Impacts from noise from increased training operations and additional major fleet exercises would be minimized as described in the No-action Alternative.	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.

Table ES-3A: Summary of Environmental Impacts for the No-action Alternative, Alternative 1, and Alternative 2, Kauai (Continued)

Resource Category	PMRF/Main Base	Makaha Ridge	Kokee
Socioeconomics	**No-action:** Beneficial impacts to economy and community on Kauai. **Alternative 1:** Small increase in beneficial impacts to economy on Kauai from increased training operations, future RDT&E operations, and major exercises. **Alternative 2:** Small increase in beneficial impacts to economy on Kauai from increased training operations, future RDT&E operations, and additional major exercises.	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.
Transportation	**No-action:** No impacts identified for the transportation system; PMRF events are discrete and intermittent. Transportation of ordnance and liquid propellants conducted in accordance with established procedures. **Alternative 1:** Minimal increase in average daily traffic due to increased training operations, HRC enhancements, and major fleet exercises. Traffic increases generated by construction personnel due to HRC enhancements would be temporary and would result in minor additional traffic. Major exercises are discrete and intermittent with minimal temporary increase in traffic. **Alternative 2:** No additional traffic will be generated for increased training operations, RDT&E operations, and additional major fleet exercises above what would be generated for alternative 1.	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.
Utilities	**No-action:** Current utility capacity meets demands. **Alternative 1:** Electricity demand, potable water consumption, wastewater generated, and solid waste disposal would be handled by existing facilities. **Alternative 2:** Additional electricity demand, potable water consumption, wastewater generated and solid waste disposal would be handled by existing facilities.	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.

Table ES-3A: Summary of Environmental Impacts for the No-action Alternative, Alternative 1, and Alternative 2, Kauai (Continued)

Resource Category	PMRF/Main Base	Makaha Ridge	Kokee
Water Resources	**No-action:** Compliance with standard operating procedures and policies would minimize impacts. Training operations have minimal impact to beach and inland areas and surface drainage is not permanently affected. Emissions from launches and exercises would not significantly affect water resources. **Alternative 1:** Impacts to water resources from increased training operations, RDT&E operations, HRC enhancements, and major fleet exercises would be minimized as described in the No-action Alternative. Slight increase in missile launch emissions would not significantly affect water quality. Construction activities associated with HRC enhancements would follow standard operating procedures minimizing potential impacts from accidental spills of hazardous materials. **Alternative 2:** Impacts to water resources from increased training operations, RDT&E operations, HRC enhancements, and major fleet exercises would be minimized as described in the No-action Alternative and Alternative 1.	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.

Table ES-3B: Summary of Environmental Impacts for the No-action Alternative, Alternative 1, and Alternative 2, Kauai

Resource Category	HIANG Kokee	Kamokala Magazines	Niihau	Kaula
Airspace	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.	**No-action:** Continued close coordination with the Federal Aviation Administration and PMRF regarding continued operations and activities to controlled and uncontrolled airspace, special use airspace, enroute airways, and jet routes would minimize impacts. **Alternative 1:** Impacts to airspace from ongoing activities, increased training operations, RDT&E activities or HRC investments would be minimized as described in the No-Action Alternative. No new airspace proposal or any modification to existing airspace would be required. **Alternative 2:** Impacts to airspace from ongoing activities, additional major range events, increased training exercises, or additional RDT&E activities or HRC investments would be minimized as described in the No-action Alternative and Alternative 1.
Biological Resources (Terrestrial and Offshore)	**No-action:** Training Operations and major exercises take place in current operating areas. Compliance with relevant policies and procedures would minimize the effects on wildlife. No impacts from electromagnetic radiation generation to wildlife. **Alternative 1:** Impacts to biological resources from increased training operations would be minimized as described in the No-action Alternative. No expansion required. Additional electromagnetic radiation would not affect wildlife.	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.	**No-action:** Training Operations and major exercises take place in current operating areas. Compliance with relevant Navy policies and procedures during these training operations would minimize the effects on vegetation and wildlife, as well as limit the potential for introduction of invasive plant species. No impacts from electromagnetic radiation generation to wildlife	**No-action:** Minimal impacts to vegetation. Mitigation measures are in place that reduce or eliminate any potential impacts to marine mammals. Minimal impacts to migratory seabirds. **Alternative 1:** Training Operations and major exercises take place in current operating areas, with no expansion. Compliance with relevant Navy, NMFS, and USFWS policies and procedures during these training operations would minimize the effects on vegetation and wildlife.

Table ES-3B: Summary of Environmental Impacts for the No-action Alternative, Alternative 1, and Alternative 2, Kauai (Continued)

Resource Category	HIANG Kokee	Kamokala Magazines	Niihau	Kaula
Biological Resources (Terrestrial and Offshore) (Continued)	**Alternative 2:** Impacts to biological resources from increased training operations and additional major exercises would be minimized as described in the No-action Alternative and Alternative 1.		**Alternative 1:** Impacts to biological resources from increased training operations and major exercises would be minimized as described in the No-action Alternative. No expansion is required. Minimal impacts to biological resources from construction; additional electromagnetic radiation would not affect wildlife. **Alternative 2:** Impacts to biological resources from increased training operations and major exercises would be as described in the No-Action Alternative and Alternative 1. Temporary, short-term startle effects from noise to wildlife and birds. The intensity and duration of wildlife startle responses decrease with the number and frequency of exposures	**Alternative 2:** Impacts to biological resources from increased training operations and major exercises would be minimized as described in the No-action Alternative and Alternative 1. Temporary, short-term startle effects from noise to wildlife and birds. The intensity and duration of wildlife startle responses decrease with the number and frequency of exposures. No potential impacts to migratory seabird populations.
Cultural Resources	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.	**No-action:** No known cultural sites within the impact zone; training operations will have no impacts. Major exercises are restricted to the impact zone and will have no impacts. **Alternative 1:** Increased training operations are confined to the impact zone and would have no impact on cultural resources. **Alternative 2:** Additional increases in training operations are confined to the impact zone and would have no impact on cultural resources.

Table ES-3B: Summary of Environmental Impacts for the No-action Alternative, Alternative 1, and Alternative 2, Kauai (Continued)

Resource Category	HIANG Kokee	Kamokala Magazines	Niihau	Kaula
Geology and Soils	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.	**No-action:** Minimize impact by concentrating targeting on the southeast tip of the island. **Alternative 1:** Impacts from Increased training and major exercises would be minimized as described in the No-action Alternative. **Alternative 2:** Impacts from increased training and additional major exercises would be minimized as described in the No-action Alternative.
Hazardous Materials and Waste	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.	**No-action:** PMRF has procedures in place to manage hazardous materials and waste. Storage and transportation or ordnance is conducted in accordance with established DOT, DoD, and Navy safety procedures. **Alternative 1:** Impacts would be minimized as described in the No-action Alternative. **Alternative 2:** Impacts would be minimized as described in the No-action Alternative.	**No-action:** PMRF has appropriate plans in place to manage hazardous materials and waste. **Alternative 1:** Impacts from the increase in training operations and major exercises would be minimized as described in the No-action Alternative. Any construction activities would comply with standard operating procedures and adhere to the existing hazardous management plans. **Alternative 2:** Impacts from additional increases in training operations and major exercises would be minimized as described in the No-action Alternative and Alternative 1.	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.

Table ES-3B: Summary of Environmental Impacts for the No-action Alternative, Alternative 1, and Alternative 2, Kauai (Continued)

Resource Category	HIANG Kokee	Kamokala Magazines	Niihau	Kaula
Health and Safety	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.	**No-action:** Compliance with existing health and safety plans and procedures would minimize impacts. No change in the type of ordnance stored and no increase safety risks. Storage and transportation of ordnance are conducted in accordance with established DOT, DoD and Navy safety procedures. **Alternative 1:** Impacts would be minimized as described in the No-action Alternative. **Alternative 2:** Impacts would be minimized as described in the No-action Alternative.	**No-action:** Compliance with existing health and safety plans and procedures would minimize impacts. Location of radar and electronic warfare sites away from the public results in no adverse public health and safety issues. **Alternative 1:** Impacts from additional training operations and major exercises would be minimized as described in the No-action Alternative. Construction would be in accordance with USACE Safety and Health Requirements Manual. **Alternative 2:** Impacts from additional training operations and major exercises would be minimized as described in the No-action Alternative and Alternative 1.	**No-action:** Compliance with existing health and safety plans and procedures would minimize health and safety risks. **Alternative 1:** Impacts from additional training operations would be minimized as described in the No-action Alternative. **Alternative 2:** Impacts from additional training operations would be minimized as described in the No-action alternative.
Land Use	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.	**No-action:** No change in land use for on-going Navy operations. The continuation of operations will be consistent to the maximum extent practicable with the Hawaii Coastal Zone Management Program. **Alternative 1:** No change in land use is although increased operations and major exercises. **Alternative 2:** No change in land use although increased operations and major exercises.

Note: No impacts at Port Allen, Kikiaola Small Boat Harbor, or Mt. Kahili are anticipated due to site activities under the No-action Alternative, Alternative 1, or Alternative 2.
Note: No impacts to Air Quality, Biological Resources (Marine), Geology and Soils, Noise, Socioeconomics, Transportation, Utilities, and Water Resources are anticipated due to site activities under the No-action Alternative, Alternative 1, or Alternative 2.

Table ES-4A: Summary of Environmental Impacts for the No-action Alternative, Alternative 1, and Alternative 2, Oahu

Resource Category	Naval Station Pearl Harbor	Ford Island	Naval Inactive Ship Maintenance Facility, Pearl Harbor
Biological Resources (Terrestrial and Offshore)	**No-action:** Procedures and policies are in place to minimize the potential for impacts to vegetation and wildlife, as well as limit the potential for introduction of invasive plant species. No impacts to essential fish habitat. **Alternative 1:** Impacts to biological resources from increased operations and major fleet exercises would be minimized as described in the No-action Alternative. Operations would take place at existing locations; no expansion of the area would be involved. **Alternative 2:** Impacts to biological resources from increased operations and additional major fleet exercises would be minimized as described in the No-action Alternative and Alternative 1. Temporary, short-term startle effects from noise to wildlife and birds. The intensity and duration of wildlife startle responses decrease with the number and frequency of exposures.	**No-action:** Procedures and policies are in place to minimize the potential for impacts to vegetation and wildlife, as well as limit the potential for introduction of invasive plant species. No impacts to essential fish habitat. No critical habitat has been identified. **Alternative 1:** Impacts to biological resources from increased operations and major fleet exercises would be minimized as described in the No-action Alternative. Operations would take place at existing locations; no expansion of the area would be involved. **Alternative 2: :** Impacts to biological resources from increased operations and additional major fleet exercises would be minimized as described in the No-action Alternative and Alternative 1. Temporary, short-term startle effects from noise to wildlife and birds. The intensity and duration of wildlife startle responses decrease with the number and frequency of exposures.	**No-action:** Procedures and policies are in place to minimize impacts to vegetation and wildlife, as well as limit the potential for introduction of invasive plant species. Minor and localized impacts to fish. No impacts to essential fish habitat. **Alternative 1:** Impacts to biological resources from increased operations and major fleet exercises would be minimized as described in the No-action Alternative. Operations would take place at existing locations; no expansion of the area would be involved. **Alternative 2:** Impacts to biological resources from increased operations and additional major fleet exercises would be minimized as described in the No-action Alternative and Alternative 1. Temporary, short-term startle effects from noise to wildlife and birds. The intensity and duration of wildlife startle responses decrease with the number and frequency of exposures.
Cultural Resources	**No-action:** Operations will be conducted in accordance with the policies, guidelines, and standard operating procedures outlined in the Integrated Cultural Resources Management Plan, Pearl Harbor Naval Complex or any other agreement documents promulgated since completion of the ICRMP to minimize any impacts. **Alternative 1:** Impacts from increased training operations/activities would be minimized as described in the No-action Alternative. **Alternative 2:** Impacts from additional increases in training operations/activities would minimized as described in the No-action Alternative.	**No-action:** There are no training or major fleet exercises with the potential to affect cultural resources. **Alternative 1:** Construction of the ATF would be mitigated by compliance with the Pearl Harbor ICRMP and would require coordination with Navy Region Hawaii's cultural resource coordinator. **Alternative 2:** There are no new major fleet exercises or training operations with the potential to affect cultural resources.	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.

Table ES-4A: Summary of Environmental Impacts for the No-action Alternative, Alternative 1, and Alternative 2, Oahu (Continued)

Resource Category	Naval Station Pearl Harbor	Ford Island	Naval Inactive Ship Maintenance Facility, Pearl Harbor
Hazardous Materials and Waste	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.	**No-action:** Naval Inactive Ship Maintenance Facility, Pearl Harbor has appropriate plans in place to manage hazardous materials used and generated. **Alternative 1:** Impacts from the increase in training operations and major fleet exercises would be minimized as described in the No-action Alternative. **Alternative 2:** Impacts from additional increases in training operations and major fleet exercises would be minimized as described in the No-action Alternative.
Socioeconomics	**No-action:** Beneficial impacts to economy and community on Oahu. **Alternative 1:** Small increase in beneficial impacts to economy on Oahu from increased RDT&E and major fleet exercises. **Alternative 2:** Small increase in beneficial impacts to economy on Oahu from increased training operations, and additional major fleet exercises.	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.
Water Resources	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.	**No-action:** There are no training operations, RDT&E operations, or major fleet exercises with the potential to affect water resources. **Alternative 1:** There are no training operations, RDT&E operations, or major fleet exercises with the potential to affect water resources. HRC enhancements would adhere to standard operating procedures for construction to minimize and avoid adverse impacts to water quality. **Alternative 2:** Impacts would be minimized as described in Alternative 1.	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.

Note: No impacts to Air Quality, Airspace, Biological Resources (Marine), Geology and Soils, Health and Safety, Land Use, Noise, Transportation, and Utilities, are anticipated due to site activities under the No-action Alternative, Alternative 1, or Alternative 2.

Table ES-4B: Summary of Environmental Impacts for the No-action Alternative, Alternative 1, and Alternative 2, Oahu

Resource Category	EOD Range NAVMAG Pearl Harbor West Loch	Lima Landing	Puuloa Underwater Range
Biological Resources (Terrestrial and Offshore)	**No-action:** Procedures and policies are in place to minimize impacts to biological resources. Intrusive noise could startle noise-sensitive wildlife in the vicinity. **Alternative 1:** Impacts from increased operations and training exercises would be minimized as described in the No-action Alternative. **Alternative 2:** Impacts from additional increases in operations and training exercises would be minimized as described in the No-action Alternative. Temporary, short-term startle effects from noise to wildlife and birds. The intensity and duration of wildlife startle responses decrease with the number and frequency of exposures.	**No-action:** Procedures and policies are in place to minimize impacts to biological resources. Minor and localized impacts to fish. No impacts to essential fish habitat. **Alternative 1:** Impacts from increased operations and exercises would be minimized as described in the No-action Alternative. Operations would take place at existing locations; no expansion of the area would be involved. Minor and localized impacts to fish. **Alternative 2:** Impacts from increased operations and additional major fleet exercises would be minimized as described in the No-action Alternative and Alternative 1. Temporary, short-term startle effects from noise to wildlife and birds. The intensity and duration of wildlife startle responses decrease with the number and frequency of exposures.	**No-action:** Procedures and policies are in place to minimize impacts to biological resources. Minor and localized impacts to fish. No impacts to essential fish habitat. Any effects from noise, shock, or residual chemicals would be localized and temporary. **Alternative 1:** Impacts from increased operations and major fleet exercises would be minimized as described in the No-action Alternative. Operations would take place at existing locations; no expansion of the area would be involved. **Alternative 2:** Impacts from increased operations and additional major fleet exercises would be minimized as described in the No-action Alternative and Alternative 1. Temporary, short-term startle effects from noise to wildlife and birds. The intensity and duration of wildlife startle responses decrease with the number and frequency of exposures.
Cultural Resources	**No-action:** No ongoing training operations with the potential to affect cultural resources. No cultural resources present in the area. **Alternative 1:** Increasing training operations/activities would not affect cultural resources because there are no cultural resources present in the area. **Alternative 2:** Additional increases in training operations/activities would not affect cultural resources because there are no cultural resources present in the area.	**No-action:** There are no cultural resources within the region of influence for Lima Landing's underwater demolition activities. No effects on cultural resources are expected. Policies and procedures are in place to minimize any impacts. **Alternative 1:** Increasing training operations and major fleet activities would be mitigated by compliance with existing policies and procedures. **Alternative 2:** Additional increases in training operations and major fleet activities would be mitigated by compliance with existing policies and procedures. Future location changes for underwater demolition activities would be coordinated with the Navy Region Hawaii cultural resources coordinator.	**No-action:** No known cultural resources exist. No impacts to cultural resources anticipated. **Alternative 1:** No impacts anticipated due to increased training operations and major fleet exercises. **Alternative 2:** No impacts anticipated due to additional increases in training operations and major fleet exercises.

Table ES-4B: Summary of Environmental Impacts for the No-action Alternative, Alternative 1, and Alternative 2, Oahu (Continued)

Resource Category	EOD Range NAVMAG Pearl Harbor West Loch	Lima Landing	Puuloa Underwater Range
Geology and Soils	**No-action:** Policies and procedures are in place to minimize any impacts. EOD training is not expected to affect the geology of the Range; no construction or excavation is planned. Minor contamination of surface soil. **Alternative 1:** Impacts from Increased training operations would be minimized as described in the No-action Alternative. **Alternative 2:** Impacts from additional major fleet exercises would be minimized as described in the No-action Alternative.	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.
Hazardous Materials and Waste	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.	**No-action:** Lima Landing has appropriate plans in place to manage hazardous materials used and generated. **Alternative 1:** Impacts from the increase in training operations and major fleet exercises would be minimized as described in the No-action Alternative. **Alternative 2:** Impacts from additional increase in training operations and major fleet exercises would be minimized as described in the No-action Alternative.	**No-action:** Puuloa Underwater range has appropriate plans in place to manage hazardous materials used and generated. **Alternative 1:** Impacts from the increase in training operations and major fleet exercises would be minimized as described in the No-action Alternative. **Alternative 2:** Impacts from the additional increase in training operations and major fleet exercises would be minimized as described in the No-action Alternative.
Health and Safety	**No-action:** Compliance with standard operating procedures would minimize impacts. Location away from the public results in no adverse public health and safety issues. **Alternative 1:** Impacts from the additional training operations and major fleet exercises would be minimized as described in the No-action Alternative. **Alternative 2:** Impacts from the additional training operations and major fleet exercises would be minimized as described in the No-action Alternative.	**No-action:** Compliance with standard operating procedures would minimize impacts. Location away from the public results in no adverse public health and safety issues. Demolition activities are conducted in accordance with COMNAVSURFPAC Instruction 3120.8F. **Alternative 1:** Impacts from the additional training operations and major fleet exercises would be minimized as described in the No-action Alternative. **Alternative 2:** Impacts from the additional training operations and major fleet exercises would be minimized as described in the No-action Alternative.	**No-action:** Compliance with standard operating procedures would minimize impacts. Location away from the public results in no adverse public health and safety issues. Demolition activities are conducted in accordance with COMNAVSURFPAC Instruction 3120.8F. **Alternative 1:** Impacts from the additional training operations and major fleet exercises would be minimized as described in the No-action Alternative. **Alternative 2:** Impacts from the additional training operations and major fleet exercises would be minimized as described in the No-action Alternative.

Table ES-4B: Summary of Environmental Impacts for the No-action Alternative, Alternative 1, and Alternative 2, Oahu (Continued)

Resource Category	EOD Range NAVMAG Pearl Harbor West Loch	Lima Landing	Puuloa Underwater Range
Water Resources	**No-action:** Intermittent, short-term discharges of minute amounts of munitions constituents into surface waters will have no effect on water resources. **Alternative 1:** Increases in training operations will not significantly affect water resources. **Alternative 2:** Additional increases in training operations will not significantly effect water resources	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.

Note: No impacts to Air Quality, Airspace, Biological Resources (Marine), Land Use, Noise, Socioeconomics, Transportation, and Utilities, are anticipated due to site activities under the No-action Alternative, Alternative 1, or Alternative 2.

Table ES-4C: Summary of Environmental Impacts for the No-action Alternative, Alternative 1, and Alternative 2, Oahu

Resource Category	Naval Defensive Sea Area	CG Station Barbers Point/Kalaeola Airport	Marine Corps Base Hawaii
Airspace	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.	**No-action:** Impacts to airspace from continued operations and activities to controlled and uncontrolled airspace, enroute airways and jet routes, or airports and airfields are minimized through standard operating procedures, and coordination with the State of Hawaii, U.S. Coast Guard, Kalaeloa Airport, and the Federal Aviation Administration. No modifications or need for additional airspace is required. **Alternative 1:** Impacts to airspace from increased training operations and major fleet exercises would be minimized as described in the No-action Alternative. **Alternative 2:** Impacts to airspace from increased training operations and additional major fleet exercises would be minimized as described in the No-action Alternative.	**No-action:** Impacts to airspace from continued operations and activities to controlled and uncontrolled airspace, special use airspace, enroute airways and jet routes, or airports and airfields are minimized through standard operating procedures and continued close coordination with the Federal Aviation Administration. No modifications or need for additional airspace is required. **Alternative 1**: Impacts to airspace from increased training operations, and major fleet exercises would be minimized as described in the No-action Alternative. **Alternative 2:** Impacts to airspace from ongoing activities, increased training operations, and additional major fleet exercises would be minimized as described in the No-action Alternative.
Biological Resources (Terrestrial and Offshore)	**No-action:** Procedures and policies are in place to minimize impacts to biological resources. No essential fish habitat affected. **Alternative 1:** Impacts would be minimized as described in the No-action Alternative. Increased operations and major fleet exercises would take place at existing locations; no expansion of the area would be involved. **Alternative 2:** Impacts would be minimized as described in the No-action Alternative. Increased operations and additional major fleet exercises would take place at existing locations; no expansion of the area would be involved.	**No-action:** Training Operations and major exercises take place in current operating areas, with no expansion. Compliance with relevant Navy and Coast Guard policies and procedures during these training operations would minimize the effects on vegetation and wildlife, as well as limit the potential for introduction of invasive plant species. **Alternative 1:** Impacts from increased training operations and major fleet exercises would be minimized as described in the No-action Alternative. **Alternative 2:** Impacts from increased training operations and major exercises would be minimized as described in the No-action Alternative. Temporary, short-term startle effects from noise to wildlife and birds. The intensity and duration of wildlife startle responses decrease with the number and frequency of exposures.	**No-action:** Marine Corps and Navy procedures and policies are in place to minimize impacts to biological resources and prevent introduction of invasive species. **Alternative 1:** Impacts from increased training operations and major fleet exercises would be minimized as described in the No-action Alternative. **Alternative 2:** Impacts from increased operations and additional major fleet exercises would be minimized as described in the No-action Alternative. Temporary, short-term startle effects from noise to wildlife and birds. The intensity and duration of wildlife startle responses decrease with the number and frequency of exposures.

Table ES-4C: Summary of Environmental Impacts for the No-action Alternative, Alternative 1, and Alternative 2, Oahu (Continued)

Resource Category	Naval Defensive Sea Area	CG Station Barbers Point/Kalaeola Airport	Marine Corps Base Hawaii
Cultural Resources	**No-action:** No known cultural resources exist. No impacts to cultural resources anticipated. **Alternative 1:** No impacts anticipated due to increased training operations and major fleet exercises. **Alternative 2:** No impacts anticipated due to additional increases in training operations and major fleet exercises.	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.	**No-action:** Activities occur in designated areas and sensitive areas are avoided. Compliance with the standard operating procedures and policies minimizes impacts. If cultural resources are unexpectedly encountered then the Hawaii SHPO will be notified. **Alternative 1:** Increased training operations avoid sensitive areas and impacts would be avoided as described in the No-action Alternative. **Alternative 2:** Additional increases in training operations avoid sensitive areas and impacts would be avoided as described in the No-action Alternative.
Health and Safety	**No-action:** Compliance with standard operating procedures would minimize impacts. The operations will be completely contained and the area cleared resulting in no adverse public health and safety issues. **Alternative 1:** Impacts from the additional training operations and major fleet exercises would be minimized as described in the No-action Alternative. **Alternative 2:** Impacts from the additional training operations and major fleet exercises would be minimized as described in the No-action Alternative.	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.
Noise	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.	**No-action:** Coast Guard Air Station Barbers Point has appropriate plans in place to manage noise levels. Noise produced is expected to stay within the existing noise contours. **Alternative 1:** Minor impacts to areas near the airport from increased operations, training exercises, and major fleet exercises. **Alternative 2:** Minor impacts to areas near the airport from increased operations, training exercises, and major fleet exercises.	**No-action:** Marine Corps Base Hawaii maintains a hearing protection program that would minimize impacts. Noise levels that reach off-post are mitigated by public notification and restricting training to daylight hours. **Alternative 1:** Increased training operations would take place at existing locations; no expansion of the area would be involved. Impacts would be minimized as described in the No-action Alternative. **Alternative 2:** Increased training operations and additional major fleet exercises would take place at existing locations; no expansion of the area would be involved. Impacts would be minimized as described in the No-action Alternative.

Note: No impacts to Air Quality, Biological Resources (Marine), Geology and Soils, Hazardous Materials and Waste, Land Use, Socioeconomics, Transportation, Utilities, and Water Resources, are anticipated due to site activities under the No-action Alternative, Alternative 1, or Alternative 2.

Table ES-4D: Summary of Environmental Impacts for the No-action Alternative, Alternative 1, and Alternative 2, Oahu

Resource Category	MCTAB	Hickam AFB	Wheeler Army Airfield
Airspace	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.	**No-action:** Impacts to airspace from continued operations and activities to controlled and uncontrolled airspace, enroute airways and jet routes, or airports and airfields are minimized through standard operating procedures, and coordination with the Air Force, Honolulu International Airport, and the Federal Aviation Administration. No modifications or need for additional airspace is required. **Alternative 1:** Impacts to airspace from increased training operations would be minimized as described in the No-action Alternative. **Alternative 2:** Impacts to airspace from increased training operations and additional major fleet exercises would be minimized as described in the No-action Alternative.	**No-action:** Impacts to airspace from continued operations and activities to controlled and uncontrolled airspace, enroute airways and jet routes, or airports and airfields are minimized through standard operating procedures, and coordination with the Army and the Federal Aviation Administration. No modifications or need for additional airspace is required. **Alternative 1:** Impacts to airspace from increased training operations would be minimized as described in the No-action Alternative. **Alternative 2:** Impacts to airspace from increased training operations and additional major fleet exercises would be minimized as described in the No-action Alternative.
Biological Resources (Terrestrial and Offshore)	**No-action:** MCTAB and Navy procedures and policies are in place to minimize impacts to biological resources and prevent introduction of invasive species. **Alternative 1:** Increased training operations would take place at existing locations; no expansion of the area would be involved. Impacts would be minimized as described in the No-action Alternative. **Alternative 2:** Increased training operations and additional major fleet exercises would take place at existing locations; no expansion of the area would be involved. Impacts would be minimized as described in the No-action Alternative. Temporary, short-term startle effects from noise to wildlife and birds. The intensity and duration of wildlife startle responses decrease with the number and frequency of exposures.	**No-action**: Hickam AFB and Navy procedures and policies are in place to minimize impacts to biological resources and prevent introduction of invasive species. **Alternative 1:** Increased training operations and major fleet exercises would take place at existing locations; no expansion of the area would be involved. Impacts would be minimized as described in the No-action Alternative. **Alternative 2:** Increased training operations and additional major fleet exercises would take place at existing locations; no expansion of the area would be involved. Impacts would be minimized as described in the No-action Alternative. Temporary, short-term startle effects from noise to wildlife and birds. The intensity and duration of wildlife startle responses decrease with the number and frequency of exposures.	**No-action:** Army and Navy procedures and policies are in place to minimize impacts to biological resources and prevent introduction of invasive species. No critical habitat has been identified on Wheeler Army Airfield. **Alternative 1:** Increased training operations and major fleet exercises would take place at existing locations; no expansion of the area would be involved. Impacts would be minimized as described in the No-action Alternative. **Alternative 2:** Increased training operations and additional major fleet exercises would take place at existing locations; no expansion of the area would be involved. Impacts would be minimized as described in the No-action Alternative. Temporary, short-term startle effects from noise to wildlife and birds. The intensity and duration of wildlife startle responses decrease with the number and frequency of exposures.

Table ES-4D: Summary of Environmental Impacts for the No-action Alternative, Alternative 1, and Alternative 2, Oahu (Continued)

Resource Category	MCTAB	Hickam AFB	Wheeler Army Airfield
Cultural Resources	**No-action:** Activities occur in designated areas and sensitive areas are avoided. Compliance with the standard operating procedures and policies minimizes impacts. If cultural resources are unexpectedly encountered then the Bellows AFS cultural resources coordinator will be notified. **Alternative 1:** Increased training operations avoid sensitive areas and impacts would be minimized as described in the No-action Alternative. **Alternative 2:** Additional increases in training operations avoid sensitive areas and impacts would be minimized as described in the No-action Alternative.	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.

Note: No impacts to Air Quality, Biological Resources (Marine), Geology and Soils, Hazardous Materials and Waste, Health and Safety, Land Use, Noise, Socioeconomics, Transportation, Utilities, and Water Resources, are anticipated due to site activities under the No-action Alternative, Alternative 1, or Alternative 2.

Table ES-4E: Summary of Environmental Impacts for the No-action Alternative, Alternative 1, and Alternative 2, Oahu

Resource Category	Makua Military Reservation	Kahuku Training Area	Dillingham Military Reservation
Biological Resources (Terrestrial and Offshore)	**No-action:** Training Operations and major exercises take place in current operating areas, with no expansion. Compliance with relevant Navy and Army policies, procedures, and plans during these training operations would minimize the effects on vegetation and wildlife, as well as limit the potential for introduction of invasive plant species. Critical habitat and sensitive areas would be avoided where possible. **Alternative 1:** Impacts from increased training operations and major fleet exercises would be minimized as described in the No-action Alternative. **Alternative 2:** Impacts from increased training operations and major exercises would be minimized as described in the No-action Alternative. Temporary, short-term startle effects from noise to wildlife and birds. The intensity and duration of wildlife startle responses decrease with the number and frequency of exposures.	**No-action:** Training Operations and major fleet exercises take place in current operating areas, with no expansion. Compliance with relevant Navy and Army policies, procedures, and plans during these training operations would minimize the effects on vegetation and wildlife, as well as limit the potential for introduction of invasive plant species. Critical habitat and sensitive areas would be avoided where possible. **Alternative 1:** Impacts from increased training operations would be minimized as described in the No-action Alternative. **Alternative 2:** Impacts from increased training operations and major fleet exercises would be minimized as described in the No-action Alternative. Temporary, short-term startle effects from noise to wildlife and birds. The intensity and duration of wildlife startle responses decrease with the number and frequency of exposures.	**No-action:** Army and Navy procedures and policies are in place to minimize impacts to biological resources and prevent introduction of invasive species. **Alternative 1:** Increased training operations and major fleet exercises would take place at existing locations; no expansion of the area would be involved. Impacts would be minimized as described in the No-action Alternative. **Alternative 2:** Increased training operations and additional major fleet exercises would take place at existing locations; no expansion of the area would be involved. Impacts would be minimized as described in the No-action Alternative. Temporary, short-term startle effects from noise to wildlife and birds. The intensity and duration of wildlife startle responses decrease with the number and frequency of exposures.
Cultural Resources	**No-action:** Activities occur in designated areas and sensitive areas are avoided. Compliance with Army and Navy standard operating procedures, policies, and plans minimizes impacts. If cultural resources are unexpectedly encountered then the Schofield Barracks cultural resources manager will be notified. **Alternative 1:** Increased training operations avoid sensitive areas and impacts would be minimized as described in the No-action Alternative. **Alternative 2:** Additional increases in training operations avoid sensitive areas and impacts would be minimized as described in the No-action Alternative.	**No-action:** Activities occur in designated areas and sensitive areas are avoided. Compliance with Army and Navy standard operating procedures, policies, and plans minimizes impacts. If cultural resources are unexpectedly encountered then the Schofield Barracks cultural resources manager will be notified. **Alternative 1:** Increased training operations avoid sensitive areas and impacts would be avoided as described in the No-action Alternative. **Alternative 2:** Additional increases in training operations and major fleet exercises avoid sensitive areas and impacts would be avoided as described in the No-action Alternative.	**No-action:** Activities occur in designated areas and sensitive areas are avoided. Compliance with the standard operating procedures, policies, and plans minimizes impacts. If cultural resources are unexpectedly encountered then the Hawaii SHPO (if the find is made by Marine Corps of Navy) or the Schofield Barracks cultural resources manager (if the find occurs during Army operations) will be notified. **Alternative 1:** Increased training operations avoid sensitive areas and impacts would be avoided as described in the No-action Alternative. **Alternative 2:** Additional increases in training operations and major fleet exercises avoid sensitive areas and impacts would be avoided as described in the No-action Alternative.

Table ES-4E: Summary of Environmental Impacts for the No-action Alternative, Alternative 1, and Alternative 2, Oahu (Continued)

Resource Category	Makua Military Reservation	Kahuku Training Area	Dillingham Military Reservation
Health and Safety	**No-action:** Compliance with standard operating procedures and plans would minimize impacts. **Alternative 1:** Impacts from the additional training operations and major fleet exercises would be minimized as described in the No-action Alternative. **Alternative 2:** Impacts from the additional training operations and major fleet exercises would be minimized as described in the No-action Alternative.	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.
Noise	**No-action:** Makua Military Reservation maintains a hearing protection program that would minimize impacts. **Alternative 1:** Increased training operations would take place at existing locations; no expansion of the area would be involved. Impacts would be minimized as described in the No-action Alternative. **Alternative 2**: Increased training operations and additional major fleet exercises would take place at existing locations; no expansion of the area would be involved. Impacts would be minimized as described in the No-action Alternative.	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.

Note: No impacts to Air Quality, Airspace, Biological Resources (Marine), Geology and Soils, Hazardous Materials and Waste, Land Use, Socioeconomics, Transportation, Utilities, and Water Resources, are anticipated due to site activities under the No-action Alternative, Alternative 1, or Alternative 2.

Table ES-4F: Summary of Environmental Impacts for the No-action Alternative, Alternative 1, and Alternative 2, Oahu

Resource Category	Ewa Training Minefield	Barbers Point Underwater Range	Naval Undersea Warfare Center -
Biological Resources (Terrestrial and Offshore)	**No-action:** Procedures and policies are in place to minimize impacts to biological resources. Minor and localized impacts to fish. Any effects from noise, shock, or residual chemicals would be localized and temporary. **Alternative 1:** Increased operations and major fleet exercises would take place at existing locations; no expansion of the area would be involved. Impacts would be minimized as described in the No-action Alternative. **Alternative 2:** Increased operations and additional major fleet exercises would take place at existing locations; no expansion of the area would be involved. Impacts would be minimized as described in the No-action Alternative. Temporary, short-term startle effects from noise to wildlife and birds. The intensity and duration of wildlife startle responses decrease with the number and frequency of exposures.	**No-action:** Procedures and policies are in place to minimize impacts to biological resources. Minor and localized impacts to fish. No impacts to essential fish habitat. **Alternative 1:** Increased operations and major fleet exercises would take place at existing locations; no expansion of the area would be involved. Impacts would be minimized as described in the No-action Alternative. **Alternative 2:** Increased operations and additional major fleet exercises would take place at existing locations; no expansion of the area would be involved. Impacts would be minimized as described in the No-action Alternative. Temporary, short-term startle effects from noise to wildlife and birds. The intensity and duration of wildlife startle responses decrease with the number and frequency of exposures.	SESEF - **No-action:** Procedures and policies are in place to minimize impacts to biological resources **Alternative 1:** Impacts from increased operations would be minimized as described in the No-action Alternative. **Alternative 2:** Impacts from increased operations would be minimized as described in the No-action Alternative. FORACS - **No-action:** Procedures and policies are in place to minimize impacts to biological resources **Alternative 1:** Impacts from increased operations would be minimized as described in the No-action Alternative. **Alternative 2:** Impacts from increased operations would be minimized as described in the No-action Alternative.
Hazardous Materials Waste	**No-action:** Ewa Training Minefield has appropriate plans in place to manage hazardous materials used and generated. **Alternative 1:** Increases in training operations and major fleet exercises would be minimized as described in the No-action Alternative. **Alternative 2:** Additional increases in training operations and major fleet exercises would be minimized as described in the No-action Alternative.	**No-action:** Barbers Point Underwater Range has appropriate plans in place to manage hazardous materials used and generated. **Alternative 1:** **I**ncreases in training operations and major fleet exercises would be minimized as described in the No-action Alternative **Alternative 2:** Additional increases in training operations and major fleet exercises would be minimized as described in the No-action Alternative	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.
Health & Safety	**No-action:** Compliance with standard operating procedures would minimize impacts. Demolition activities are conducted in accordance with COMNAVSURFPAC Instruction 3120.8F. **Alternative 1:** The additional training operations and major fleet exercises would be minimized as described in the No-action Alternative. **Alternative 2:** The additional training operations and major fleet exercises would be minimized as described in the No-action Alternative.	**No-action:** Compliance with standard operating procedures would minimize impacts. Demolition activities are conducted in accordance with COMNAVSURFPAC Instruction 3120.8F. **Alternative 1:** The additional training operations and major fleet exercises would be minimized as described in the No-action Alternative. **Alternative 2:** The additional training operations and major fleet exercises would be minimized as described in the No-action Alternative.	SESEF & FORACS - **No-action:** Compliance with standard operating procedures would minimize impacts. **Alternative1:** The increased RDT&E operations would be minimized as described in the No-action Alternative. . **Alternative 2:** The increased RDT&E operations would be minimized as described in the No-action Alternative.

Note: No impacts to Air Quality, Airspace, Biological Resources (Marine), Cultural Resources, Geology and Soils, Land Use, Noise, Socioeconomics, Transportation, Utilities, and Water Resources, are anticipated due to site activities under the No-action Alternative, Alternative 1, or Alternative 2.
Note: No impacts at Keehi Lagoon, Kaena Point, Mt. Kaala, Wheeler Network Communications Control, Mauna Kapu Communication Site, or Makua Radio/Repeater/Cable Head, are anticipated due to site activities under the No-action Alternative, Alternative 1, or Alternative 2.

Table ES-5: Summary of Environmental Impacts for the No-action Alternative, Alternative 1, and Alternative 2, Maui

Resource Category	Maui Offshore
Biological Resources (Terrestrial and Offshore)	**No-action:** Compliance with policies and procedures will minimize impacts to biological resources. **Alternative 1:** Impacts to biological resources from increased training operations would be minimized as described in the No-action Alternative. The Portable Undersea Tracking Range would be used in areas around Maui with water depths less than 300 feet. Other than the temporary disturbance to marine species during instrumentation installation and recovery, no impacts would be expected to occur. **Alternative 2:** Impacts to biological resources from increased training operations and additional major exercises would be minimized as described in the No-action Alternative.

Note: No impacts to Air Quality, Airspace, Biological Resources (Marine), Cultural Resources, Geology and Soils, Hazardous Materials and Waste, Health and Safety, Land Use, Noise, Socioeconomics, Transportation, Utilities, or Water Resources are anticipated due to site activities under the No-action Alternative, Alternative 1, or Alternative 2.
Note: No impacts at the Maui Space Surveillance Site, the Shallow Water Minefield Sonar Training Area, the Maui High Performance Computing Center, or the Sandia Maui Haleakala Facility are anticipated due to site activities under the No-action Alternative, Alternative 1, or Alternative 2.

Table ES-6: Summary of Environmental Impacts for the No-action Alternative, Alternative 1, and Alternative 2, Hawaii

Resource Category	PTA	Bradshaw Army Airfield	Kawaihae Pier
Airspace	**No-action:** Impacts to airspace from continued operations and activities to controlled and uncontrolled airspace, special use airspace, enroute airways and jet routes, or airports and airfields are minimized through standard operating procedures, coordination with PTA Range Control and the Federal Aviation Administration. No modifications or need for additional airspace is required. **Alternative 1:** Impacts to airspace from increased training operations and major fleet exercises would be minimized as described in the No-action Alternative. **Alternative 2:** Impacts to airspace from increased training operations and additional major fleet exercises would be minimized as described in the No-action Alternative.	**No-action:** Impacts to airspace from continued operations and activities to controlled and uncontrolled airspace, special use airspace, enroute airways and jet routes, or airports and airfields are minimized through standard operating procedures, coordination with PTA Range Control and the Federal Aviation Administration. No modifications or need for additional airspace is required. **Alternative 1:** Impacts to airspace from increased training operations and major fleet exercises would be minimized as described in the No-action Alternative. **Alternative 2:** Impacts to airspace from increased training operations and additional major range events would be minimized as described in the No-action Alternative	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.
Biological Resources (Terrestrial and Offshore)	**No-action:** Training Operations and major fleet exercises will take place in current operating areas, with no expansion. Compliance with relevant Navy policies, procedures, and plans during these training operations will minimize the effects on vegetation and wildlife, as well as limit the potential for introduction of invasive plant species. **Alternative 1:** Impacts to biological resources from increased training operations and major fleet exercises would be minimized as described in the No-action Alternative. **Alternative 2:** Impacts to biological resources from increased training operations and major fleet exercises would be minimized as described in the No-action Alternative. Temporary, short-term startle effects from noise to wildlife and birds. The intensity and duration of wildlife startle responses decrease with the number and frequency of exposures.	**No-action:** These activities are limited in scope and are not anticipated to impact the areas beyond the airfield itself. Training Operations and major exercises take place in current operating areas, with no expansion. Compliance with relevant Navy policies, procedures, and plans during these training operations would minimize the effects on vegetation and wildlife, as well as limit the potential for introduction of invasive plant species. **Alternative 1:** Impacts to biological resources from increased training operations would be minimized as described in the No-action Alternative. **Alternative 2:** Impacts to biological resources from increased training operations and additional major fleet exercises would be minimized as described in the No-action Alternative. Temporary, short-term startle effects from noise to wildlife and birds. The intensity and duration of wildlife startle responses decrease with the number and frequency of exposures.	**No-action:** Training Operations and major exercises take place in current operating areas, with no expansion. Compliance with relevant Navy policies and procedures during these training operations would minimize the effects on vegetation and wildlife, as well as limit the potential for introduction of invasive plant species. Sensitive biological resource areas are avoided. **Alternative 1:** No increases in training events at Kawaihae Pier are expected. Impacts would be minimized as described in the No-action Alternative. **Alternative 2:** Impacts to biological resources from increased training operations and additional major fleet exercises would be minimized as described in the No-action Alternative. Temporary, short-term startle effects from noise to wildlife and birds. The intensity and duration of wildlife startle responses decrease with the number and frequency of exposures.

Table ES-6: Summary of Environmental Impacts for the No-action Alternative, Alternative 1, and Alternative 2, Hawaii (Continued)

Resource Category	PTA	Bradshaw Army Airfield	Kawaihae Pier
Cultural Resources	**No-action:** Activities occur in designated areas and sensitive areas are avoided. Compliance with the standard operating procedures and policies minimizes impacts. If cultural resources are unexpectedly encountered then the Schofield Barracks Cultural Resources Manager will be contacted. **Alternative 1:** Increased training operations and HRC enhancements would avoid sensitive areas. Impacts to cultural resources would be avoided as described in the No-action Alternative. **Alternative 2:** Additional increases in training operations and additional major fleet exercises would avoid sensitive areas. Impacts to cultural resources would be avoided as described in the No-action Alternative.	**No-action:** There are no training or Major Range Event actions with the potential to affect cultural resources at Bradshaw Army Airfield. Policies and procedures are in place to minimize any impacts. **Alternative 1:** There are no training events with the potential to affect cultural resources at Bradshaw Army Airfield. To avoid adverse effects, any HRC enhancements would be coordinated with the Schofield Barracks Cultural Resources Manager. Policies and procedures are in place to minimize any impacts. **Alternative 2:** There are no training exercises or Major Fleet Exercises with the potential to affect cultural resources at Bradshaw Army Airfield. Policies and procedures are in place to minimize any impacts.	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.
Health and Safety	**No-action:** Compliance with existing health and safety plans and procedures will minimize impacts. **Alternative 1:** Impacts to health and safety from the additional training operations and HRC enhancements would be minimized as discussed in the No-action Alternative. **Alternative 2:** Impacts to health and safety from the additional training operations and major fleet exercises would be minimized as discussed in the No-action Alternative.	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.
Noise	**No-action:** PTA maintains a hearing protection program that would minimize impacts. **Alternative 1**: Increased training operations would take place at existing locations; no expansion of the area would be involved. Noise impacts would be minimized as discussed in the No-action Alternative. **Alternative 2:** Increased training operations and additional major fleet exercises would take place at existing locations; no expansion of the area would be involved. Noise impacts would be minimized as discussed in the No-action Alternative.	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.	No impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.

Note: No impacts to Air Quality, Biological Resources (Marine), Geology and Soils, Hazardous Materials and Waste, Land Use, Socioeconomics, Transportation, Utilities, and Water Resources are anticipated due to site activities under the No-action Alternative, Alternative 1, or Alternative 2.

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1.0 PURPOSE AND NEED FOR THE PROPOSED ACTION

1.1 INTRODUCTION

The United States (U.S.) Department of the Navy (Navy) has prepared this Draft Environmental Impact Statement (EIS) / Overseas Environmental Impact Statement (OEIS) to assess the potential environmental impacts associated with sustainable range usage and enhancements within the Navy's Hawaii Range Complex (HRC) to support and maintain Navy Pacific Fleet training, and research, development, testing and evaluation (RDT&E) operations, and associated range capabilities (including hardware and infrastructure improvements).

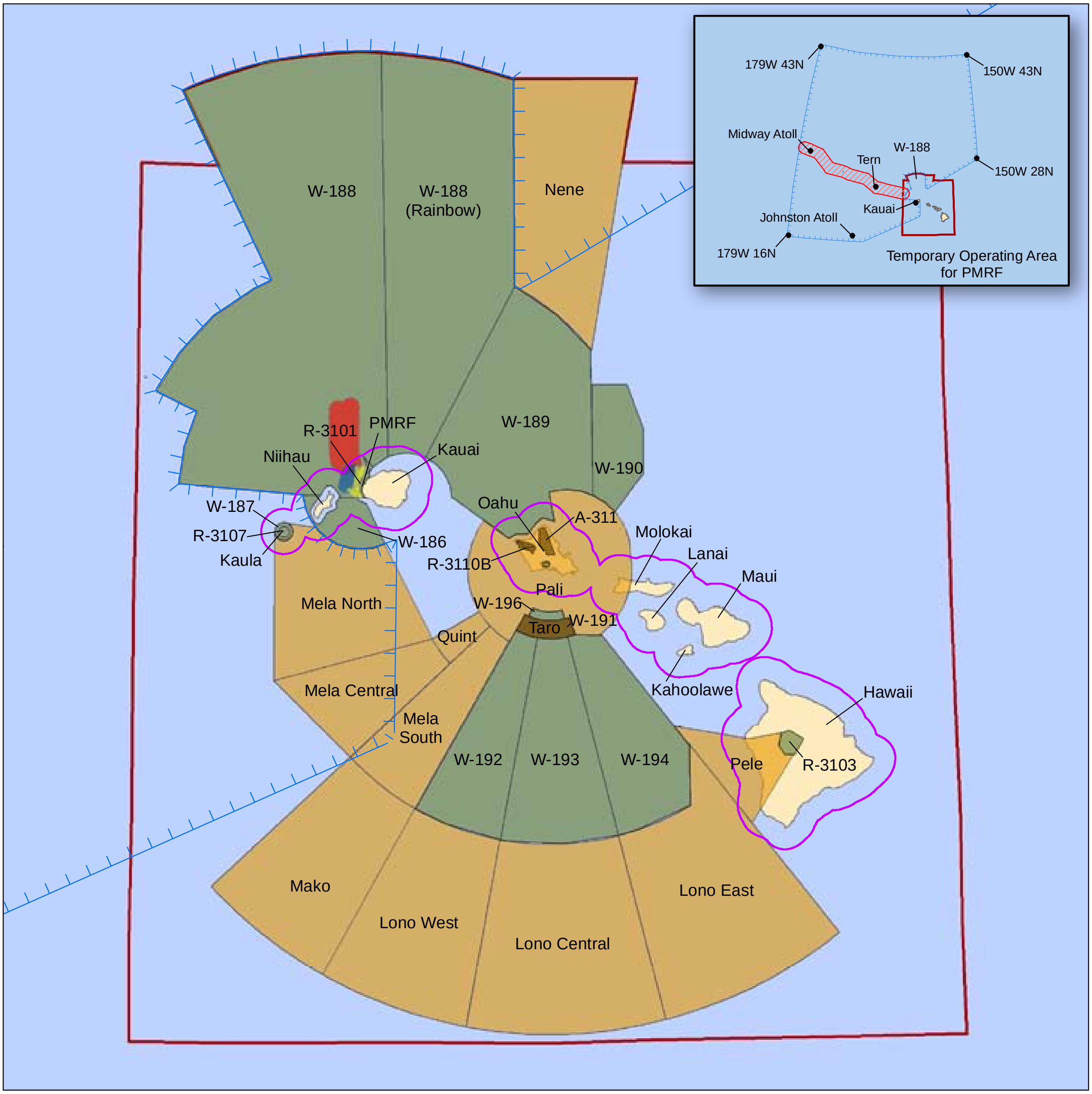
The Navy's mission is to maintain, train, and equip combat-ready naval forces capable of winning wars, deterring aggression, and maintaining freedom of the seas. Section 5062 of Title 10 of the United States Code (U.S.C.) [1]directs that all naval forces be trained for combat. The Chief of Naval Operations meets that direction, in part, by conducting training exercises at sea and ensuring naval forces have access to viable ranges, operation areas, and airspace where skills for wartime missions can be developed and maintained and RDT&E of naval weapons systems can be conducted. For purposes of this Draft EIS/OEIS, exercises and training do not include combat operations, operations in direct support of combat, or other activities conducted primarily for purposes other than training.

To meet its mission requirements, the Navy ensures the long-term sustainment and viability of its range assets while protecting human health and the environment. The Navy remains dedicated to sustaining its ranges through robust assessment of and planning for optimal range uses. This nationwide effort by the Navy to fully utilize and enhance existing range capabilities has been initiated so that the highest levels of required readiness are maintained.

The proposed action is to support and conduct current and emerging training and RDT&E training events in the HRC and upgrade or modernize range complex capabilities to enhance and sustain Navy training and testing. The decision to be made by the Assistant Secretary of the Navy (Installations & Environment) is to determine both the level and mix of training to be conducted and the range capabilities enhancements to be made within the HRC that best meet the needs of the Navy.

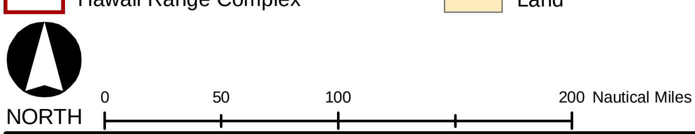
The Draft EIS/OEIS study area, the HRC, covers 235,000 square nautical miles (nm^2) around the main Hawaiian Island chain and a 2.1-million nm^2 Temporary Operating Area of sea and airspace (see Figure 1.1-1). The study area is a complex consisting of instrumented ocean

[1] Title 10, Section 5062 of the United States Code provides: "The Navy shall be organized, trained, and equipped primarily for prompt and sustained combat incident to operations at sea. It is responsible for the preparation of naval forces necessary for the effective prosecution of war except as otherwise assigned and, in accordance with Integrated Joint Mobilization Plans, for the expansion of the peacetime components of the Navy to meet the needs of war."



EXPLANATION

- Temporary Operating Area for Pacific Missile Range Facility (PMRF)
- Federal Jurisdictional (12-nautical mile) Boundary
- Barking Sands Tactical Underwater Range (BARSTUR) Hydrophones
- Barking Sands Underwater Range Expansion (BSURE) Hydrophones
- Hawaii Range Complex
- Air Traffic Control Assigned Airspace (ATCAA)
- Special Use Airspace
- Special Use Airspace and ATCAA
- Shallow Water Training Range (SWTR)
- Land



EIS/OEIS Study Area: Hawaii Range Complex and Temporary Operating Area

Hawaiian Islands

Figure 1.1-1

areas, airspace, ocean surface operation areas, targets, and land range facilities. The operations analyzed in this Draft EIS/OEIS include current and future proposed training and RDT&E training events within these areas and Navy-funded range capabilities enhancements (including infrastructure improvements), and Navy training on other military services' training ranges.

This Draft EIS/OEIS has been prepared by the Department of the Navy in compliance with the National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. § 4321 et seq.); the Council on Environmental Quality [CEQ] Regulations for Implementing the Procedural Provisions of NEPA (Title 40 Code of Federal Regulations [CFR] §§ 1500-1508); Department of the Navy Procedures for Implementing NEPA (32 CFR § 775); and Executive Order 12114 (EO 12114), Environmental Effects Abroad of Major Federal Actions. The NEPA process ensures that environmental impacts of proposed major Federal actions are considered in agency decisionmaking. EO 12114, which is analogous to NEPA, requires environmental consideration of environmental impacts of actions outside the United States such as non-territorial ocean areas. This Draft EIS/OEIS satisfies the requirements of both NEPA and EO 12114. It will be filed with the U.S. Environmental Protection Agency and distributed or otherwise made available to Federal, State, and local government agencies, and to the public for review and comment.

1.2 BACKGROUND

One of the obligations of the Navy, pursuant to Title 10 of the U.S.C., is to ensure that the men and women, Sailors and officers, sent to sea on behalf of the United States are fully trained and ready for deployment on short notice, as a combat-ready naval force and for other non-combat missions assigned to them. In addition, combat forces must have available to them the changes and improvements that new technologies can provide. These emerging technologies must be researched, developed, tested, and evaluated before being made widely available for use. The Navy meets these training and testing responsibilities across the open oceans and on its range complexes.

For more than a century, the Navy has trained its Sailors in Hawaii and repaired and replenished the ships of the United States at Pearl Harbor. In the 1920s, a submarine base was established at Pearl Harbor, creating a need for the training of Sailors and officers serving in the undersea environment. As world tensions increased in the 1930s and early 1940s, the Navy rapidly increased its presence and number of facilities in Hawaii. The Pacific Fleet established its headquarters at Pearl Harbor on February 1, 1941. Ten months later, on December 7, the Fleet was attacked at Pearl Harbor, propelling America into World War II. The Pacific was the site of World War II's most decisive naval battles. Naval forces in Hawaii remained vital to U.S. interests throughout the mid-century, as control of the seas provided advantages to allied forces during the Korean and Vietnam Wars. Since 1968, a multinational sea-power exercise given the name "Rim of the Pacific" has been conducted within the HRC, testing the abilities of a number of the navies of the Pacific Rim to function together. Today, the Navy's presence in Hawaii remains of essential strategic and operational importance to U.S. national interests.

Over 20 years ago, acoustic monitoring devices were placed at the Pacific Missile Range Facility (PMRF) on the ocean floor off the west coast of Kauai to detect and track underwater activity. These acoustic systems provide a unique evaluative tool that offers specific information in tracking participants' movements and responses during naval training exercises. PMRF is now the world's largest military test and training range capable of supporting subsurface, surface, air, and space training events. It consists of instrumented underwater ranges, controlled airspace, and a temporary operating area covering 2.1 million nm^2 of ocean (refer to Figure 1.1-1). Since its establishment, PMRF has provided major range services for training, tactics development, and RDT&E of air, surface, and subsurface weapons systems for the Navy, other Department of Defense agencies, allies, and private industry.

Today, more than 20 surface ships and submarines are homeported in Hawaii. Specialty forces, including Navy divers and explosive ordnance disposal technicians, also conduct vital training within the HRC. The Sailors and officers assigned to these homeported ships and submarines, those awaiting sea duty, and Strike Groups transiting through the Pacific, as well as naval forces of our foreign allies, must maintain their proficiencies to allow them to be ready and qualified to be deployed when ordered to do so at short notice. The HRC provides extensive, remote and strategic training areas and facilities that enable Navy personnel to maintain and strengthen these required proficiencies.

1.2.1 NAVY'S AT SEA POLICY

In December of 2000, the Under Secretary of the Navy issued a memorandum for the Chief of Naval Operations and the Commandant of the Marine Corps entitled "Compliance with Environmental Requirements in the Conduct of Naval Exercises or Training at Sea" which has come to be known as the "At Sea Policy." The Navy's At Sea Policy sets forth how the Navy would update and upgrade its compliance with the body of environmental law which applies to these exercises and training operations — at sea and at the Navy's range complexes. The policy applies to training at sea, including the conduct of joint (multi-service) and combined (multi-nation) exercises, which are also known as military readiness activities, as that term is defined in Section 315(f) of Public Law 107-314. Training, including joint and combined exercises, does not include combat operations, operations in direct support of combat, or other activities conducted primarily for purposes other than training.

The memorandum directed the Navy's fleet commanders to develop an approach to environmental compliance for the fleet training ranges and operational areas within their respective areas of responsibility, including ranges used for RDT&E operations. Major training exercises and those operations occurring within a range or operation area could be included with the compliance effort for the applicable range or operation area. The approach would involve a "comprehensive analysis of the environmental impacts of a class of undertakings repetitive in nature or of similar effect and recurring within the same geographical area, so as to avoid or mitigate adverse effects to the extent practicable consistent with the accomplishment of the military training and exercise activities under review." Fleet commanders were similarly directed to review RDT&E ranges to the extent they are used for fleet training.

The Commander, U.S. Pacific Fleet is conducting, for each range complex across the Pacific, that programmatic location-specific approach to environmental analysis, complying with NEPA and EO 12114, reviewing the present and reasonably foreseeable activities at each range complex. In accordance with the At Sea Policy, this document provides a description of existing operations and reasonably foreseeable alternative levels of activity within the HRC, and an analysis of the environmental consequences of those operations and alternative levels of activity. Included are major training exercises, routine training and exercises, and RDT&E

operations conducted within or projected to be conducted within the HRC, as well as planned upgrades to the HRC to ensure its sustainability.

1.2.2 NAVY TRAINING: PLANNING AND REQUIREMENTS

The HRC is one of the Navy's range complexes and is used for training of operational forces, RDT&E of military systems and equipment, and other military operations. These range complexes must be maintained to support national security objectives and to ensure a high state of readiness of Navy and Marine Corps forces. Training requirements for the Navy's operational forces are the primary reference for determining required range capabilities. Operational requirements for deployment and employment of trained naval forces, in turn, determine training requirements.

To enhance the present and future viability of its training ranges, the Navy has initiated a Range Sustainability program. Annual Sustainable Ranges Reports are submitted to the Office of the Secretary of Defense, in compliance with Section 366 of the Defense Authorization Act of 2003 and Section 320 of the Defense Authorization Act of 2004. These reports outline the Navy's ongoing Range Sustainability efforts, including execution of a comprehensive range sustainment strategy through the Tactical Training Theater Assessment and Planning (TAP) program (Section 1.2.3) and development of a Navy-wide range sustainment policy. The policy will maximize the use of existing range assets by assigning specific range sustainment responsibilities to each level of the range support command structure and integrating current range sustainment strategies from the test and training communities. Training requirements are supported by sustainment efforts which emphasize the full, effective, and efficient utilization of existing range capabilities.

Navy training proceeds on a continuum, from teaching an array of basic and specialized individual military skills, to intermediate skills or small unit training, to advanced, integrated training events, culminating in joint (multi-service) exercises or pre-deployment certification events. Each step on this continuum is assessed for effectiveness on an ongoing basis, as new systems, or tactics, techniques, and procedures are developed and implemented.

The deployment of naval forces, including those that train in the HRC, is determined by the combatant commanders (a senior military commander with a large, geographically demarked area of responsibility) based on worldwide requirements and commitments. In order to meet these requirements, naval forces are geographically apportioned. The dynamic requirements of national security affect the deployment of naval forces. As a result, deployment schedules are not fixed, but remain flexible, often changing to meet the Nation's security needs. Real world contingencies drive the training schedule in relation to when and where the naval forces are required. The support necessary to conduct required pre-deployment training, particularly training range support, must therefore be available when and as needed.

In furtherance of its responsibilities under Title 10, the Navy established the Fleet Readiness Training Plan (FRTP). The FRTP ensures naval units are ready to increase in response to directives from the National Command Authority. This enhanced capability provides the combatant commander with the military forces necessary to respond simultaneously to multiple contingencies as required by emerging world events.

The deployment training cycle for Strike Groups is comprised of pre-deployment training and certification, deployment, and post-deployment sustainment and maintenance. Prior to 2003, two or three Strike Groups were deployed at any one time, and the Navy had the capability to increase to a maximum of two more. Experience in the Global War on Terror and analysis of possible future campaign scenarios made clear the need for enhancing the capability of Navy ranges. To meet this readiness challenge the Navy initiated the FRTP. The FRTP establishes the training needed to be accomplished to allow six Strike Groups to be deployed in a very short time, and two more in stages soon thereafter. This approach to fleet deployment capabilities is sometimes referred to as the 6+1+1 strategy. The FRTP implements changes in the fleet training cycle, including acceleration of the cycle and redundancy through the near-simultaneous execution of similar training events, which necessarily affects use of Navy range resources.

1.2.3 TACTICAL TRAINING THEATER ASSESSMENT AND PLANNING PROGRAM

The Navy has historically conducted training and RDT&E training events at various range complexes in the eastern and middle Pacific, including the HRC. In 2002, Commander, U.S. Atlantic Fleet and Commander, U.S. Pacific Fleet developed the TAP Program to serve as the overarching fleet training area sustainment program. The purpose of TAP is to support Navy objectives that: (1) promote use and management of ranges (such as the HRC) in a manner that supports national security objectives and a high state of combat readiness, and (2) ensures the long-term viability of range assets while protecting human health and the environment. The TAP Program focuses specifically on the sustainability of ranges, operation areas, and airspace that support the FRTP. One element of the TAP Program is the development of Range Complex Management Plans (RCMPs) (further discussed in Section 1.2.4). Another element is environmental planning documentation (e.g., this Draft EIS/OEIS), which will assess the potential for environmental impacts associated with certain operations/actions conducted within a range complex.

1.2.4 THE HAWAII RANGE COMPLEX MANAGEMENT PLAN

The Final Draft RCMP for the HRC was completed in 2006. The RCMP iterates the strategic vision for the Complex, which is to provide sustainable and modernized ocean operating areas, airspace, ranges, range infrastructure, training facilities, and resources to fully support Navy training requirements in accordance with the Complex's roles and missions. The strategic vision for the HRC also includes eventual certification to host accredited Joint National Training Capability (JNTC) events at sea. The JNTC is a global, information age capability encompassing multiple certified training sites capable of hosting complex training events, and is a key component of Department of Defense transformation efforts.

The roles and missions for the HRC include providing training opportunities for eight naval mission areas, specifically: Anti-Air Warfare, Amphibious Warfare, Anti-Surface Warfare, Anti-Submarine Warfare, Mine Warfare, Strike Warfare, Electronic Combat, and Naval Special Warfare at varying levels of training complexity. The HRC roles and missions also include providing RDT&E capabilities.

Of these roles and missions, the Hawaii RCMP identifies deficiencies in the capabilities in all mission areas when compared to the complex's required capabilities. In an attempt to remedy the identified shortfalls, the Hawaii RCMP makes recommendations for range enhancements—some of which may have an impact on the environment. Those recommended range enhancements that have the potential to impact the environment are further described in Chapter 2.0.

1.3 PURPOSE AND NEED FOR ACTION

The purpose for the proposed action is to:

- Achieve and maintain fleet readiness using the HRC to support and conduct current, emerging, and future training events and RDT&E training and testing events;
- Conduct missions supported by the HRC, consistent with the requirements of the FRTP and other transformation initiatives, and;
- Upgrade/modernize existing range capabilities to enhance and ensure the sustainability of Navy training and testing.

The proposed action is needed to provide combat capable forces ready to deploy worldwide in accordance with U.S.C. Title 10, Section 5062. To implement these Congressional mandates, the Navy needs to:

- Maintain current levels of military readiness by training in the HRC;
- Accommodate future increases in operational training tempo in the HRC and support the rapid deployment of naval units or Strike Groups;
- Achieve and sustain readiness of ships and squadrons consistent with the FRTP so that the Navy can quickly increase significant combat power in the event of a national crisis or contingency operation;
- Support the acquisition and implementation into the fleet of advanced military technology. The HRC must adequately support the testing and training needed for new platforms and weapons systems (e.g., the Littoral Combat Ship and the MH-60R Seahawk helicopter); and,
- Maintain the long-term viability of the HRC while protecting human health and the environment, and enhancing the quality and communication capability and safety of the range complex.

Conduct of current and emerging training and RDT&E training events, and implementation of range capabilities enhancements, includes a collection of actions which will be evaluated in this Draft EIS/OEIS. Alternative implementation scenarios (described in detail in Chapter 2.0) involve some combination of the following:

- Increase training operations to support the FRTP and necessary force structure changes;
- Support three transient Strike Group training exercises at the same time;
- Support an additional carrier during Rim of the Pacific Exercises;
- Support increased levels of Undersea Warfare Training Exercises;
- Operate a Portable Undersea Tracking Range;
- Construct and operate an Acoustic Test Facility;
- Enhance RDT&E and training operations at PMRF;
- Construct and operate an Instrumented Minefield Training Area; and;
- Use the 2.1-million nm^2 Temporary Operating Area as required.

1.4 OVERVIEW OF THE HAWAII RANGE COMPLEX

1.4.1 SUMMARY DESCRIPTION

The HRC consists of specified open ocean, offshore, and onshore areas and special use airspace geographically situated on and around the Hawaiian Islands. The components of the HRC encompass:

- 235,000 nm^2 of sea space;
- 71,500 nm^2 of special use airspace; and
- Various Navy land ranges and other Service's land ranges where Navy training occurs.

The HRC includes PMRF, which is both a fleet training range and a fleet RDT&E range. PMRF includes 1,020 nm^2 of instrumented ocean area at depths between 1,800 and 15,000 feet. Also included are designated warning and operation areas, airspace, water ranges, land ranges, the Pearl Harbor Naval Defensive Sea Area, and open ocean areas. For the purpose of analysis, four corners or points were established to create a notional boundary for this HRC; however, naval training and testing may occur at any location in the marine environment.

The major component areas of the HRC and the Temporary Operating Area are illustrated in Figure 1.1-1. The Temporary Operating Area consists of 2.1 million nm^2 of sea and airspace activated by PMRF during missile defense exercises, and returned to civilian (i.e., the Federal Aviation Administration [FAA]) control upon completion of such exercises. Due to the range and speed of weapons and missiles, this large area is required to ensure a safety area in which debris could fall with minimal risk of damage or injury to humans. The Temporary Operating Area airspace is released back to the FAA at the completion of the hazardous activity.

For range management and scheduling purposes, the HRC is divided into numerous sub-component ranges or training areas used to conduct training events and RDT&E of military hardware, personnel, tactics, munitions, explosives, and electronic combat systems, as described in detail in Chapter 2.0.

1.4.2 MISSION OF THE HAWAII RANGE COMPLEX

The strategic mission of the HRC is to support naval operational readiness by providing a realistic, live training environment for forces assigned to the Pacific Fleet, the Fleet Marine Force, and other users. As its highest priority, the Range Complex will support the FRTP readiness processes as revised in 2003 in the Fleet Response Plan (FRP) (Commander, Fleet Forces Command (CFFC) message date-time-group 231400Z May 03) and CFFC Instruction 3501.3, Fleet Training Strategy. The strategic mission implements the strategic vision and includes management objectives and the HRC concept of training events.

The HRC is one of the most capable and heavily used Navy range complexes in the Pacific Region. Accordingly, the Commander, Pacific Fleet and CFFC strategic vision for this complex is for it to remain the principal Navy training venue in the middle Pacific with the capability and capacity to support current, emerging, and future training requirements. The capabilities of the HRC must be sustained, upgraded, modernized, and transformed as new weapons systems achieve initial operational capability, new threat capabilities emerge, and new technologies offer improved training opportunities. More specifically, the range complex must be capable of providing:

- Advanced-level training of Strike Groups pursuant to the FRTP, including realistic opposing force and electronic threat replication to support training of integrated and joint forces
- Joint training events as a compatible and interoperable component of the emerging JNTC
- Intermediate-level and basic-level training of Navy forces across all primary mission areas pursuant to the requirements of the FRTP
- Sustainment training as a "backyard" range[4] for surface ships, submarines, aviation squadrons, special warfare, and explosive ordnance disposal units based in Hawaii, and specialized support for units based elsewhere on the West Coast and in the western Pacific
- Sophisticated instrumented range facilities for Anti-Submarine Warfare and Mine Warfare training for ships, aircraft, and submarines
- Alignment of the HRC infrastructure with Naval Force structure, including accommodating new weapons, systems, and platforms (vessels and aircraft) as they are introduced into the fleet
- Sustainable range management and planning that provides for consolidated range communications and scheduling; institutionalizes standardized data management

[4] A capable range facility, located in the vicinity of homeports and stations, is a critical component of naval readiness. The Navy strives, and in many cases is required by law, to track and, where possible, limit "personnel tempo," meaning the amount of time our Sailors and Marines spend deployed away from home. Personnel tempo is an important factor in family readiness, morale, and retention. The availability of a "backyard" range is critical to Navy efforts in these areas.

practices; and protects and conserves range resources for current and future training requirements

- Support for allies' military training and RDT&E operations

The Hawaii RCMP identifies deficiencies in the capability of the HRC to perform its mission, based on an assessment of current capabilities as compared to required capabilities. The RCMP therefore recommends management approaches to address deficiencies. The management recommendations which have the potential to impact the environment are addressed in this Draft EIS/OEIS, and are further described in Chapter 2.0.

1.5 SCOPE AND CONTENT OF THE EIS/OEIS

The geographic scope of this Draft EIS/OEIS (Study Area) includes 235,000 nm^2 of open ocean area (including subsurface), associated special use airspace above and around the Hawaiian Islands, and the 2.1 million nm^2 Temporary Operating Area (Figure 1.1-1). This Draft EIS/OEIS will also address naval operations within the offshore and onshore ranges and training areas of the HRC. This Draft EIS/OEIS will provide a programmatic evaluation of current and proposed training operations, and associated management approaches as identified in the Hawaii RCMP.

Under customary international law, U.S. Territory extends out into the ocean a distance of 3 nautical miles (nm) (5.6 kilometers [km]) from the coastline. By Presidential Proclamation 5928, issued December 27, 1988, the United States extended its exercise of sovereignty and jurisdiction under international law to 12 nm (22 km); but the Proclamation expressly provides that it does not extend or otherwise alter existing Federal law or any associated jurisdiction, rights, legal interests, or obligations. The Proclamation thus did not alter existing legal obligations under NEPA. As a matter of policy, however, the Department of the Navy has elected to apply NEPA to the 12 nm (22 km) limit established by the Proclamation. Impacts to areas of the HRC that lie within 12 nm (territorial seas) are subject to analysis under NEPA. Impacts in the areas that are outside U.S. territorial waters is analyzed using the procedures set out in EO 12114 and associated implementing regulations.

1.6 COOPERATING AGENCIES

The following Federal agencies have been cooperating agencies in the preparation of this Draft EIS/OEIS:

- Department of Energy
- Missile Defense Agency
- National Marine Fisheries Service
- U.S. Army

1.7 THE ENVIRONMENTAL REVIEW PROCESS

1.7.1 NATIONAL ENVIRONMENTAL POLICY ACT

In 1969, Congress enacted NEPA, which provides for the consideration of environmental issues in Federal agency planning and decision making. Regulations for Federal agency implementation of the act were established by the President's CEQ. NEPA requires Federal agencies to prepare an EIS for proposed actions that may significantly affect the quality of the human and natural environments. The EIS must disclose significant environmental impacts and inform decision makers and the public of the reasonable alternatives that would avoid or minimize adverse impacts or enhance the quality of the human environment.

The first step in the NEPA process is the publication of a Notice of Intent (NOI) to prepare the Draft EIS (DEIS). The NOI provides an overview of the proposed project and the scope of the EIS. The NOI for this project was published in the *Federal Register* on August 29, 2006, and in five local newspapers (i.e., the *Maui News*, the *Honolulu Star Bulletin*, the *Hawaii Tribune Herald*, the *Garden Island*, and the *Honolulu Advertiser* on September 2, 4, and 5).

Scoping is an early and open process for developing the "scope" of issues to be addressed in the EIS and for identifying significant issues related to a proposed action. During scoping, the public helps define and prioritize issues and convey these issues to the agency through both oral and written comments. The scoping period for the HRC EIS/OEIS began with the publication of an NOI. The scoping period lasted 46 days, concluding on October 13, 2006. Four scoping meetings were held on September 13, 14, 16, and 18, 2006 on the islands of Maui, Oahu, Hawaii, and Kauai, respectively. The scoping period for the HRC lasted 46 days, concluding on October 13, 2006. The scoping meetings were held in an open house format, presenting informational posters and written information, and making U.S. Navy staff and project experts available to answer participants' questions. Additionally, a court reporter was available to record participants' oral comments. This format allowed the public to interact informally, one-on-one, with project representatives or comment formally, on the record, to representatives of the U.S. Navy. Table 1.7-1 lists location, date, and number of attendees at the scoping meetings.

Table 1.7-1. Scoping Meeting Locations, Dates, and Attendees

Location	Date	Public Attendees
Maui Arts and Cultural Center, Kahului, Maui, HI	13 September 2006	9
Disabled American Veterans Hall, Honolulu, Oahu, HI	14 September 2006	31
Hilo Hawaiian Hotel, Hilo, Hawaii, HI	16 September 2006	39
Kauai Civil Defense Agency, Lihue, Kauai, HI	18 September 2006	47

In addition to the scoping meetings, the public could make comments through a 1-800 telephone number, by sending an email, or by mailing a written comment. Issues identified by the public were provided to resource specialists working on the Draft EIS/OEIS to ensure that all comments were considered during the preparation of the document. Table 1.7-2 presents a summary of the number of issues identified for each resource area.

After scoping, this Draft EIS/OEIS was prepared to provide an assessment of the potential impacts of the proposed action and alternatives on the environment. It was then provided to the U.S. Environmental Protection Agency for review and comment in accordance with their responsibilities under Section 309 of the Clean Air Act and to have a Notice of Availability published in the *Federal Register*. The Navy also placed notices in the aforementioned newspapers announcing the availability of the Draft EIS/OEIS. The Draft EIS/OEIS is now being circulated for a review and comment period. The Draft EIS/OEIS distribution list is presented in Chapter 10.0. The Draft EIS/OEIS is also being made available for general review in public libraries and other publicly accessible locations to include those listed in Chapter 10.0. Public meetings will be held to accept public comments. The public meetings will be held in the same locations as the scoping meetings listed in Table 1.7-1.

Table 1.7-2. Number of Issues by Resource Area

Resource Area	Number of Comments	Percent of Total
Program	114	32.1%
Policy/NEPA Process	47	13.2%
Cumulative Impacts	5	1.4%
Socioeconomics	14	3.9%
Cultural Resources	12	3.4%
Hazardous Materials & Hazardous Waste	2	0.6%
Biological Resources—Marine	83	23.4%
Air Quality	4	1.1%
Health and Safety	28	7.9%
Environmental Justice	2	0.6%
Biological Resources—Terrestrial	4	1.1%
Miscellaneous	7	2.0%
Mitigation Measures	3	0.8%
Alternatives	6	1.7%
Utilities	2	0.6%
Noise	1	0.3%
Land Use	10	2.8%
Transportation	3	0.8%
Water Resources	1	0.3%
Airspace	7	2.0%
Total	**355**	

A Final EIS/OEIS will be prepared that incorporates, and formally responds to, all public comments received on the Draft EIS/OEIS. Responses can take the form of corrections of data inaccuracies, clarifications of and modifications to analytical approaches, inclusion of additional data or analyses, and modification of the proposed action or alternatives. The Final EIS/OEIS will then be circulated for public review.

Finally, a Record of Decision will be issued, no less than 30 days after the Final EIS/OEIS is made available to the public. The Record of Decision will summarize the final decision and identify the selected alternative, describe the public involvement and agency decision-making processes, and present commitments to specific mitigation measures. The selected alternative can then be implemented.

1.7.2 EXECUTIVE ORDER 12114

EO 12114, *Environmental Effects Abroad of Major Federal Actions*, directs Federal agencies to provide for informed decision making for major Federal actions outside the United States, including the global commons, the environment of a non-participating foreign nation, or impacts on protected global resources. An OEIS is required when an action has the potential to significantly harm the environment of the global commons. Global commons are defined as "geographical areas that are outside of the jurisdiction of any nation, and include the oceans outside territorial limits and Antarctica. Global commons do not include contiguous zones and fisheries zones of foreign nations" (32 CFR 187.3).

1.7.3 OTHER ENVIRONMENTAL REQUIREMENTS CONSIDERED

HRC training must be consistent with a variety of other environmental laws, regulations, and EOs. These may include:

- Marine Mammal Protection Act;
- Endangered Species Act;
- Coastal Zone Management Act;
- Rivers and Harbors Act;
- Magnuson-Stevens Fishery Conservation and Management Act;
- Clean Air Act;
- Clean Water Act;
- EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*; and
- EO 13045, Environmental Health and Safety Risks to Children.

To the extent practicable, this document will be used as the basis for any required consultation and coordination. Appendix C includes a brief description of the applicable laws, regulations, and EOs.

1.8 RELATED ENVIRONMENTAL DOCUMENT

Environmental documents for some of the programs and projects within the geographical scope of this Draft EIS/OEIS that have undergone environmental review to ensure NEPA and EO 12114 compliance include:

- *Undersea Warfare Exercise (USWEX) Programmatic Environmental Assessment,* January 2007
- *2006 Supplement to the 2002 Rim of the Pacific (RIMPAC) Programmatic Environmental Assessment,* January 2006
- *2006 Exercise Valiant Shield Overseas Environmental Assessment, June 2006*
- *Mobile Sensors Environmental Assessment*, October 2004
- *Ballistic Missile Defense System Programmatic Draft Environmental Impact Statement*, September 2004
- *2004 Supplement to the 2002 Rim of the Pacific Programmatic Environmental Assessment,* June 2004
- *Mobile Launch Platform Environmental Assessment*, June 2004
- *Ground-based Midcourse Defense (GMD) Extended Test Range (ETR) Environmental Impact Statement*, July 2003
- *Theater High Altitude Area Defense (THAAD) Pacific Test Flights Environmental Assessment*, December 2002
- *Development and Demonstration of the Long Range Air Launch Target System Environmental Assessment*, October 2002
- *Rim of the Pacific (RIMPAC) 2002 Programmatic Environmental Assessment*, June 2002
- *North Pacific Targets Program Environmental Assessment*, April 2001
- *Mountaintop Surveillance Sensor Test Integration Center (MSSTIC) Facility Kauai, Hawaii Environmental Assessment*, May 2000
- *Rim of the Pacific (RIMPAC) 2000 Environmental Assessment*, May 2000
- *Pacific Missile Range Facility Enhanced Capability Final Environmental Impact Statement,* December 1998
- *Hawaiian Islands Humpback Whale National Marine Sanctuary Final Environmental Impact Statement/Management Plan*, February 1997
- *Final Environmental Assessment for Temporary Hawaiian Area Tracking System*, June 1994

1.8.1 RELEVANT ENVIRONMENTAL DOCUMENTS BEING PREPARED CONCURRENT WITH THIS EIS/OEIS

The following documents are either draft or are in progress at this time, and are expected to be completed (final version) by the time the HRC EIS/OEIS is at the draft stage and ready for public comment. However, they are listed in this section separately since they are currently the draft phase, and therefore cannot be directly incorporated by reference. In the event that a document listed below is not final at the time of the HRC Draft EIS/OEIS, the relevant analysis from that document will be included in to the HRC Draft EIS/OEIS.

- *Exercise Valiant Shield Programmatic Environmental Assessment/Overseas Environmental Assessment,* June 2007
- *Environmental Assessment (EA) for Mk 48 Mod 6 Torpedo Exercises in Hawaiian Waters*
- *Programmatic Overseas Environmental Assessment for MK 48 Advanced Capability Torpedo Service Weapons Test and Sinking Exercises in Four Pacific Ocean Locations*
- *Barking Sands Underwater Range Expansion (BSURE) Refurbishment Overseas Environmental Assessment*
- *Advanced Radar Engineering Laboratory Environmental Assessment,* August 2007
- *Pohakuloa Training Area Environmental Assessment*

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2.0 Description of the Proposed Action and Alternatives

2.0 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

The Navy has identified the need to support and conduct current, emerging, and future training and research, development, testing and evaluation (RDT&E) operations in the Hawaii Range Complex (HRC) (see Chapter 1.0). This chapter provides detailed information on the Proposed Action and alternatives analyzed in the Environmental Impact Statement (EIS) / Overseas EIS (OEIS). Over a 10-year planning period the Navy proposes to implement actions within the HRC to:

- Maintain current levels of military readiness by training in the HRC;
- Accommodate future increases in operational training tempo in the HRC and support the rapid deployment of naval units or Strike Groups;
- Achieve and sustain readiness of ships and squadrons so that the Navy can optimize the use of existing HRC capacity to quickly heighten significant combat power in the event of a national crisis or contingency operation, and consistent with the Fleet Readiness Training Plan (FRTP);
- Support the acquisition and implementation into the Fleet of advanced military technology. The HRC must adequately support the testing and training needed for new platforms and weapons systems (e.g., the Littoral Combat Ship and the MH-60R Seahawk helicopter); and,
- Maintain the long-term viability of the HRC while protecting human health and the environment (including the implementation of marine mammal protective measures), and enhancing the quality and communication capability and safety of the range complex.

Conduct of current and emerging training and RDT&E operations, and implementation of range capabilities enhancements includes a collection of actions which will be evaluated in this EIS/OEIS. Alternative implementation scenarios (described in detail in this chapter) involve some combination of the following:

- Increase training operations to support the FRTP and necessary force structure changes;
- Support three transient Strike Group training exercises at the same time;
- Support an additional carrier during Rim of the Pacific Exercises;
- Support increased levels of Undersea Warfare Training Exercises (USWEX);
- Operate a Portable Undersea Tracking Range;
- Construct and operate an Acoustic Test Facility;
- Enhance RDT&E and training operations at the Pacific Missile Range Facility (PMRF), and;
- Construct and operate an Instrumented Minefield Training Area; and
- Use the 2.1-million nm^2 Temporary Operating Area as required.

This chapter is divided into three major subsections: Section 2.1 provides a detailed description of the HRC. Section 2.2 describes the Proposed Action, including alternatives eliminated from further consideration, the No-action Alternative, and Alternatives 1 and 2. The Navy's preferred alternative is Alternative 2.

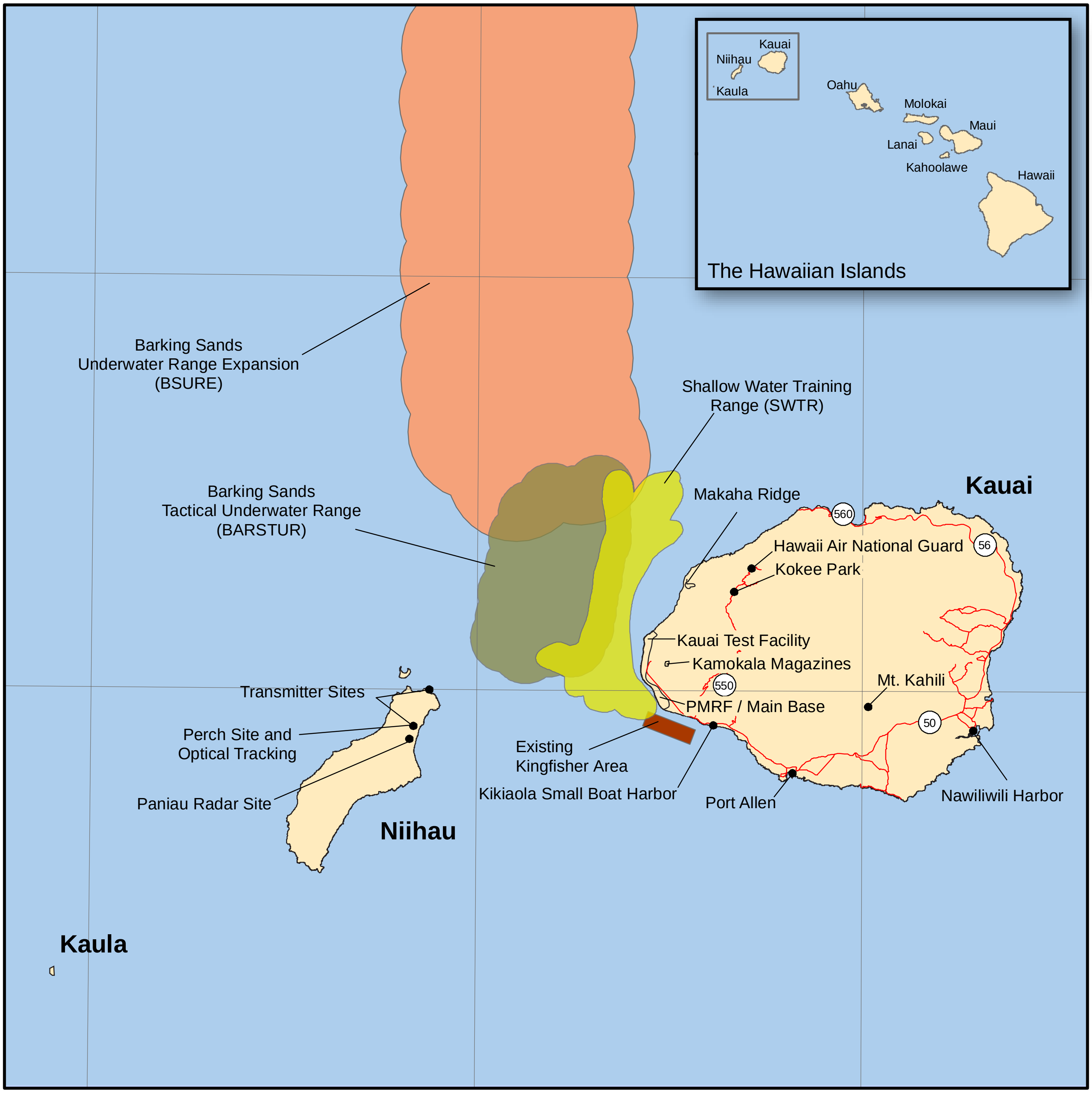
2.1 DESCRIPTION OF THE HAWAII RANGE COMPLEX

The HRC geographically encompasses open ocean, offshore, and onshore areas located on or around the major islands of the Hawaiian Island chain. Figure 1.1-1 shows the range boundaries. The geographic scope of this HRC EIS/OEIS (the study area) includes the Hawaii offshore operation areas, (consisting of 235,000 square nautical miles [nm^2] of ocean, generally from 17 to 26 degrees north latitude and from 154 to 162 degrees west longitude), land areas used by the Navy within these operation areas, and the PMRF Temporary Operating Area, (consisting of 2.1 million nm^2 to the north and west of Kauai). The study area includes the Hawaii Offshore Areas, facilities used by the Navy Undersea Warfare Center (NUWC) Detachment Pacific on west Oahu, the Explosive Ordnance Disposal (EOD) Shore Area at Pearl Harbor on Oahu, and other Hawaii Onshore Areas. These ranges and operation areas are used to conduct operations and training involving military hardware, personnel, tactics, ordnance, and electronic combat systems. Several of the areas are also used for RDT&E, including missile defense programs. Figures 1.1-1 and 2.1-1 through 2.1-4 show the HRC study area and support locations.

2.2 PROPOSED ACTION AND ALTERNATIVES

NEPA implementing regulations (40 Code of Federal Regulations [CFR] 1502.14) and Navy procedures (32 CFR 775) provide guidance on the consideration of alternatives in an EIS and promote rigorous exploration and objective evaluation of all reasonable alternatives. Alternatives were developed giving due consideration to the purpose and need of the Proposed Action, and factors such as the capability to support current and emerging Fleet tactical training and RDT&E requirements; the capability to support realistic, essential training at the level and frequency sufficient to support the FRTP and Tactical Training Theater Assessment and Planning (TAP) program recommendations; and the capability to support training requirements without impacting Navy guidelines governing the amount of time a unit may be deployed away from its homeport.

Each of the alternatives must be feasible, reasonable, and reasonably foreseeable in accordance with Navy guidance in Chief of Naval Operation Instruction (OPNAVINST) 5090.1B and Council on Environmental Quality (CEQ) regulations (40 CFR 1500-1508). Reasonable alternatives include those that are practical or feasible from the technical and economic standpoint and that use common sense. Reasonable alternatives must meet the stated purpose and need of the Proposed Action.



EXPLANATION

- Road
- Kingfisher Area
- Shallow Water Training Range (SWTR)
- Barking Sands Tactical Underwater Range (BARSTUR)
- Barking Sands Underwater Range Expansion (BSURE)
- Installation Areas
- Land

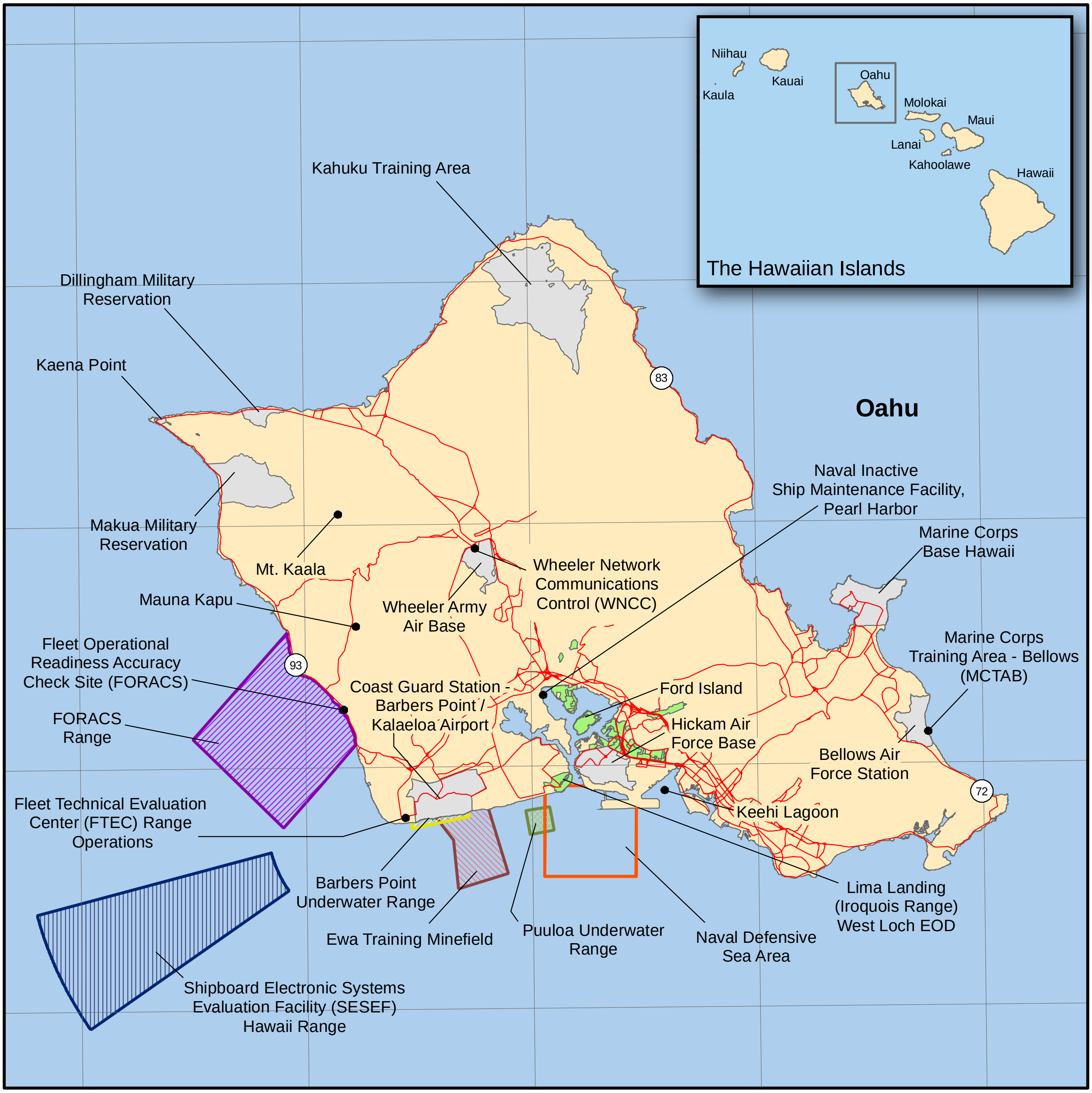
NORTH

0 5 10 20 Nautical Miles

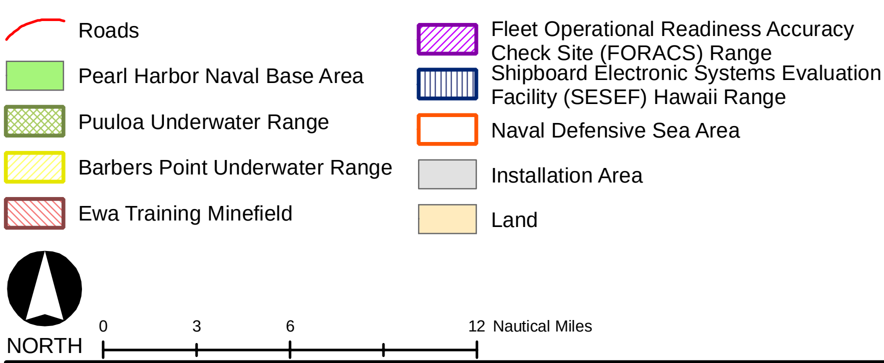
Hawaii Range Complex Study Area and Support Locations

Kauai, Niihau, and Kaula, Hawaii

Figure 2.1-1



EXPLANATION



Hawaii Range Complex Study Area and Support Locations

Oahu, Hawaii

Figure 2.1-2

EXPLANATION

Road

Shallow Water Minefield Sonar Training Range

Land

NORTH

0 5 10 20 Nautical Miles

Hawaii Range Complex Study Area and Support Locations

Maui, Molokai, and Lanai, Hawaii

Figure 2.1-3

EXPLANATION

Road

Bradshaw Army Airfield

Installation Area

Land

NORTH

0 5 10 20 Nautical Miles

Hawaii Range Complex Study Area and Support Locations

Island of Hawaii

Figure 2.1-4

070323_Hawaii SptLc.eps

Alternatives that are outside the scope of what the Congress has approved or funded must still be evaluated in the EIS/OEIS if they are reasonable, because the EIS/OEIS may serve as the basis for modifying congressional approval or funding in light of NEPA's goals and policies.

Alternatives were selected based on their ability to meet the following criteria:

- Use existing Navy ranges and facilities in and around Hawaii;
- Be consistent with the stated current and emerging requirements for the range complex;
- Achieve training tempo requirements based on Fleet deployment schedules;
- Meet the requirements of Department of Defense (DoD) Directive 3200.15, Sustainment of Ranges and operation areas;
- Implement new operational training requirements and RDT&E operations; and
- Support realistic training that replicates expected operating environments for naval forces.

2.2.1 ALTERNATIVES ELIMINATED FROM FURTHER CONSIDERATION

2.2.1.1 REDUCTION IN THE LEVEL OF CURRENT TRAINING IN THE HAWAII RANGE COMPLEX

During scoping the alternative to reduce the level of training operations in the HRC was suggested. An alternative that would decrease military training from current levels would not meet the purpose and need of the Proposed Action. A reduction in levels of training within the HRC would not support the Navy's ability to meet United States Code (U.S.C.) Title 10 requirements. In addition, a reduction in training operations could jeopardize the ability of specialty forces, transient units, and Strike Groups using the HRC for training purposes to be ready and qualified for deployment. Lastly, a reduction in training operations would require local units/users to routinely travel to other range complexes to fulfill training requirements and result in an unacceptable increase in time away from the homeport (i.e., time away from home and families). For these reasons, this alternative has been eliminated from further consideration in the EIS/OEIS.

2.2.1.2 ALTERNATIVE LOCATIONS FOR TRAINING CONDUCTED IN THE HAWAII RANGE COMPLEX

Consideration of alternative locations for training conducted in the HRC was rejected from further analysis because it does not meet the purpose and need of the Proposed Action. In accordance with the At Sea Policy and the Tactical Training Theater Assessment and Planning Program, the Navy is conducting range-by-range NEPA and Executive Order (EO) 12114 analyses. Naval ranges will be analyzed separately on a case-by-case basis for potential environmental impacts arising from requirements to sustain capabilities at each site. This document provides a description of existing operations and reasonably foreseeable alternative levels of activity within the HRC, and an analysis of the environmental consequences of those operations.

The HRC has the infrastructure to support a large number of forces, has extensive existing range assets, and accommodates Navy training and testing responsibilities both geographically and strategically, in a location under U.S. control. The Navy's physical presence and training capabilities are critical in providing stability to the Pacific Region. Centrally located in the North Pacific, the HRC is co-located with the Naval command units of Commander U.S. Pacific Fleet; Commander Submarine Force, U.S. Pacific Fleet; and the U.S. Marine Corps Forces, Pacific. The HRC is also home to the joint armed services command units of U.S. Pacific Command, U.S. Army Pacific, and Commander, Pacific Air Forces. With a unified presence of Army, Marine Corps, Navy, Air Force, National Guard, and Coast Guard elements, the HRC provides the training area for large multi-force (air, land, and sea components) and multinational training exercises. One example of this is the biennial Rim of the Pacific (RIMPAC) exercise. The HRC is the only central location in the Pacific for numerous allied nations from North America, South America, and Asia to converge for valuable training exercises that help strengthen ties with our many allies.

The relative isolation of the HRC's broad open ocean area offers an invaluable facility on which to conduct missile testing and training. Able to link with Army's Pohakuloa Training Area, as well as U.S. Air Force and U.S. Marine Corps bases where aircraft basing and amphibious operations may occur, the HRC provides a superior joint training environment for all the services as well as advanced missile testing capability.

The open ocean of the HRC presents a realistic environment for strike warfare training, including amphibious, nearshore, and antisubmarine warfare. Training may be conducted close to land masses so that battle situations may be realistically simulated but typically far from commercial traffic. There is room and space to operate within proximity of land but at safe distances from other simultaneous training operations. This allows both training of locally based units and the necessary build-up of capability through training that culminates in multi-force training in Hawaii as naval forces transit the Pacific.

The HRC is the most capable and time-efficient en route training location for naval forces and units deploying to or returning from regions in the western Pacific and Indian Ocean from homeports on the U.S. west coast. Recent changes in the Navy's FRTP require ships and squadrons returning from overseas deployment to remain fully trained and ready to redeploy on short notice. The HRC is the training location for those units returning to homeports on the west coast of the United States after operational deployments.

The premier capability of the HRC is PMRF. PMRF is the world's largest military test and training range capable of supporting subsurface, surface, air, and space training operations. It consists of underwater ranges, controlled airspace, and a temporary operating area covering 2.1 million nm^2 of ocean. PMRF provides major range services for training, tactics development, and RDT&E of air, surface, and subsurface weapons systems for the Navy, other DoD agencies, allies, and private industry.

The specific value of the HRC and its superiority to alternative ranges is defined by its location in the Pacific Ocean, its proximity to Hawaii-based forces, its presence on the route of transiting forces, and its central location for nations around the rim of the Pacific. The HRC contains distinctive individual capabilities that require the continuation of specific in-place training and RDT&E activities. Further, the HRC is just one of many Naval ranges in current operation that will require separate environmental analyses for mandated achievement of sustainable on-site training and testing. For the above reasons, it is neither reasonable, practical nor appropriate to seek alternative locations for training conducted in the HRC. This alternative, therefore, has been eliminated from further consideration in the EIS/OEIS.

2.2.1.3 COMPUTER SIMULATION TRAINING

Under this alternative, naval training would be completed through use of simulation in the place of actual exercises. Computer simulators and other types of simulation training tools are already used extensively in the Navy's training programs. Computer technologies provide excellent tools for implementing a successful, integrated training program while reducing the risk and expense typically associated with training at sea. Although it is an essential component of training, computer simulation cannot substitute for the high stress environment (such as personnel experience under combat conditions) that would be encountered during an actual non-training situation. Simulators may assist in developing an understanding of basic skills and equipment operation, but cannot offer a complete picture of the detailed and instantaneous interaction within each command and among the many commands and warfare communities that actual training at sea provides. Simulated training does not fully develop the skills and capabilities necessary to attain appropriate military readiness. Consequently, conducting all naval training by simulation is deemed inadequate and fails to meet the purpose and need of the Proposed Action. Therefore, this alternative was not carried forward for analysis.

2.2.2 NO-ACTION ALTERNATIVE

The purpose of including a No-action Alternative in environmental impact analyses is to ensure that agencies compare the potential impacts of the proposed Federal action to the known impacts of maintaining the status quo. The No-action Alternative presented here comprises a baseline of current, ongoing training and RDT&E operations and support of existing range capabilities. This alternative represents what is in essence a continuation of the Navy's present course of action, that is, the regular and historic level of activity present within the HRC. The analysis of this alternative is a snapshot of the status quo, a description of the continuing and current use of the HRC.

The No-action Alternative stands as no change from current levels of training usage. The existing level of activity is used as a benchmark with which to compare the outputs and effects of differing alternatives. If the No-action Alternative is selected, the Navy would continue its current activities at the HRC. Alternatives 1 and 2 analyze greater use of range assets to support training exercises by combining activities together to maximize training opportunities. By using the status quo as the No-action Alternative, the Navy compares the impacts of current operations to the impacts of enhanced operations presented in Alternatives 1 and 2.

Under the No-action Alternative, the current baseline of operations includes over 9,300 training and RDT&E operations being conducted in the HRC annually. Training operations including Major Exercises and RDT&E operations would continue at the baseline levels (which include RIMPAC exercises). The No-action Alternative includes the operations discussed in the following sections as well as those described in the 1998 PMRF Final EIS, the additional PMRF programs analyzed since December 1998, the operations described in the RIMPAC 2002

Programmatic Environmental Assessment (EA) and the supplements to that document in 2004 and 2006, and operations described in the USWEX Programmatic EA.

2.2.2.1 HAWAII RANGE COMPLEX TRAINING OPERATIONS

The current training operations within the HRC (Figure 1.1-1) are listed below and shown in Table 2.2.2.1-1. Appendix D provides a detailed description of current training operations within the HRC.

Table 2.2.2.1-1. Baseline Training Operations

Mission Area	Operation	Area	Baseline (Operations/ Year)
OPEN OCEAN OPERATIONS			
Anti-Air Warfare (AAW)	Air Combat Maneuver	W-188, 189, 190, 192, 193, 194	738
	Air-to-Air Missile Exercise	W-188	12
	Surface-to-Air Gunnery Exercise	W-188, 192, Mela South	86
	Surface-to-Air Missile Exercise	W-188	17
	Chaff Exercise	Hawaii Offshore	34
Amphibious Warfare (AMW)	Naval Surface Fire Support Exercise	W-188	22
Anti-Surface Warfare (ASUW)	Visit, Board, Search, and Seizure	Hawaii Offshore	60
	Surface-to-Surface Gunnery Exercise	W-191, 192, 193, 194, 196, Mela South, Pacific Missile Range Facility (PMRF)	69
	Surface-to-Surface Missile Exercise	Pacific Missile Range Facility (PMRF) (W-188)	7
	Air-to-Surface Gunnery Exercise	Hawaii Offshore, PMRF	128
	Air-to-Surface Missile Exercise	PMRF	36
	Bombing Exercise (Sea)	Hawaii Offshore, PMRF	35
	Sink Exercise	Hawaii Offshore, PMRF	6
	Antisurface Warfare Torpedo Exercise (Submarine-Surface)	Hawaii Offshore, PMRF	35
Anti-Submarine Warfare (ASW)	Antisubmarine Warfare Tracking Exercise	Hawaii Offshore, PMRF	372
	Antisubmarine Warfare Torpedo Exercise	Hawaii Offshore, PMRF	500
	Major Integrated ASW Training Exercise	Hawaii Offshore, PMRF	5
Electronic Combat (EC)	Electronic Combat Operations	W-188, 192, 193, 194, Lono West, Mela South	50
Mine Warfare (MIW)	Mine Countermeasures Exercise	PMRF, Submarine Operating Area	32
Naval Special Warfare (NSW)	Swimmer Insertion/Extraction	Hawaii Offshore, Marine Corps Training Area–Bellows (MCTAB), PMRF	80
Strike Warfare (STW)	Bombing Exercise (Land)	Kaula, Pohakuloa Training Area (PTA)	165
	Air-to-ground Gunnery Exercise	Kaula	16
Other	Command and Control (C2)	U.S. Command Ship at sea	1

Table 2.2.2.1-1. Baseline Training Operations (Continued)

Mission Area	Operation	Area	Baseline (Operations/ Year)
OFFSHORE OPERATIONS			
AMW	Expeditionary Assault	PMRF, MCTAB	11
ASUW	Flare Exercise	W-188	6
MIW	Mine Neutralization	Puuloa Underwater Range	62
	Mine Laying	PMRF	22
NSW	Swimmer Insertion/Extraction	Hawaii Offshore, MCTAB, PMRF	52
Other	Salvage Operations	Pearl Harbor, Puuloa Underwater Range, Keehi Lagoon	3
	In Port Ship Support Operations	Pearl Harbor	1
ONSHORE OPERATIONS			
MIW	Land Demolitions	Explosive Ordnance Disposal Land Range	85
NSW	SPECWAROPS	Bradshaw Army Airfield, Makua Military Reservation, Kahuku Military Training Area, Dillingham Military Reservation, Wheeler Army Airfield, Niihau, MCTAB, and PTA	30
Other	Command and Control (C2)	Pearl Harbor, Marine Corps Base Hawaii (MCBH), Hickam Air force Base (AFB), Wheeler Army Airfield (AAF), Bradshaw AAF	1
	Aircraft Support Operations	Pearl Harbor, Kalaeloa Airport, MCBH, Hickam AFB, Wheeler AAF, Bradshaw AAF, PMRF	1
	Personnel Support Operations	Oahu, Kauai	1
	Air Operations	Pearl Harbor, Kalaeloa Airport, MCBH, Hickam AFB, Wheeler AAF, Bradshaw AAF, PMRF	2,600
	Field Carrier Landing Practice (FCLP)	MCBH, Barking Sands	0
	Live Fire Exercise	Makua Military Reservation, PTA	3
	Humanitarian Assistance / Non-combatant Evacuation Operations (HAO/NEO)	PMRF, Niihau, MCBH, MCTAB, Kahuku	1
	Humanitarian Assistance / Disaster Relief Operations (HA/DR)	MCBH, MCTAB, Kahuku	1

2.2.2.2 HAWAII RANGE COMPLEX SUPPORT OPERATIONS

Numerous support functions take place as an integral part of training operations occurring in the HRC. These support functions can generally be described as either supporting the command and control (C2) operations, or supporting ships, aircraft, or personnel. The support operations described in this section are included in Table 2.2.2.1-1. The nature of these support functions is primarily continuous, non-range events that occur as part of major range exercises. In general, the level of these support operations increases as the level of range training and exercise operations increase.

Command and Control

The purpose of the C2 operations is to provide continuous command and control support for major exercises. Each activity is monitored and coordinated for safety and on-time performance, to ensure training objectives are accomplished, and to identify lessons learned for future training operations and exercises. Overall command functions can be performed from a command ship or from land facilities at Pearl Harbor or PMRF. C2 is achieved through a network of communication devices strategically located at selected DoD installations around the islands (e.g., at range control offices and air traffic centers) to ensure positive communication with the training and exercise participants.

In-port Ship Support Operations

The purpose of the in-port ship operations is to provide major support for Navy ships and submarines. In-port support includes the typical activities that are carried out when foreign and U.S. warships and submarines are berthed at Pearl Harbor. This includes in-port briefings and debriefings and in-port training activities, including oil spill response training. Once berthed, ships would re-supply, plan for refueling, load ammunition, and conduct other maintenance activities, including the off loading of solid wastes and wastewater (black and gray water). In addition, the Federal Industrial Supply Center at Pearl Harbor processes non-typical orders to acquire country unique items that are not normally handled by the U.S. Fleet.

Shore facilities management activities include berthing space and utility hookups, harbor coordination and control, and space management for equipment and personnel. Pearl Harbor has contained more than 60 warships during major exercises and on other occasions.

Pearl Harbor is a restricted area. No vessels are allowed into Pearl Harbor without permission of Commander Navy Region Hawaii. The restricted area extends outward from the mouth of the harbor and is defined by a rectangular-shaped boundary known as the Pearl Harbor Naval Defensive Sea Area.

Aircraft Support Operations

Aircraft support operations are necessary to ensure safe air operations. Aircraft support includes space for the various types of aircraft, equipment for refueling and maintenance.

U.S. and foreign aircraft (fixed wing, rotary, and airship) are supported from Hickam Air Force Base (AFB), Marine Corps Air Facility Kaneohe Bay, and Wheeler Army Airfield on Oahu; Bradshaw Army Airfield on Hawaii; and PMRF Barking Sands airfield on Kauai.

Personnel Support Operations

The purpose of the personnel support operations is to meet the housing and facilities needs of the personnel that support range operations. This includes in-port briefings and debriefings and in-port training activities. In addition, some exercises conclude with receptions, athletic events, and other social activities.

Housing is provided both on and off installation as necessary to house transient aircraft crews and temporary support personnel. Off-installation housing requirements can range from 700 to 1,500 units.

Aircraft Operations

Aircraft operations are a part of daily and major exercise operations. Aircraft operations are support at the following facilities: Hickam AFB, Marine Corps Air Facility Kaneohe Bay, and Wheeler Army Airfield on Oahu; Bradshaw Army Airfield on Hawaii; and PMRF Barking Sands airfield on Kauai.

2.2.2.3 CURRENT TRAINING OPERATIONS WITHIN THE HAWAII RANGE COMPLEX

Table 2.2.2.3-1 includes the current training operations conducted within the HRC. Appendix D provides additional description of these operations.

Table 2.2.2.3-1. Current Training Operations in the HRC

Mission Area	Operation	Operation Description
Anti-Air Warfare (AAW)	Air Combat Maneuver	Two to eight fighter aircraft engage in aerial combat, typically at high altitudes, far from land.
	Air-to-Air Missile Exercise	In scripted scenarios, aircraft fire air-to-air guided missiles at aerial targets.
	Surface-to-Air Gunnery Exercise	Surface ships fire guns at an aircraft towed target.
	Surface-to-Air Missile Exercise	Surface ships fire missiles at target drones.
	Chaff Exercise	Ship and aircraft crews practice defensive maneuvering while expending chaff to evade radar targeting by a simulated missile threat. Chaff consists of thin metallic strips that reflect radio frequency energy, confusing radar.
Amphibious Warfare (AMW)	Naval Surface Fire Support Exercise	Navy ships fire main guns at a simulated target located west of Kauai.
	Expeditionary Assault	Ship, aircraft, and boat crews; and Marine expeditionary forces train to launch from ships at sea and safely move ashore.
Anti-Surface Warfare (ASUW)	Visit, Board, Search, and Seizure	Helicopter and boat crews train to transport teams to board vessels and inspect the ship's cargo and personnel.
	Surface-to-Surface Gunnery Exercise	Surface ships fire guns against stationary or moving targets for live fire target practice.
	Surface-to-Surface Missile Exercise	Surface ships fire missiles against moving or stationary surface targets.
	Air-to-Surface Gunnery Exercise	Helicopter crews fire guns against stationary or moving targets for live fire target practice.

Table 2.2.2.3-1. Current Training Operations in the HRC (Continued)

Mission Area	Operation	Operation Description
	Air-to-Surface Missile Exercise	Helicopter crews fire guided missiles or simulate firing missiles at stationary or moving targets.
	Bombing Exercise (Sea)	Fixed-wing aircraft drop bombs against a stationary target on the surface of the ocean.
	Sink Exercise	Multiple aircraft, ships, and submarines fire live weapons at a hulk (a surface ship, usually a former Navy ship, that has been decommissioned).
	Antisurface Warfare Torpedo Exercise (Submarine-Surface)	A submarine fires an inert exercise torpedo at a surface target. Target could be a Navy ship or a range support boat.
	Flare Exercise	Aircraft crews practice defensive maneuvering while expending flares to evade infrared (IR) targeting by a simulated surface-to-air missile (SAM) system.
Anti-Submarine Warfare (ASW)	Antisubmarine Warfare Tracking Exercise	Aircraft, ship and submarine crews train in locating and tracking a maneuvering submerged target using active or passive sonar.
	Antisubmarine Warfare Torpedo Exercise	Aircraft, ship and submarine crews track and fire an inert practice torpedo against a maneuvering submerged target.
	Major Integrated ASW Training Exercise (RIMPAC, USWEX, 3 Strike Groups)	Elements of the ASW Tracking Exercise combine in this exercise of multiple air, surface and subsurface units, over a period of several days.
Electronic Combat (EC)	Electronic Combat Operations	Air and land based systems emit electronic signals, designed to simulate threat radars. Ship and aircraft crews train to respond to these signals as appropriate.
Mine Warfare (MIW)	Mine Countermeasures Exercise	Aircraft, ships, and submarines train to detect, then avoid or disable in-water mines.
	Mine Neutralization	Personnel train to detect and destroy or disable in-water mines.
	Mine Laying	Offensive mining where aircraft and submarines deploy mines into the water.
	Land Demolitions	Explosive Ordnance Disposal personnel train to locate, excavate, identify and neutralize land mines and other unexploded ordnance. Neutralizing typically involves destroying with an explosive charge.
Naval Special Warfare (NSW)	Swimmer Insertion/Extraction	Underwater training involving a Sea, Air, and Land (SEAL) Delivery Vehicle that transports SEALs between a submerged submarine and shore.
	Special Warfare Operations (SPECWAROPS)	SPECWAROPS are performed by Navy SEALs and U.S. Marines. Activities include special reconnaissance, reconnaissance and surveillance, combat search and rescue, and direct action.
Strike Warfare (STW)	Bombing Exercise (Land)	Fixed-wing aircraft drop inert bombs against a land target.
	Air-to-ground Gunnery Exercise	Helicopter crews fire guns at stationary land targets.

Table 2.2.2.3-1. Current Training Operations in the HRC (Continued)

Mission Area	Operation	Operation Description
Other	Salvage Operations	Navy divers train to tow disabled ships, repair damaged ships, remove sunken ships, and conduct deep ocean recovery.
	Live Fire Exercise	Ground forces conduct live fire weapons training while maneuvering. Live fire includes small arms, artillery, and aerial gunnery.
	Humanitarian Assistance / Non-combatant Evacuation Operations (HAO/NEO)	HAO/NEO training exercises involve approximately 150 personnel and troops and specialists who initially provide assistance to civilians and then evacuate the civilians when necessary.
	Humanitarian Assistance / Disaster Relief Operations (HA/DR)	HA/DR training exercises involve approximately 125 to 250 military personnel and 125 to 200 simulated refugees. The exercise consists of military forces providing critical services (water, food, etc.) to refugees.

2.2.2.4 HAWAII RANGE COMPLEX RDT&E OPERATIONS

RDT&E operations occur primarily at one of two locations in Hawaii: PMRF and NUWC Detachment Pacific ranges. The current RDT&E operations conducted in the HRC are described below and summarized in Table 2.2.2.4-1.

Table 2.2.2.4-1. Baseline RDT&E Operations

Mission Area	Operation	Area	Baseline (Operations/Year)
OPEN OCEAN OPERATIONS			
Pacific Missile Range Facility (PMRF)	Anti-air Warfare RDT&E	Open Ocean	35
	Antisubmarine Warfare	Open Ocean	19
	Combat System Ship Qualification Trial	Open Ocean	7
	Electronic Combat/Electronic Warfare	Open Ocean	65
	High Frequency	Open Ocean	9
	Missile Defense	Open Ocean	46
Naval Undersea Warfare Center Ranges	Shipboard Electronic Systems Evaluation Facility (SESEF) Quick Look Tests	Open Ocean	3,842
	SESEF System Performance Tests	Open Ocean	67
Planned Testing & Evaluation Operations	Additional Chemical Simulant	Open Ocean	0
	Intercept Targets launched into PMRF Controlled Area	Open Ocean	0
	Launched SM-6 from Sea-Based Platform (AEGIS)	Open Ocean	0
	Test Unmanned Surface Vehicles	Open Ocean	0
	Test Unmanned Aerial Vehicles	Open Ocean	0
	Test Hypersonic Vehicles	Open Ocean	0
Offshore Enhancements	Portable Undersea Tracking Range	Open Ocean	0

Table 2.2.2.4-1. Baseline RDT&E Operations (Continued)

Mission Area	Operation	Area	Baseline (Operations/Year)
OPEN OCEAN OPERATIONS (Continued)			
PMRF Enhancements	Large Area Tracking Range Upgrade	Open Ocean	0
	Enhanced Electronic Warfare Training	Open Ocean	0
	Expanded Training Capability for Transient Air Wings	Open Ocean	0
Future RDT&E Operations	Directed Energy	Open Ocean	0
	Advanced Hypersonic Weapon	Open Ocean	0
OFFSHORE OPERATIONS			
PMRF	Antisubmarine Warfare	Maui	19
	Electronic Combat/Electronic Warfare	PMRF (Main Base)	65
	High Frequency	PMRF	9
	Missile Defense	PMRF	46
Naval Undersea Warfare Center Ranges	Fleet Operational Readiness Accuracy Check Site (FORACS) Tests	Oahu	5
	SESEF Quick Look Tests	Oahu	3,842
	SESEF System Performance Tests	Oahu	67
Planned Testing & Evaluation Operations	Test Unmanned Surface Vehicles	PMRF	0
	Test Unmanned Aerial Vehicles	PMRF	0
Pearl Harbor Enhancements	MK-84/MK-72 Pinger Acoustic Test Facility	Ford Island	0
	Mobile Diving and Salvage Unit Training Area	Naval Defensive Sea Area	0
Offshore Enhancements	Portable Undersea Tracking Range	PMRF, Maui	0
PMRF Enhancements	Large Area Tracking Range Upgrade	Kauai, Oahu, Maui, Hawaii	0
	Kingfisher Underwater Training Area	Niihau	0
	Expanded Training Capability for Transient Air Wings	Kauai, Oahu, Maui, Hawaii	0
Future RDT&E Operations	Directed Energy	PMRF (Main Base)	0
	Advanced Hypersonic Weapon	PMRF (Main Base)	0

Table 2.2.2.4-1. Baseline RDT&E Operations (Continued)

Mission Area	Operation	Area	Baseline (Operations/Year)
ONSHORE OPERATIONS			
PMRF	Anti-air Warfare RDT&E	Naval Station Pearl Harbor	35
	Electronic Combat/Electronic Warfare	PMRF/Main Base	65
	Joint Task Force Wide Area Relay Network	PMRF	2
	Missile Defense	PMRF/Main Base	46
Naval Undersea Warfare Center Ranges	SESEF Quick Look Tests	Oahu	3,842
	SESEF System Performance Tests	Oahu	67
Planned Testing & Evaluation Operations	Additional Chemical Simulant	PMRF/Main Base	0
	Test Unmanned Aerial Vehicles	Kauai	0
	Test Hypersonic Vehicles	Kauai	0
PMRF Enhancements	Large Area Tracking Range Upgrade	Kauai, Oahu, Maui, Hawaii	0
	FORCEnet Antenna	PMRF (Makaha Ridge or Kokee)	0
	Enhanced Electronic Warfare Training	Kauai, Maui, Hawaii	0
	Expanded Training Capability for Transient Air Wings	Kauai, Oahu, Maui, Hawaii	0
	Enhanced Auto ID System and Force Protection Capability	PMRF (Makaha Ridge)	0
	Construct Range Operations Control Building	PMRF (Main Base)	0
	Improve Fiber Optics Infrastructure	PMRF (Main Base, Makaha Ridge)	0
Future RDT&E Operations	Directed Energy	PMRF (Main Base)	0
	Advanced Hypersonic Weapon	PMRF (Main Base)	0

2.2.2.4.1 Pacific Missile Range Facility

PMRF is the world's largest military test range capable of supporting subsurface, surface, air, and space operations (Figure 2.1-1). PMRF consists of 1,000 nm^2 of underwater ranges, 42,000 nm^2 of controlled airspace, and a temporary operating area covering 2.1-million nm^2 of ocean area. PMRF provides major range services for training, tactics development, and evaluation of air, surface, and subsurface weapons systems for the Navy, other DoD agencies, foreign military forces, and private industry. It also maintains facilities and provides services to support naval operations, and other activities and units designated by the Chief of Naval Operations (CNO).

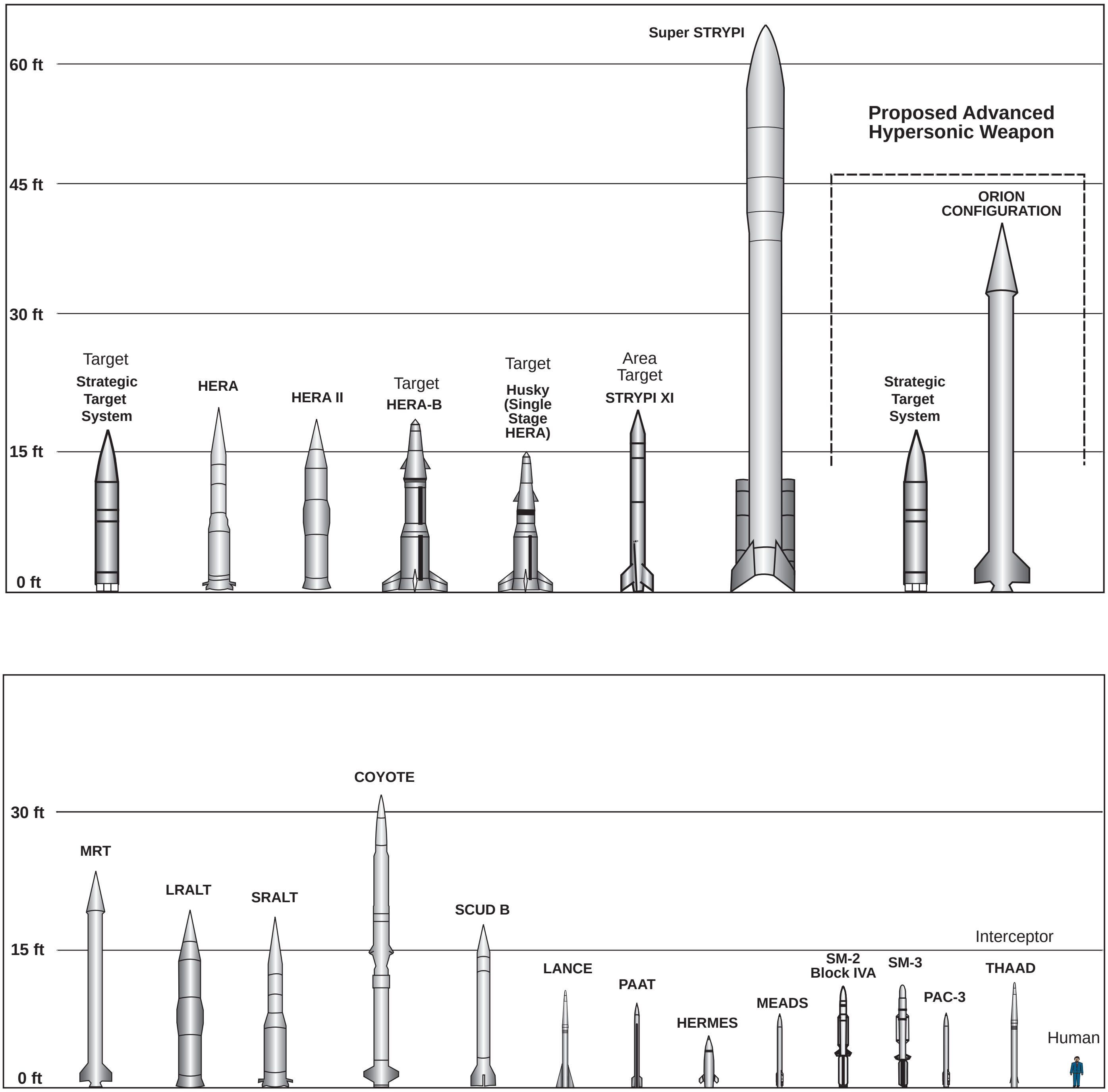
PMRF's additional mission is supporting RDT&E projects. Current ongoing programs at PMRF include CNO designated operations, torpedo, torpedo defense, submarine and periscope detection, ship-defense systems, missile defense, and other miscellaneous programs (such as gunnery/special weapons tests). These programs involve the testing and evaluation of enhancements on systems already used in exercises conducted at PMRF. These are described briefly below:

- CNO projects are usually related to test and evaluation research, some involving tactical responses to potential underwater, surface, airborne, and ballistic missile threats. Other CNO projects study proposed or new hardware and software designs.
- Torpedo RDT&E programs include a torpedo development testing program involving deep and shallow-water testing of aircraft, helicopter, and surface ship-launched anti-submarine torpedo sensors to enhance their operational performance.
- Torpedo defense RDT&E programs include a surface-ship torpedo-defense program, involving the testing of new systems to counter incoming torpedoes.
- Submarine detection RDT&E programs include an advanced sensor application program for locating submarines. Periscope detection programs include: radar, optical, and laser testing from airborne, ground, and surface ship platforms.
- Ship defense system RDT&E programs include chaff and flare countermeasures testing.
- Missile defense RDT&E programs include missile launches from PMRF and offshore platforms and ships, with intercepts over the broad ocean area within PMRF's Temporary Operating Area.
- Gunnery/special weapons tests include the usually one-of-a-kind adaptation of an existing weapon to meet a unique threat situation. The weapon is either mounted to or fired from a boat offshore of PMRF/Main Base or set up west of the PMRF launch facility. Targets include surface targets and small radio-controlled planes.

Missile training exercises conducted at PMRF include general air-to-air, air-to-surface, surface-to-air, and surface-to-surface missile exercises; specific anti-surface missile exercises; and AAW exercises. Each missile training operation must obtain PMRF safety approval before proceeding, covering the type of weapon, type of target, speed, altitude, debris corridor, ground hazard area, and water surface and undersea hazard areas. Figure 2.2.2.4.1-1 shows existing relative heights of missiles launched as part of PMRF operations. Appendix E lists the existing missile defense systems at PMRF. These systems use both solid and liquid propellants. Defensive missile payloads may be equipped with divert and attitude control propulsion systems that control the payload after separation from the launch vehicle. Divert and attitude control systems may use small liquid hypergolic propellant systems or consist of miniature solid-propellant rocket motors.

Anti-Air Warfare RDT&E

Anti-air Warfare (AAW) RDT&E operations involve testing and training on Aegis capable ships after refurbishment or overhaul. Aegis Ballistic Missile Defense (BMD) operations involve testing and evaluating the ship's missile system and associated hardware in support of the ship's missile defense mission. An additional operation for Aegis ships is the waterfront integration test (WIT), which provides pier side testing, simulating events that take place during the on range Aegis BMD operations. WIT ensures that all shipboard systems are operable.



Relative Missile Heights

Figure 2.2.2.4.1-1

Antisubmarine Warfare Test and Evaluation

ASW Test and Evaluation (T&E) operations at PMRF include sensor, fire control, and weapon testing. The use of PMRF Submarine Tracking Systems (STS) involves using this system to evaluate MK-30 system upgrades. The MK-30 target is a self-propelled underwater vehicle capable of simulating the dynamic, acoustic, and magnetic characteristics of a submarine. The Navy uses in-water submarine simulators such as the MK-30 ASW target. The MK-30 target fulfills the need for a convenient, cost-effective means for operational training of Fleet units. Submarine system evaluation operations conducted in submarine training areas near Maui are also part of ASW T&E operations.

Combat System Ship Qualification Trial

Combat System Ship Qualification Trial (CSSQT) operations are performed at PMRF and are categorized as T&E operations. CSSQT is conducted for new ships and for ships that have undergone modification and/or overhaul of their combat systems. Although CSSQT can vary from ship to ship as requirements dictate, the primary goals are to ensure that the ship's equipment and combat systems are in top operational condition, and that the ship's crew is proficient at operating these systems. Therefore, CSSQT can include operating any or all of a ship's combat systems.

Electronic Combat/Electronic Warfare

Electronic Combat/Electronic Warfare (EC/EW) operations include tests designed to assess how well EC/EW training exercises are performed. The EC/EW operations, which occur typically in W-188, are monitored at PMRF shore sites.

High Frequency

High frequency T&E operations include the use of high frequency radio signals and the evaluation of their effectiveness. High frequency in the radio spectrum refers to frequencies between 3 megahertz (MHz) and 30 MHz. This frequency range is commonly used for maritime and amateur short-wave radio transmissions. These operations can take place both at PMRF shore sites and within W-188.

Joint Task Force Wide Area Relay Network

Joint Task Force Wide Area Relay Network (JTF WARNET) is a demonstration of advanced Command, Control and Communications (C3) technologies in a highly mobile, wireless, wide-area relay network in support of tactical forces. The objective of a network of this type is to link tactical forces, providing a common operating picture. Although similar in function to a common internet setting, JTF WARNET demonstrates this capability in a very austere battlefield environment, without the luxury of existing communication systems. In addition, the network must be capable of transmitting classified information. JTF WARNET testing evaluates joint and allied C3 decision making, planning and execution, and tactical capability.

Missile Defense

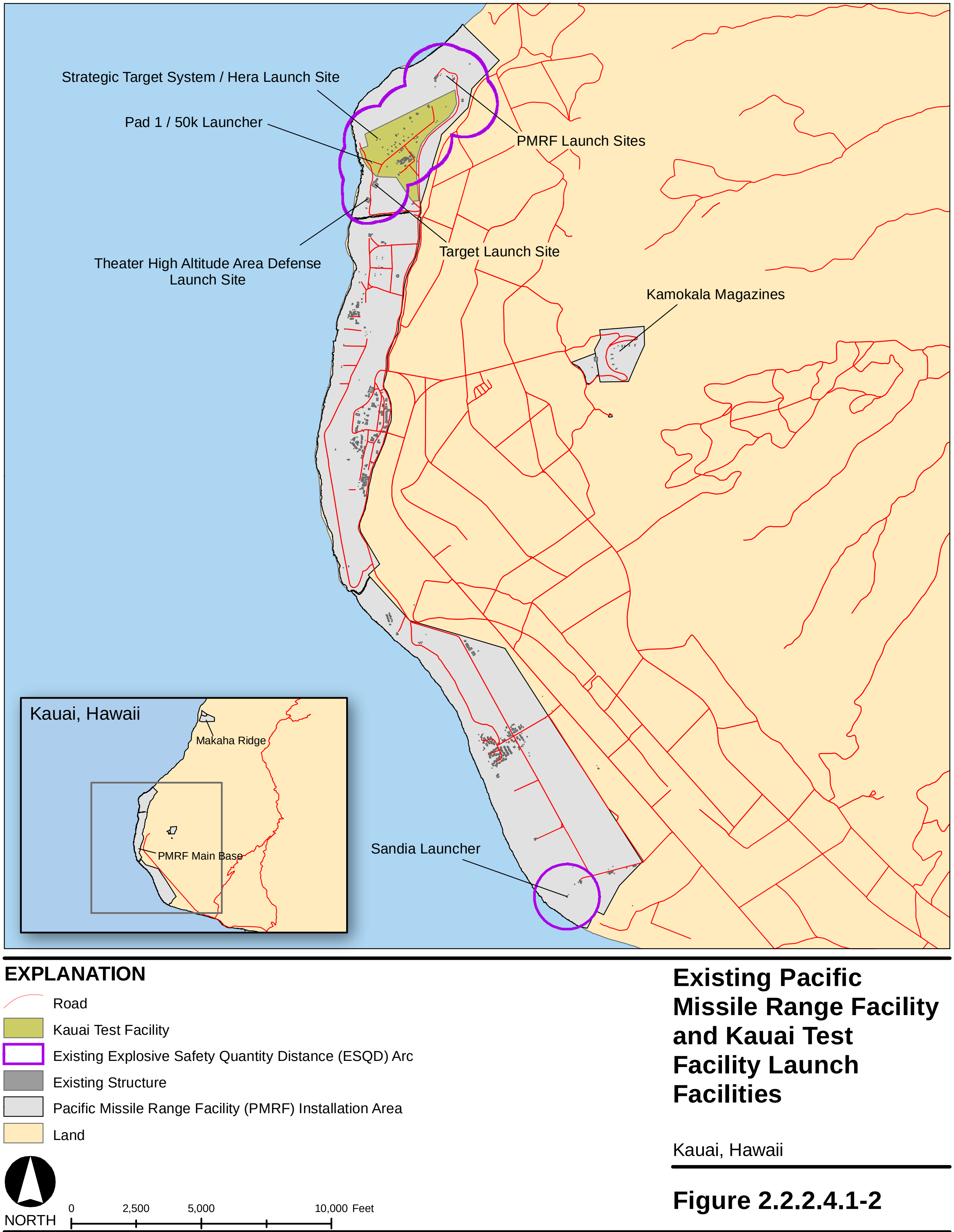
Figure 2.2.2.4.1-2 shows the existing launch facilities at PMRF and the Kauai Test Facility (KTF). Figure 2.2.2.4.1-3 shows the existing missile flight corridors. Aerial targets are launched from PMRF, mobile sea-based platforms, or military cargo aircraft. During Navy Aegis missile defense RDT&E operations, a ballistic missile target vehicle is launched from PMRF and intercepted by a ship-launched missile. The test operations can involve:

- Aegis ships
- Use of the Mobile Range Safety System
- On-load and off-load of aircraft
- Long-Range Air Launch Target
- Smart Test Vehicle
- Light Detection and Ranging
- Mobile At-Sea Sensor System
- Use of the Battle Management Interoperability Center
- Transportation of liquid propellants to PMRF
- Flight Termination System preparations for an operation
- Dress rehearsals and dry runs for specific missile defense operations

The Army's Terminal High Altitude Area Defense (THAAD) is part of the Department of Defense Ballistic Missile Defense System. THAAD is the antimissile system designed to intercept and destroy missiles in the final phase of their trajectories. THAAD PMRF training operations include midcourse tracking of ballistic missiles using the Coherent Signal Processing radar, telemetry, C-Band precision radars, and Mobile Aerial Target Support System. THAAD differs from other missile defense testing in that THAAD scenarios involve the target vehicle being launched outside of PMRF, with the THAAD interceptor launched from an existing launch pad at PMRF. The intercept occurs in the Temporary Operating Area.

Other RDT&E associated missile defense operations include preparing security, range instrumentation and communications checks, radar calibrations, and range clearance.

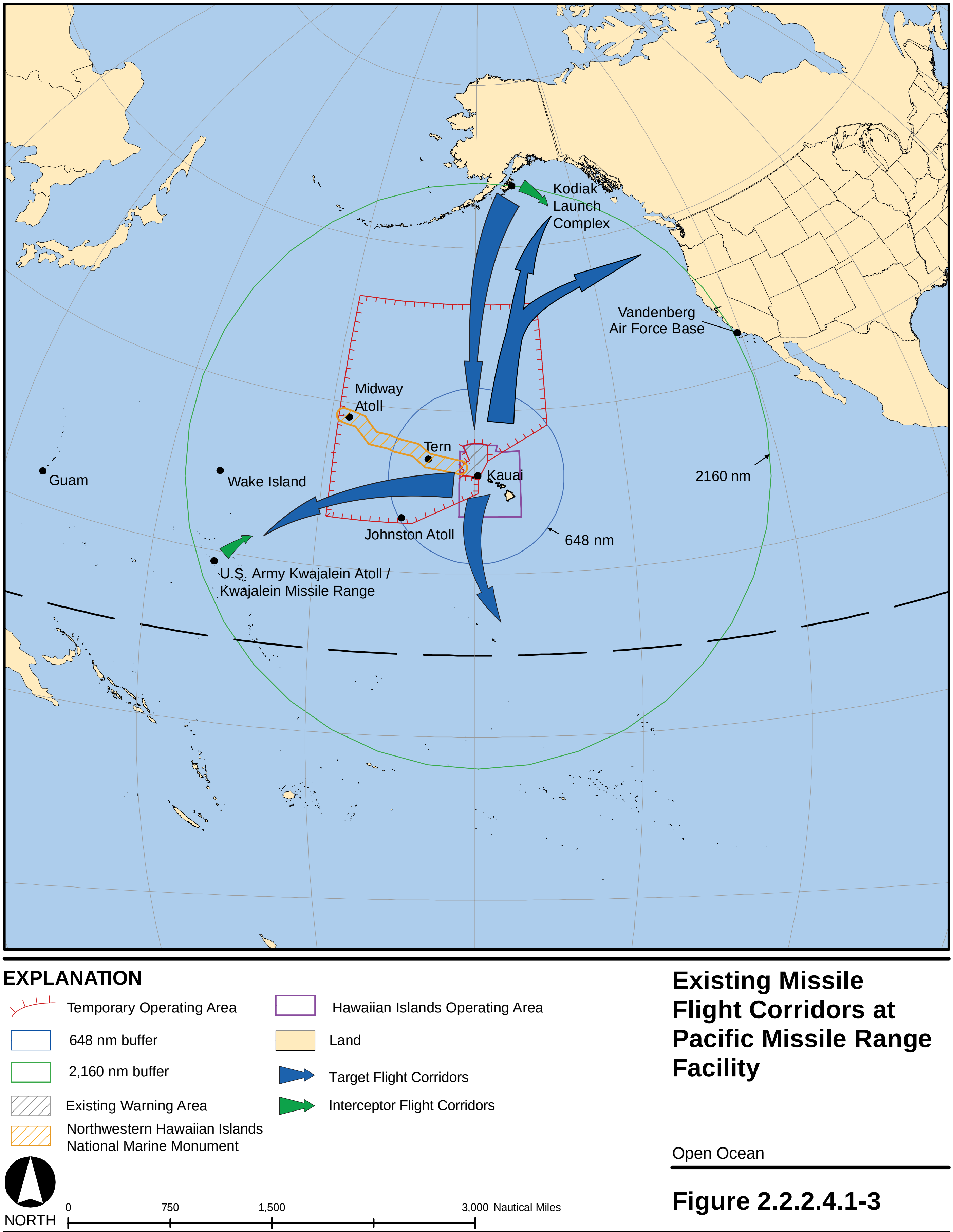
As part of the required clearance before an exercise, the target area must be inspected visually and determined to be clear. Range Control is charged with hazard area surveillance and clearance and the control of all range operational areas. Figures 2.2.2.4.1-4 and 2.2.2.4.1-5 depict the range areas associated with two conceptual missile defense scenarios. The PMRF Range Control Officer is solely responsible for determining range status and setting RED (no firing) and GREEN (range is clear and support units are ready to begin the event) range firing conditions. The Range Control Officer coordinates the control of PMRF airspace, with the Federal Aviation Administration and other military users, often on a real-time basis.



Existing Pacific Missile Range Facility and Kauai Test Facility Launch Facilities

Kauai, Hawaii

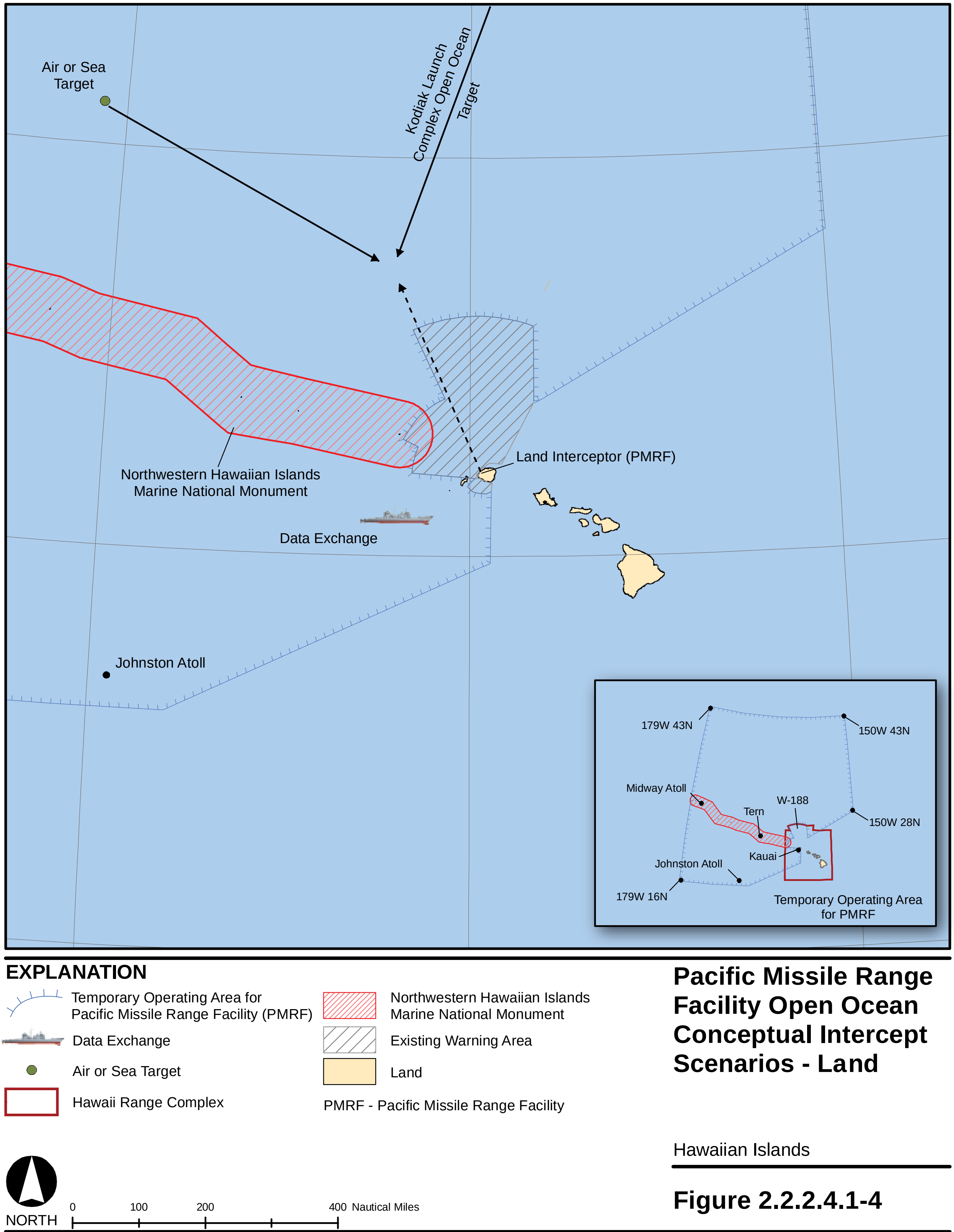
Figure 2.2.2.4.1-2



Existing Missile Flight Corridors at Pacific Missile Range Facility

Open Ocean

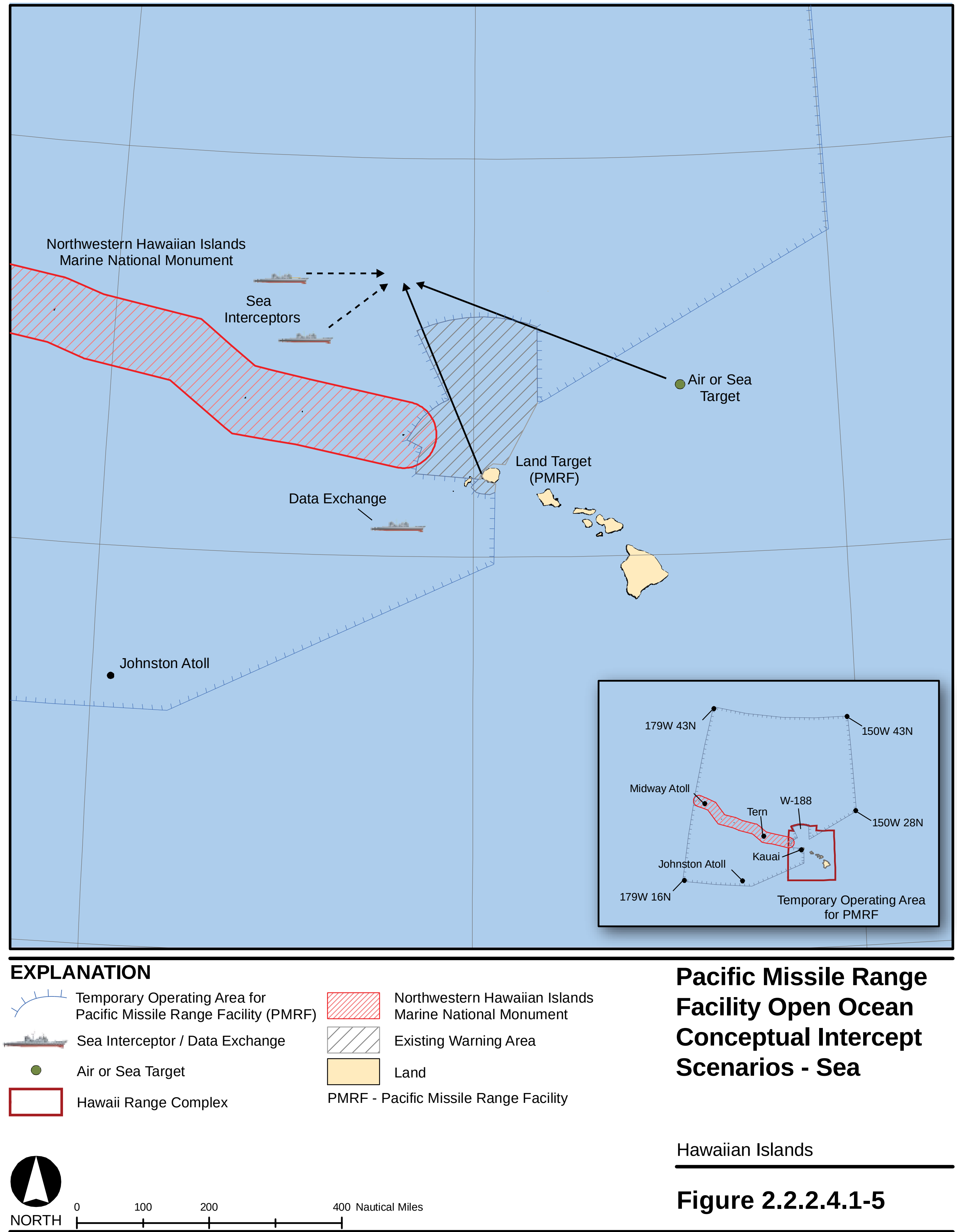
Figure 2.2.2.4.1-3



Pacific Missile Range Facility Open Ocean Conceptual Intercept Scenarios - Land

Hawaiian Islands

Figure 2.2.2.4.1-4



Pacific Missile Range Facility Open Ocean Conceptual Intercept Scenarios - Sea

Hawaiian Islands

Figure 2.2.2.4.1-5

The Range Control Officer communicates with the training events conductors and all participants entering and leaving the range areas. The Range Control Officer also communicates with other agencies such as the Federal Aviation Administration Air Route Traffic Control Center in Honolulu, the PMRF/Main Base airfield control tower, the 154th Air Control Squadron at Kokee, and the Fleet Area Control and Surveillance Facility at Ford Island, Pearl Harbor.

2.2.2.4.2 Naval Undersea Warfare Center Ranges

RDT&E training operations take place at the NUWC ranges in Hawaii (Figure 2.2.2.4.2-1). The Shipboard Electronic Systems Evaluation Facilities (SESEF) range, located off Barbers Point on Oahu, provides state-of-the-art test and evaluation of combat systems that radiate or receive electromagnetic energy. The SESEF range includes land based test facilities established to provide electromagnetic system test and evaluation services to afloat and shore commands. SESEF services can be used for the development of new and upgraded systems, and provide a real-time evaluation of a system in an operational environment.

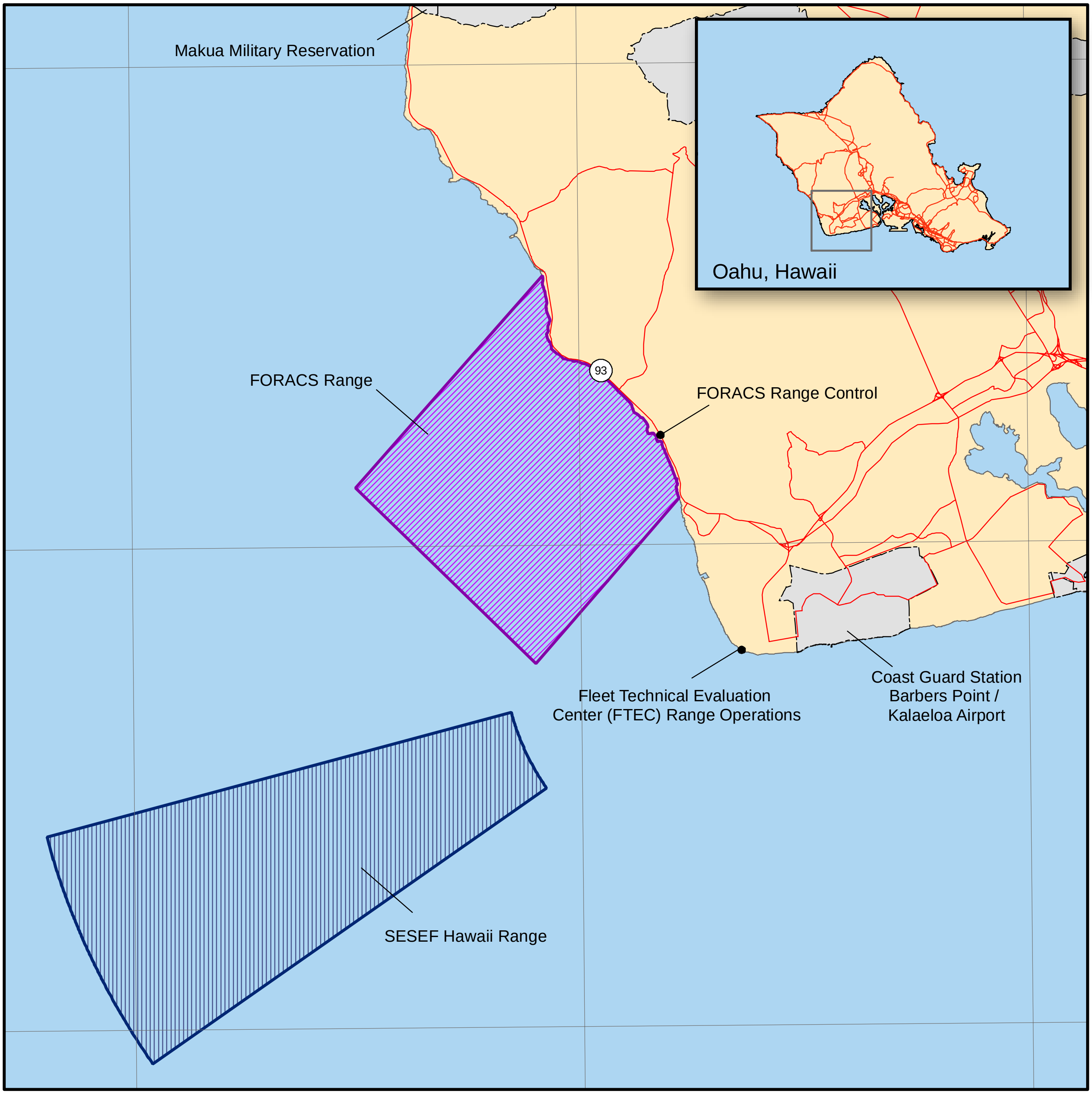
The Fleet Operational Readiness Accuracy Check Site (FORACS) range control is located near Nanakuli, Oahu. The electronic equipment at this site checks range and bearing accuracy for Navy and Coast Guard ships to ensure equipment function and calibration.

SESEF Tests

SESEF tests are conducted to evaluate ship, shore, and aircraft systems that emit or detect electronic emissions. These systems include those used for radio communications, data transfer, navigation, radar, and identification of friend and foe. Depending on the system being evaluated, either the tested site, the SESEF, or both will transmit electronic signals in or near the radio frequency band of the electromagnetic spectrum. Specific frequencies and power settings are dependent on the type of test being conducted. The test equipment operated by SESEF allows for a performance evaluation of the ship, shore, or aircraft system. Tests conducted by SESEF fall into one of two broad categories: Quick Look and System Performance tests.

Quick Look tests are generally conducted during transit to and from port, or while pier side at Pearl Harbor. These tests provide the ship a quick operational evaluation of the system(s) being tested with a simple “SAT or UNSAT” grade along with any detected system anomalies or problems. An example is a radio check that confirms that a ship’s radio can both transmit and receive voice communications. Quick Look tests have the following characteristics:

- Generally short in duration
- Require little or no advance scheduling
- Require little or no shipboard maneuvering
- May be accomplished pier side (Communications, LINK-4A and LINK-11 only)
- Require minimal internal shipboard coordination



EXPLANATION

- Road
- Fleet Operational Readiness Accuracy Check Site (FORACS)
- Shipboard Electronic Systems Evaluation Facility (SESEF) Hawaii Range
- Installation Area
- Land

NORTH

0 1 2 4 Nautical Miles

Naval Undersea Warfare Center Ranges

Oahu, Hawaii

Figure 2.2.2.4.2-1

System performance testing provides the ship with a more detailed analysis and evaluation of the system(s) under test. The testing requirements and the desired measurement precision dictate a higher degree of control on the ship and coordination of its personnel. System performance tests are characterized as tests which:

- Generally require longer periods of dedicated testing
- Require advance scheduling and coordination with SESEF
- Require the ship to maneuver in pre-defined geometries within a certain geographic area; and
- Require internal shipboard coordination

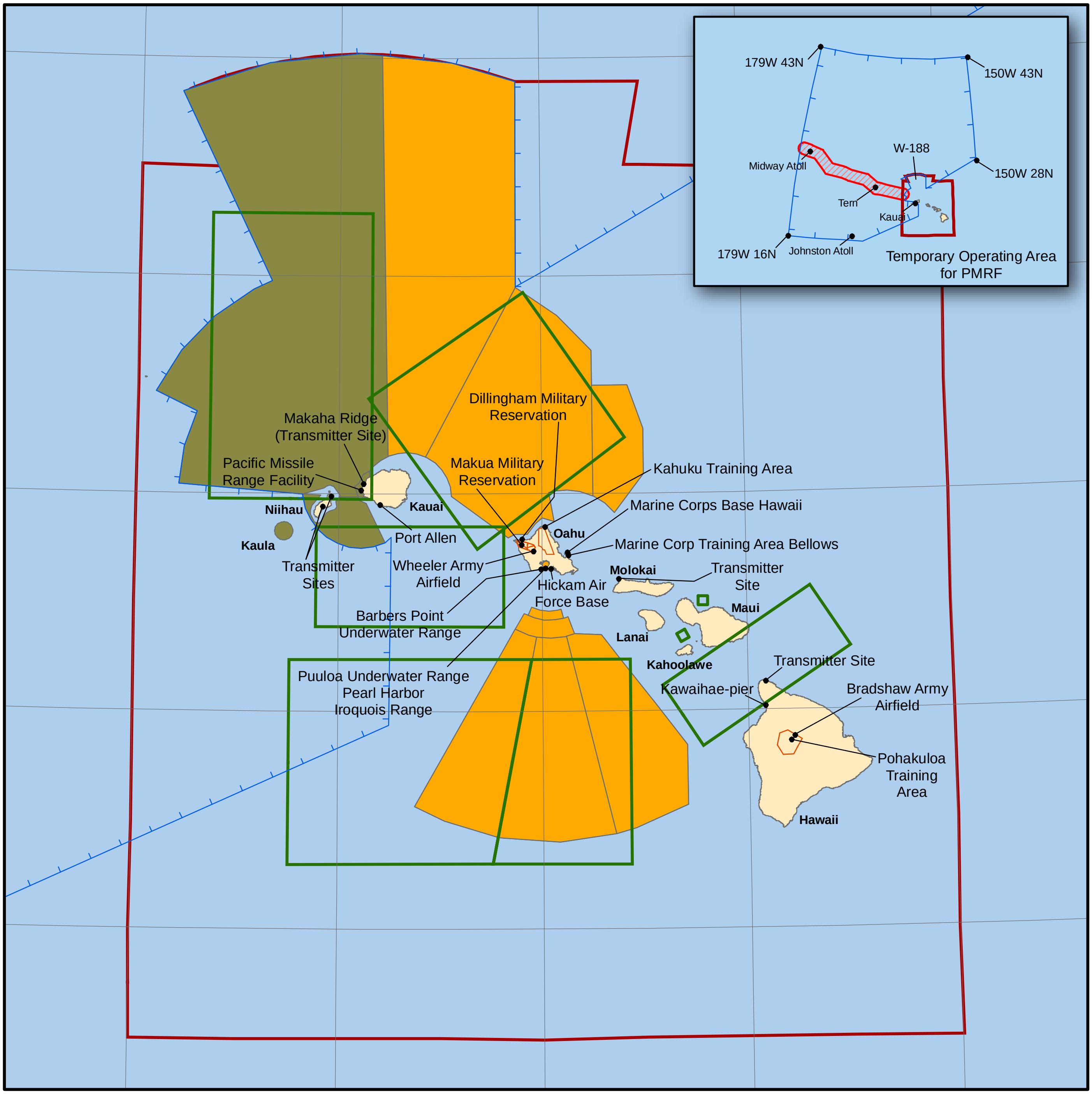
Fleet Operational Readiness Accuracy Check Site Tests

The purpose of the FORACS tests are to provide accuracy checks of ship and submarine sonar, both in active and passive modes, and to evaluate the accuracy of a ship's radar. The ship will conduct a series of "runs" on the range, each taking approximately 1.5 hours. Both active and passive sonar can be checked on a single run. During a run, the ship will approach the target, a stationary underwater acoustic transducer located near shore, making a slow turn to eventually track outbound from the target, establishing a bearing to the target in use. This information is compared with the known bearing by FORACS range technicians stationed onboard the ship. During active sonar testing, range-to-target information is also evaluated. Examples of specific FORACS tests are:

- Surface Weapons System Accuracy Trial (SURFSAT)— both an acoustic and an RF accuracy evaluation for a surface ship's radar.
- At-Sea Bearing Accuracy Test—a test of a ship's radar alone.
- Submarine Warfare System Assessment (SWSA)— an assessment of a submarine's radar and sonar. The SWSA is similar to the SURFSAT, but is only for submarines.
- Undersea Warfare Readiness Evaluation Facility (USWREF)—a test of a ship's radar and sonar. The USWREF is similar to, but less involved than, the SURFSAT or SWSA.

2.2.2.5 MAJOR EXERCISES

Types of major exercises that occur within the HRC are the RIMPAC Exercise and Undersea Warfare Exercise (USWEX). Figure 2.2.2.5-1 shows the areas used by these exercises and the areas used for ASW modeling. Table 2.2.2.5-1 shows the matrix of operations included in major exercises. Each of these exercises has at its center, one of two types of Strike Groups. A Strike Group is a naval force comprising one or more capital ships; several surface combatant ships such as cruisers, frigates, and destroyers; and one or more attack submarines.



EXPLANATION

- Temporary Operating Area for Pacific Missile Range Facility (PMRF)
- Hawaii Range Complex
- Restricted Airspace
- Sonar Modeling Area
- Northwestern Hawaiian Islands Marine National Monument
- Oahu Warning Areas
- PMRF Warning Areas
- Land

NORTH

0 50 100 200 Nautical Miles

Existing Exercise Area for Rim of the Pacific and Undersea Warfare Exercise

Hawaiian Islands

Figure 2.2.2.5-1

Table 2.2.2.5-1. Current Operations Included in Major Exercises

Training Operations

Service	Location	Island	IN-PORT/ SUPPORTEX	C2	AAW: AIROPS	AAW: S-A MISSILEX	AAW: A-A MISSILEX/ ACM	AAW: A-S MISSILEX	ASUW / ASW: S-S MISSILEX	ASUW / ASW: ASW	MIW: MINEX	MIW: MCM: SMWEX	MIW: MCM: Air MIWEX	MIW: MCM: UMWEX	ASUW: STW, CASEX	ASUW: GUNEX	ASUW: SINKEX	LFX	HAO/NEO	HA/DR	SPECWAROPS	DEMO	SALVAGE OPS	Expeditionary Assault	SUBOPS	Seaglider
Navy	Pacific Missile Range Facility*	Kauai		■	■	■	■		■			■			■				■		■	■		■		
	Niihau	Niihau																	■		■					
	Kaula	Kaula													■	■										
	Pearl Harbor**	Oahu	■	■	■																■	■	■			
	Iroquois Land/Underwater Range	Oahu																			■	■				
	Puuloa Underwater Range – Pearl Harbor	Oahu																			■	■	■			
	Barbers Point Underwater Range	Oahu																			■	■				
	Coast Guard AS Barbers Point/ Kalaeloa Airport	Oahu			■																■					
	PMRF Warning Areas#	Ocean Areas				■	■	■	■	■	■				■	■	■				■	■			■	
	Oahu Warning Areas#	Ocean Areas				■	■			■						■					■	■			■	
	Open Ocean Areas#	Ocean Areas								■		■	■	■							■	■			■	■
	U.S. Command Ship	Ocean Areas		■																						
Marines	Marine Corps Base Hawaii	Oahu		■	■									■					■	■	■			■		
	Marine Corps Training Area Bellows	Oahu																	■	■	■			■		
Air Force	Hickam Air Force Base	Oahu		■	■																■					
Army	Kahuku Training Area	Oahu																	■	■	■					
	Makua Military Reservation	Oahu																■			■					
	Dillingham Military Reservation	Oahu																			■					
	Wheeler Army Airfield	Oahu		■	■																■					
	K-Pier, Kawaihae	Hawaii																			■			■		
	Bradshaw Army Airfield	Hawaii		■	■																■					
	Pohakuloa Training Area	Hawaii		■											■			■			■					
State	Keehi Lagoon	Oahu																					■			

* Includes Port Allen and Makaha Ridge

** Includes Ford Island and all other areas within the harbor.

These areas are included in the HRC. The HRC is now used to define the outer limits of the ocean areas used during Major Exercises.

■ Locations where operations can occur

Training Operations:

A-A MISSILEX	Air-to-Air Missile Exercise (formerly AAMEX)
AAW[1]	Anti-Air Warfare
AIROPS	Aircraft Operations
AMPHIBEX	Amphibious Landing Exercise (now Expeditionary Assault)
Air MIWEX	Air Mine Warfare Exercise (formerly AMWEX)
A-S MISSILEX	Air-to-Surface Missile Exercise (formerly ASMEX)
ASUW[2]/ASW[3]	Anti-Surface Warfare/ Anti-Submarine Warfare Exercise
ASW	Anti-Submarine Warfare Exercise (formerly ASWEX)
CASEX	Close Air Support
C2	Command and Control
DEMO	Demolition Exercise
GUNEX	Gunnery Exercise
HA/DR	Humanitarian Assistance/Disaster Relief
HAO/NEO	Humanitarian Assistance Operation/ Non-Combatant Evacuation Operation
IN-PORT	In-port Briefings and Operations
LFX	Live Fire Exercise
MCM	Mine Countermeasures
MINEX	Mine Exercise
MIW[4]	Mine Warfare
SALVAGE OPS	Salvage Operations
S-A MISSILEX	Surface-to-Air Missile Exercise (formerly SAMEX)
SINKEX	Sink Exercise
SMWEX	Ship Mine Warfare Exercise
SPECWAROPS	Special Warfare Operations (NSW Operations?)
S-S MISSILEX	Surface-to-Surface Missile (formerly SSMEX)
STW	Strike Warfare Exercise (formerly STWEX)
SUBOPS	Submarine Operations
SUPPORTEX	In-Port Support Exercise
UMWEX	Underwater Mine Warfare Exercise

Note: Since the publication of the RIMPAC PEA, new terminology and/or categories of exercises have come into use. They are as follows:

[1] AAW includes AIROPS, S-A MISSILEX, A-A MISSILEX, and A-S MISSILEX

[2] ASUW includes GUNEX, S-S MISSILEX, and ASW

[3] ASW includes S-S MISSILEX and ASW

[4] MIW encompasses two subsets, MINEX and MCM. MINEX is the act of laying mines. MCM is the act of locating and countering mining by others and includes SMWEX, AMWEX, and UMWEX.

1

ASW training conducted during RIMPAC and USWEX utilizes ships, submarines, aircraft, non-explosive exercise weapons, and other training systems and devices. This EIS/OEIS documents an acoustic exposure effects-analysis on marine mammals that may be affected by the RIMPAC and USWEX ASW training events and use of mid-frequency active tactical sonar.

Nearly all ASW training would occur in the eight areas delineated in Figure 2.2.2.5-1. While ASW events could occur throughout the approximate 210,000 nm^2 of the Hawaiian Islands Operating Area, most events would occur within the approximate 46,000 nm^2 of these eight areas, which were used for analysis as being representative of the marine mammal habitats and the bathymetric, seabed, wind speed, and sound velocity profile conditions within the entire Hawaiian Islands Operating Area. Sonar modeling included the SQS 53C surface ship sonar, the AN/AQS-22 helicopter dipping sonar, the AN/SSQ-62 sonobuoy sonar, and the MK-48 torpedo sonar.

2.2.2.5.1 Rim of the Pacific

The Commander, U.S. Third Fleet, conducts RIMPAC within the HRC every other year. The biennial RIMPAC is a multinational, sea control and power projection exercise that consists of various phases of activity by Army, Marine Corps, Navy, and Air Force forces, as well as the military forces of several Pacific Rim nations. During the month-long exercise, individual training operations occur in open ocean, offshore, and onshore areas.

Much of the RIMPAC exercise takes place on existing Army, Marine Corps, and PMRF ranges. A Programmatic EA for RIMPAC was completed in 2002, and supplemental EAs were prepared in 2004 and 2006.

The 2004 Supplement to the RIMPAC Programmatic EA was prepared to evaluate the additional RIMPAC operations proposed for 2004 not covered by the RIMPAC Programmatic EA. The 2004 Supplement examined whether new installations or facilities were proposed for use, whether significantly different training levels or types of equipment were proposed, and whether environmental conditions had changed. The following exercises were evaluated in the 2004 Supplement:

- GUNEX at PMRF Barking Sands Tactical Underwater Range (BARSTUR)
- MCM at Marine Corps Training Area/Bellows (MCTAB), Oahu; Open Ocean Areas, Hawaiian Islands between Molokai, Lanai, and Maui, (including Penguin Bank and the Navy's shallow water training area south of Maui)
- Demolition at Land/Underwater Demolition Range, Naval Magazine Pearl Harbor, West Loch Branch, Oahu; Naval Inactive Ship Maintenance Facility, Middle Loch, Pearl Harbor, Oahu

The 2006 Supplement to the RIMPAC Programmatic EA also included an assessment of a NEO training event at PMRF and on Niihau and additional analysis related to mid-frequency active sonar. The training operations analyzed were the same as previously analyzed and had taken place with not significant changes over the previous 19 RIMPAC exercises. Appendix D shows the matrix of operations used during previous RIMPAC exercises by location.

For RIMPAC under the No-action Alternative, the marine mammal exposure modeling included 532 hours of 53 C surface ship sonar and associated dipping sonar, sonobuoys, and MK-48 torpedoes.

2.2.2.5.2 Undersea Warfare Exercise

USWEX includes a single Strike Group, training in the HRC for up to four days, four times per year. Appendix D shows the matrix of operations generally used during a USWEX exercise by location. The USWEX Programmatic Environmental Assessment / Overseas Environmental Assessment was completed in January 2007.

For USWEX under the No-action Alternative, the marine mammal exposure modeling included 806 hours of 53 C surface ship sonar and associated dipping sonar, and sonobuoys.

2.2.2.6 PROTECTIVE MEASURES

Under the No-action Alternative, the Navy's marine mammal protective measures will continue to be implemented. Chapter 6.0 presents these protective measures, outlining steps that are currently implemented to protect marine mammals and federally-listed species.

2.2.3 ALTERNATIVE 1

2.2.3.1 OPERATIONS ASSOCIATED WITH THE NO-ACTION ALTERNATIVE

Alternative 1 includes all ongoing operations associated with the No-action Alternative, and proposes an increased number of such operations. Table 2.2.3.1-1 indicates the number of training operations associated with the baseline and the proposed number of operations under Alternative 1.

Table 2.2.3.1-1. Baseline and Alternative 1 Proposed Training Operations

Mission Area	Operation	Area	Baseline (Operations/ Year)	Alt. 1 (Operations/ Year)
OPEN OCEAN OPERATIONS				
Anti-Air Warfare (AAW)	Air Combat Maneuver	W-188, 189, 190, 192, 193, 194	738	774
	Air-to-Air Missile Exercise	W-188	12	16
	Surface-to-Air Gunnery Exercise	W-188, 192, Mela South	86	108
	Surface-to-Air Missile Exercise	W-188	17	26
	Chaff Exercise	Hawaii Offshore	34	34
Amphibious Warfare (AMW)	Naval Surface Fire Support Exercise	W-188	22	28
Anti-Surface Warfare (ASUW)	Visit, Board, Search, and Seizure	Hawaii Offshore	60	60
	Surface-to-Surface Gunnery Exercise	W-191, 192, 193, 194, 196, Mela South, Pacific Missile Range Facility (PMRF)	69	91
	Surface-to-Surface Missile Exercise	PMRF (W-188)	7	12
	Air-to-Surface Gunnery Exercise	Hawaii Offshore, PMRF	128	152
	Air-to-Surface Missile Exercise	PMRF	36	50
	Bombing Exercise (Sea)	Hawaii Offshore, PMRF	35	35
	Sink Exercise	Hawaii Offshore, PMRF	6	6
	Antisurface Warfare Torpedo Exercise (Submarine-Surface)	Hawaii Offshore, PMRF	35	35
Anti-Submarine Warfare (ASW)	Antisubmarine Warfare Tracking Exercise	Hawaii Offshore, PMRF	397	397
	Antisubmarine Warfare Torpedo Exercise	Hawaii Offshore, PMRF	500	500
	Major Integrated ASW Training Exercise	Hawaii Offshore, PMRF	5	7

Table 2.2.3.1-1. Baseline and Alternative 1 Proposed Training Operations (Continued)

Mission Area	Operations	Area	Baseline (Operations/ Year)	Alt. 1 (Operations/ Year)
OPEN OCEAN OPERATIONS (Continued)				
Electronic Combat (EC)	Electronic Combat Operations	Hawaii Offshore, PMRF	50	88
Mine Warfare (MIW)	Mine Countermeasures Exercise	PMRF, Submarine Operating Area	32	62
Naval Special Warfare (NSW)	Swimmer Insertion/Extraction	Hawaii Offshore, Marine Corps Training Area–Bellows (MCTAB), PMRF	80	80
Strike Warfare (STW)	Bombing Exercise (Land)	Kaula, Pohakuloa Training Area (PTA)	165	216
	Air-to-ground Gunnery Exercise	Kaula	16	18
Other	Command and Control (C2)	U.S. Command Ship at sea	1	1
OFFSHORE OPERATIONS				
AMW	Expeditionary Assault	PMRF, MCTAB	11	11
ASUW	Flare Exercise	W-188	6	6
MIW	Mine Neutralization	Puuloa Underwater Range	62	62
	Mine Laying	PMRF	22	32
NSW	Swimmer Insertion/Extraction	Hawaii Offshore, MCTAB, PMRF	52	52
Other	Salvage Operations	Pearl Harbor, Puuloa Underwater Range, Keehi Lagoon, Eastern Naval Defense Sea Area	3	3
	In Port Ship Support Operations	Pearl Harbor	1	1
ONSHORE OPERATIONS				
MIW	Land Demolitions	Explosive Ordnance Disposal Land Range	85	85
NSW	SPECWAROPS	Bradshaw Army Airfield, Makua Military Reservation, Kahuku Military Training Area, Dillingham Military Reservation, Wheeler Army Airfield, Niihau, MCTAB, and PTA	30	30

Table 2.2.3.1-1. Baseline and Alternative 1 Proposed Training Operations (Continued)

Mission Area	Operations	Area	Baseline (Operations/ Year)	Alt. 1 (Operations/ Year)
ONSHORE OPERATIONS (Continued)				
Other	Command and Control (C2)	Pearl Harbor, Marine Corps Base Hawaii (MCBH), Hickam Air Force Base (AFB), Wheeler Army Airfield (AAF), Bradshaw AAF	1	1
	Aircraft Support Operations	PH, Kalaeloa Airport, MCBH, Hickam AFB, Wheeler AAF, Bradshaw AAF, PMRF	1	1
	Personnel Support Operations	Oahu, Kauai	1	1
	Air Operations	Pearl Harbor, Kalaeloa Airport, MCBH, Hickam AFB, Wheeler AAF, Bradshaw AAF, PMRF, Kona International Airport	2,600	2,600
	Field Carrier Landing Practice (FCLP)	MCBH, Barking Sands	0	12
	Live Fire Exercise	Makua, PTA	3	3
	Humanitarian Assistance / Non-combatant Evacuation Operations (HAO/NEO)	PMRF, Niihau, MCBH, MCTAB, Kahuku	1	1
	Humanitarian Assistance / Disaster Relief Operations (HA/DR)	MCBH, MCTAB, Kahuku	1	1

2.2.3.2 INCREASED TEMPO AND FREQUENCY OF TRAINING OPERATIONS AND NEW TRAINING OPERATION

Under Alternative 1, the Navy proposes to increase the tempo and frequency of training exercises in the HRC (refer to Table 2.2.3.1-1).

Field Carrier Landing Practice

Under Alternative 1, the Navy is also proposing to conduct Field Carrier Landing Practice (FCLP) for a small number of pilots each year in Hawaii. An FCLP is a series of touch-and-go landings conducted to train and field qualify pilots for aircraft carrier landings. Only carrier-based, fixed-wing aircraft pilots (both jet and propeller aircraft) are required to conduct FCLPs. FCLPs would be conducted during day and night periods, each consisting of six to eight touch-and-go landings per pilot. The landings would take place on an airport runway, preferably one marked and lighted to simulate the deck of an aircraft carrier.

The requirement for FCLP refresher training is dictated by the length of time since a pilot's last carrier landing. The number of FCLP periods and total number of FCLP landings required to prepare a pilot for carrier landings varies with individual pilot skills, experience, and currency in aircraft type. In addition, these requirements may be adjusted during FCLP refresher training according to individual performance. In general, the longer since a pilot's last carrier landing, and the less experience the pilot has, the greater the number of FCLP periods required. Nominally, four FCLP periods would be required per pilot (2 day, 2 night).

To accommodate the needs of three pilots per year that may arrive in Hawaii in need of field qualification, 12 FCLP periods would be required. These would be conducted at Marine Corps Base Hawaii on Oahu, or at PMRF Barking Sands airfield on Kauai.

2.2.3.3 ENHANCED RDT&E OPERATIONS

The Navy proposes to enhance RDT&E operations from current levels as necessary as shown in Table 2.2.3.3-1.

Table 2.2.3.3-1. Baseline and Alternative 1 RDT&E Operations

Mission Area	Operation	Area	Baseline (Operations/ Year)	Alternative 1 (Operations/ Year)
OPEN OCEAN OPERATIONS				
Pacific Missile Range Facility (PMRF)	Anti-air Warfare Research, Development, Testing, and Evaluation (RDT&E)	Open Ocean	35	40
	Antisubmarine Warfare	Open Ocean	19	21
	Combat System Ship Qualification Trial	Open Ocean	7	8
	Electronic Combat/Electronic Warfare	Open Ocean	65	72
	High Frequency	Open Ocean	9	10
	Missile Defense	Open Ocean	46	46
Naval Undersea Warfare Center Ranges	Shipboard Electronic Systems Evaluation Facility (SESEF) Quick Look Tests	Open Ocean	3,842	4,225
	SESEF System Performance Tests	Open Ocean	67	74
Planned Testing & Evaluation Operations	Additional Chemical Simulant	Open Ocean	0	Upgrade
	Intercept Targets launched into PMRF Controlled Area	Open Ocean	0	3
	Launched SM-6 from Sea-Based Platform (AEGIS)	Open Ocean	0	Upgrade
	Test Unmanned Surface Vehicles	Open Ocean	0	Upgrade
	Test Unmanned Aerial Vehicles	Open Ocean	0	Upgrade
	Test Hypersonic Vehicles	Open Ocean	0	Upgrade
Offshore Enhancements	Portable Undersea Tracking Range	Open Ocean	0	Upgrade
PMRF Enhancements	Large Area Tracking Range Upgrade	Open Ocean	0	Upgrade
	Enhanced Electronic Warfare Training	Open Ocean	0	Upgrade
	Expanded Training Capability for Transient Air Wings	Open Ocean	0	Upgrade
Future RDT&E Operations	Directed Energy	Open Ocean	0	0
	Advanced Hypersonic Weapon	Open Ocean	0	0

Table 2.2.3.3-1. Baseline and Alternative 1 RDT&E Operations (Continued)

Mission Area	Operation	Area	Baseline (Operations/ Year)	Alternative 1 (Operations/ Year)
OFFSHORE OPERATIONS				
PMRF	Antisubmarine Warfare	Maui	19	21
	Electronic Combat/Electronic Warfare	PMRF	65	72
	High Frequency	PMRF	9	10
	Missile Defense	PMRF	46	46
Naval Undersea Warfare Center Ranges	Fleet Operational Readiness Accuracy Check Site (FORACS) Tests	Oahu	5	5
	SESEF Quick Look Tests	Oahu	3,842	4,225
	SESEF System Performance Tests	Oahu	67	74
Planned Testing & Evaluation Operations	Test Unmanned Surface Vehicles	PMRF	0	Upgrade
	Test Unmanned Aerial Vehicles	PMRF	0	Modification Construction
Pearl Harbor Enhancements	MK-84/MK-72 Pinger Acoustic Test Facility	Ford Island	0	Upgrade Training Area
	Mobile Diving and Salvage Unit Training Area	Naval Defensive Sea Area	0	Upgrade
Offshore Enhancements	Portable Undersea Tracking Range	PMRF, Maui	0	Upgrade
PMRF Enhancements	Large Area Tracking Range Upgrade	Kauai, Oahu, Maui, Hawaii	0	Upgrade
	Kingfisher Underwater Training Area	Niihau	0	Construction Upgrade
	Expanded Training Capability for Transient Air Wings	Kauai, Oahu, Maui, Hawaii	0	Upgrade
Future RDT&E Operations	Directed Energy	PMRF (Main Base)	0	0
	Advanced Hypersonic Weapon	PMRF (Main Base)	0	0
ONSHORE OPERATIONS				
PMRF	Anti-air Warfare RDT&E	Naval Station Pearl Harbor	35	40
	Electronic Combat/Electronic Warfare	PMRF/Main Base	65	72
	Joint Task Force Wide Area Relay Network	PMRF	2	6
	Missile Defense	PMRF/Main Base	46	46
Naval Undersea Warfare Center Ranges	SESEF Quick Look Tests	Oahu	3,842	4,225
	SESEF System Performance Tests	Oahu	67	74
Planned Testing & Evaluation Operations	Additional Chemical Simulant	PMRF/Main Base	0	Upgrade
	Test Unmanned Aerial Vehicles	Kauai	0	Upgrade
	Test Hypersonic Vehicles	Kauai	0	Upgrade

Table 2.2.3.3-1. Baseline and Alternative 1 RDT&E Operations (Continued)

Mission Area	Operation	Area	Baseline (Operations/ Year)	Alternative 1 (Operations/ Year)
ONSHORE OPERATIONS (Continued)				
PMRF Enhancements	Large Area Tracking Range Upgrade	Kauai, Oahu, Maui, Hawaii	0	Upgrade
	FORCEnet Antenna	PMRF (Makaha Ridge or Kokee)	0	Construction
	Enhanced Electronic Warfare Training	Kauai, Maui, Hawaii	0	Construction
	Expanded Training Capability for Transient Air Wings	Kauai, Oahu, Maui, Hawaii	0	Construction
	Enhanced Auto ID System and Force Protection Capability	PMRF (Makaha Ridge)	0	Construction
	Construct Range Operations Control Building	PMRF (Main Base)	0	Construction
	Improve Fiber Optics Infrastructure	PMRF (Main Base, Makaha Ridge)	0	Construction
Future RDT&E Operations	Directed Energy	PMRF (Main Base)	0	0
	Advanced Hypersonic Weapon	PMRF (Main Base)	0	0

Sources: PMRF, Fleet Area Control and Surveillance Facility Pearl Harbor Annual Report FY 2003, SESEF FY03 Test Data Summary, FORACS BRAC Data Call, EODMU-3 Det MIDPAC OIC

2.2.3.4 FUTURE RDT&E OPERATIONS

Additional Chemical Simulant

The purpose of using chemical simulants in target launch vehicles is to assess the effectiveness of defensive missiles against threat missiles carrying chemical agents as payloads. To adequately emulate this threat in testing, it is necessary to use materials that are similar to the physical characteristics of actual chemical agents, but without the toxic effects. Use of actual chemical agents in testing would present the potential for unacceptable hazards, thus the need for simulants.

Target launches from PMRF would incorporate additional chemical simulants to include larger quantities of tributyl phosphate (TBP) and various glycols. The list of potential glycols would include glyceryl tributyrate, propylene glycol, diethyl phthalate, polyethylene glycol, triethylene glycol, diethyl decanedioate, dibenzyl ether, dibutyl phthalate, di(2-ethylhexyl) phthalate, diethylene glycol, and polypropylene glycol 425. The top three preferred simulants would be TBP, glyceryl tributyrate, and propylene glycol.

Approximately 120 gallons (gal) of simulant would be used in target vehicles launched from PMRF. The simulant would be transported from the Continental United States to PMRF with the target vehicle and would be loaded into the target vehicle payload as part of the payload processing activities.

Intercept Targets Launched Into PMRF Controlled Area

Launches from Wake Island, the Reagan Test Site at U.S. Army Kwajalein Atoll, and Vandenberg AFB would be intercepted in the Broad Ocean Area and Temporary Operating Area of the PMRF Range (Figure 2.2.3.4-1). Launches from those sites would be from existing launch facilities, and no new boosters from these sites are proposed. Targets would also continue to be launched from sea-based and air-based platforms as analyzed in previous environmental documents.

Launch SM-6 from Sea-Based Platform

PMRF would also develop as part of Alternative 1 the capability to launch the Extended Range Active Missile, tentatively designated SM-6, from a sea-based platform. This testing would be similar to ongoing launches of the current version of the Standard Missile from Aegis ships. For testing purposes the SM-6 could also be launched from the Mobile Aerial Target Support System or other mobile launch platform. The SM-6 would consist of the SM-2 Block IV booster system and an active Advanced Medium Range Air-to-Air Missile seeker to provide enhanced capabilities. Testing would occur in the Temporary Operating Area.

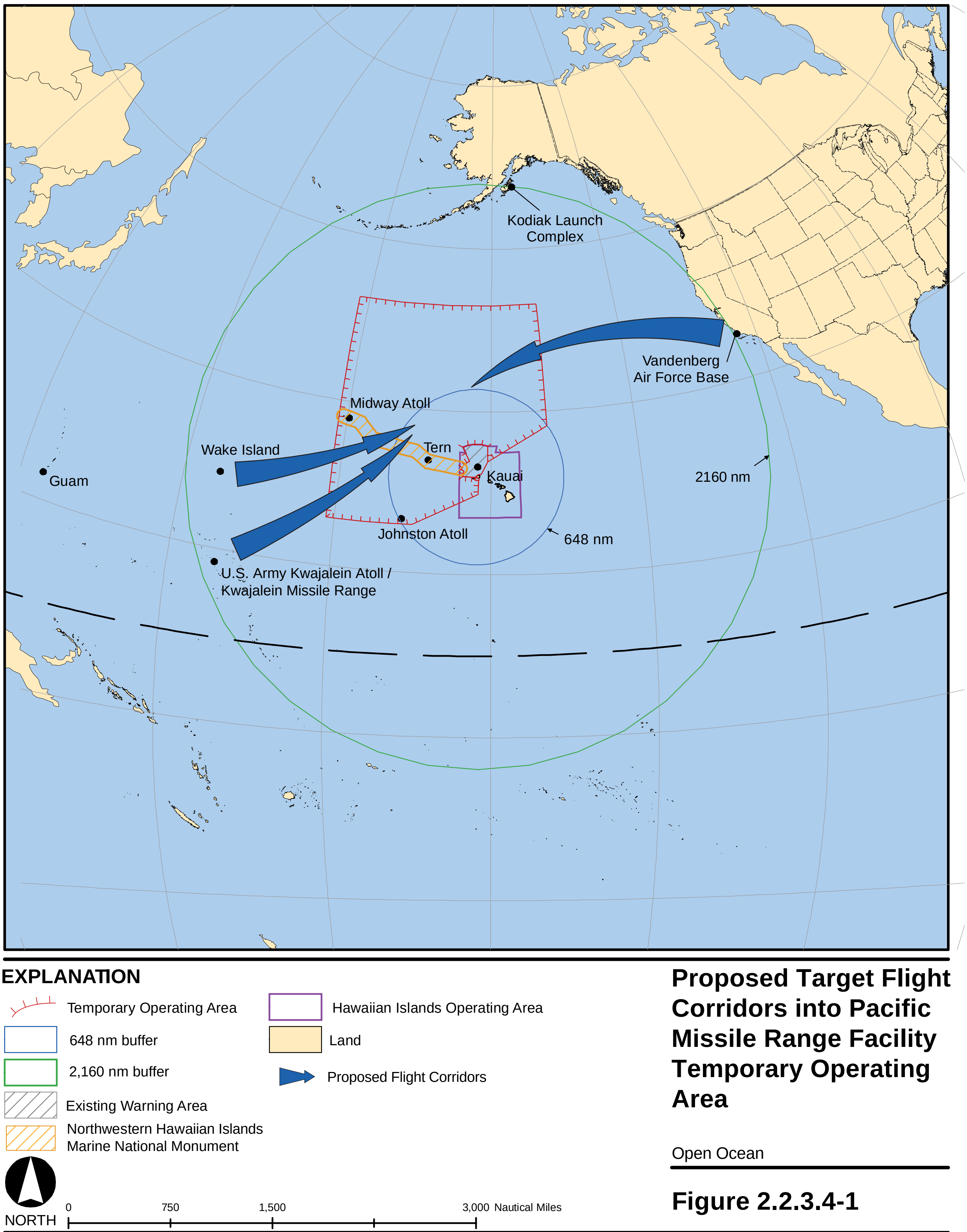
Test Unmanned Surface Vehicles

Future testing of Unmanned Surface Vehicles (USVs) is proposed to occur within the HRC. These remote-controlled boats could be equipped with modular packages to potentially support surveillance and reconnaissance activities, mine warfare, anti-terrorism/force protection, port protection, Special Forces training operations, and possibly anti-submarine warfare.

USVs generally represent small boats up to approximately 40 feet (ft) in length, with either rigid hulls and/or inflatable pontoons. Inboard or outboard diesel or gasoline engines up to several hundred horsepower would likely be used for propulsion. Test packages carried on the USVs may include radars; sonar; multi-functional camera suites; autonomous equipment packages; and required communications, testing, and support equipment. Onboard electrical power for equipment operations and engine starting would come from a series of batteries (lead-acid, lithium, etc.), and possibly an electrical generator run off the main engine.

For testing just off the coast of PMRF, the USV would be launched from either Port Allen or the Kikiaola Small Boat Harbor. For safety purposes, the USV would be towed by a manned vessel out of the harbor and up the coast to PMRF before operating remotely under its own power. Testing would only occur in areas cleared of non-mission essential vessels. Using computers, personnel would remotely operate the USV from a transportable command post in a trailer or located within an existing building at PMRF. The types of tests may include low-speed surveillance activities using cameras, radar, and/or sonar; maneuvering through obstacles; and high-speed runs in excess of 40 knots. Individual test operations could occur day or night and last for up to 24 hours, depending on test requirements. Following each test, the USV would be towed back to harbor. Depending on test schedules, the USV might be temporarily docked, or taken out of the water on a trailer for storage at the harbor or at PMRF. No new storage or docking facilities would be required.

The testing of USVs could also occur in open waters within the Temporary Operating Area. In this case, the USV would be towed out to sea or launched directly from a surface ship. Remote



Proposed Target Flight Corridors into Pacific Missile Range Facility Temporary Operating Area

Open Ocean

Figure 2.2.3.4-1

control of the USV would occur from a command center on a vessel. Again, testing would only occur in areas cleared of non-mission essential vessels.

Test Unmanned Aerial Vehicles

A variety of Unmanned Aerial Vehicles (UAVs) may also be tested in the future at PMRF. UAVs are remotely piloted or self-piloted aircraft that include fixed-wing, rotary-wing, and other vertical takeoff vehicles. They can carry cameras, sensors, communications equipment, weapons, or other payloads. At PMRF, UAV testing could support one or more of the following mission areas: intelligence, surveillance, and reconnaissance; suppression of enemy air defenses; electronic attack; anti-surface ship and anti-submarine warfare; mine warfare; communications relay; and derivations of these themes.

UAVs can vary in size up to approximately 45 ft in length, with gross vehicle weights ranging from several hundred pounds (lb) to approximately 45,000 lb. Forms of propulsion for UAVs can range from traditional turbofans, turboprops, and piston engine-driven propellers; to electric motor-driven propellers powered by rechargeable batteries (lead-acid, nickel-cadmium, lithium Ion), photovoltaic cells, and/or hydrogen fuel cells.

Prior to testing at PMRF, each UAV would be ground checked at existing facilities to ensure proper system operations. Depending on engine propulsion, the vehicle would be fueled most likely with gasoline or diesel fuel (approximately 50 to 700 lb); or jet fuel (approximately 50 to 17,000 lb of JP-5 or JP-8). Takeoff procedures would vary by UAV system, using a traditional runway takeoff, small solid rocket-assisted takeoff, or a portable catapult launcher. Personnel would use computers to remotely operate the UAV from a transportable command post in a trailer or located within an existing building at PMRF.

Depending on the UAV system being tested, individual flights could extend just a few nautical miles off the PMRF coast, or well over 100 nm into the Temporary Operating Area. Maximum altitudes for flights could range from a few thousand feet for the smallest UAVs to over 30,000 ft for the largest jet-powered vehicles. Maximum velocities attained would range from approximately 100 to 500 knots. Testing would only occur in areas cleared of non-mission essential aircraft and away from populated areas. The types of tests conducted could include demonstration of aircraft flight worthiness and endurance, surveillance activities using onboard cameras and other sensors, and over-the-horizon targeting. Individual test flights could last from a few hours to more than a day. At the completion of each flight test, vehicle landing would occur via traditional runway landing or using retrieval nets for smaller UAVs. The storage and ground-support for UAVs would occur within existing facilities at PMRF. No new facilities are planned.

In some cases, UAV flight tests, including takeoff and landing procedures, may be conducted from surface ships in the Temporary Operating Area. Remote control of the UAV would occur from a command center on a vessel. Again, testing would only occur in areas cleared of non-mission essential aircraft.

Test Hypersonic Vehicles

The Navy and the Department of Defense are working towards development of air-breathing hypersonic vehicles that are capable of maximum sustainable cruising speeds in excess of

Mach 4. As potential ordnance delivery systems, such vehicles could significantly decrease the launch to target engagement timeline.

Hypersonic vehicles, such as those being developed under the Hypersonic Flight Demonstration program, could be flight tested at PMRF from within and beyond the Temporary Operating Area. The missile-like test vehicle would be fueled at PMRF using JP-10 (exo-tetrahydrocyclo-pentadiene) or a similar turbine liquid fuel. On-board fuel weights are currently undetermined, but are expected to not exceed 500 lb. Because the hypersonic vehicles use a scramjet technology, engine operation requires a high-speed boost on a rocket or from a jet aircraft.

Rocket launching a hypersonic test vehicle could occur from the Vandal launch site at PMRF and follow a similar flight trajectory as other missiles launched from PMRF. For example, a two-stage Terrier-Orion sounding rocket could be used to boost the hypersonic vehicle. Following launch and booster motor separation, the spent motor casings would impact in the open ocean. Upon reaching hypersonic velocities at altitudes in excess of 50,000 ft, the test vehicle would continue on a pre-designated flight trajectory under its own scramjet power, before making a controlled splashdown into the open ocean.

For flight insertion using a jet aircraft, such as an F-15, the test vehicle would be attached under the aircraft at PMRF. Following takeoff, and upon reaching an appropriate altitude and velocity over the Temporary Operating Area, the test vehicle would be released from the aircraft. With engine ignition, the hypersonic test vehicle would climb to an appropriate cruising altitude before making a controlled splashdown into the open ocean.

The hypersonic vehicle flight tests would serve to demonstrate flight performance and flight worthiness. Testing would only occur in areas cleared of non-mission essential aircraft and vessels, and away from populated areas. In support of test operations at PMRF, no new facilities would be needed.

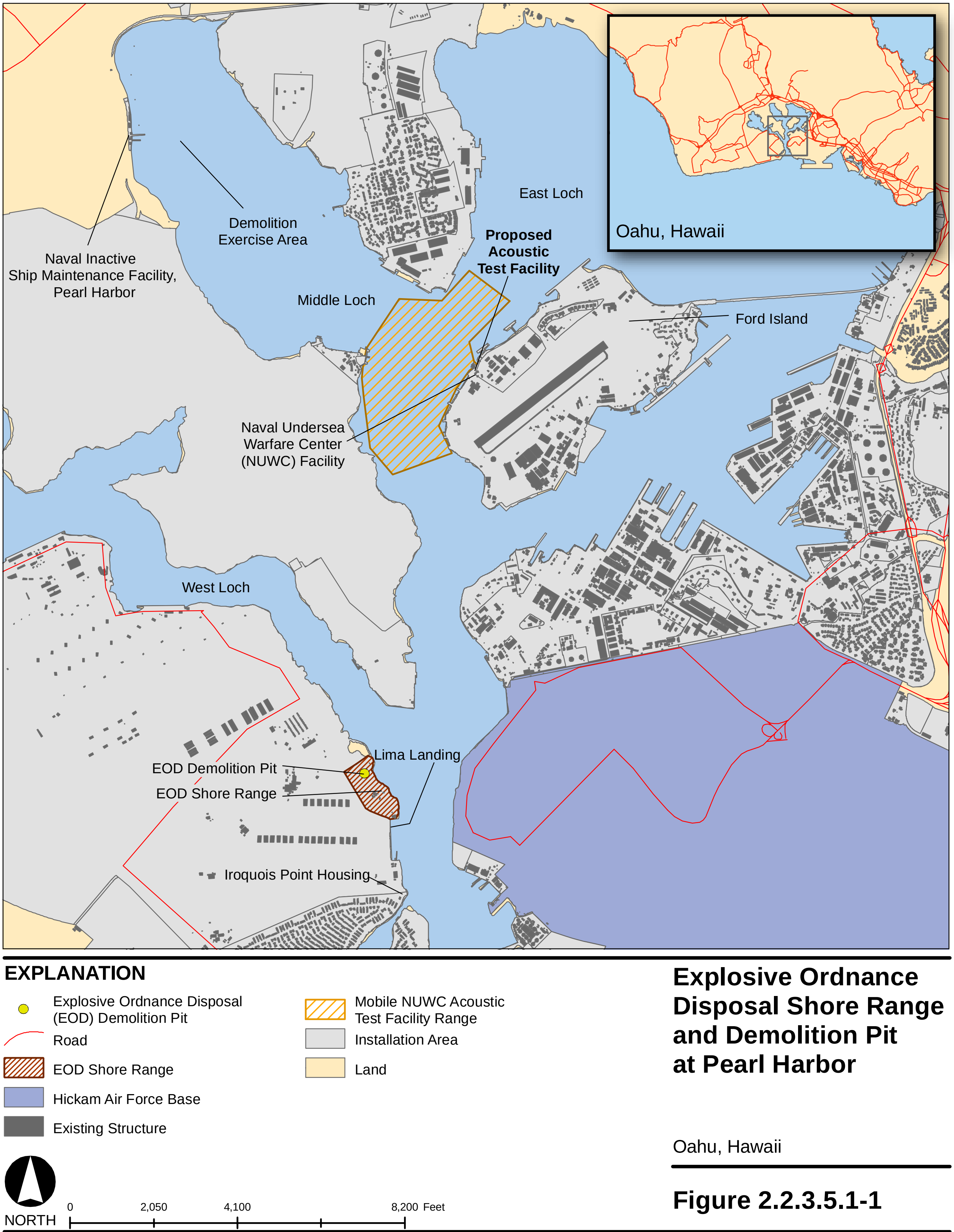
2.2.3.5 HAWAII RANGE COMPLEX ENHANCEMENTS

The Hawaii Range Complex Management Plan presented specific enhancements and recommendations to optimize range capabilities required to adequately support training for all missions and roles assigned to the HRC.

2.2.3.5.1 EOD Range Enhancements

Naval Special Warfare and EOD Targets

Hawaii based Sea, Air, and Land (SEAL) and EOD forces have target requirements not currently met in Hawaii. The Navy proposes to develop targets and support target maintenance for exposed beach obstacles and fortified beach or nearshore defenses, at least some of which must be cleared for live Naval Special Warfare weapons and explosives. NSW targets are steel frames and shapes that can be lowered into the water to simulate hulls of ships, or amphibious obstacles. EOD targets would be mine and bomb shapes. Some targets would be removed following the exercise. Others, including NSW obstacles and EOD targets, would be destroyed in place and are not recoverable. All the targets would be used at the EOD Land Range or the Puuloa EOD Range. See Figure 2.2.3.5.1-1.



Explosive Ordnance Disposal Shore Range and Demolition Pit at Pearl Harbor

Oahu, Hawaii

Figure 2.2.3.5.1-1

2.2.3.5.2 Pearl Harbor Enhancements

MK-84/MK-72 Pinger Acoustic Test Facility

MK-84 and MK-72 acoustic pingers are critical to the underwater tracking of targets on ASW ranges throughout the HRC. Each of these two models of pingers is a small acoustic transmitter that emits acoustic energy at regular intervals at a specific frequency. The pinger is attached internally or externally to submarines, simulated submarine targets, and exercise torpedoes. Undersea tracking ranges, such as the BARSTUR and Barking Sands Underwater Range Expansion (BSURE) at PMRF rely on this signal to track these underwater objects during training on the range. MK-84 and MK-72 pingers are serviced and tested in an in-ground tank at NUWC Detachment Pacific's Acoustic Test Facility at their Lualualei location. However, NUWC is vacating their Lualualei location, and there are no plans to move or rebuild the testing tank at the Acoustic Test Facility. Without a tank to test pingers, ASW target tracking capability will decline, as will ASW Tracking Exercise and Torpedo Exercise monitoring and reconstruction.

The Navy proposes to develop a new open-water Acoustic Test Facility capability near NUWC's Ford Island facility in Pearl Harbor, shown in Figure 2.2.3.5.2-1. Testing would take place in the water to the west of Ford Island, between Middle Loch and East Loch. The pinger (noise source) could be located in one of several sites. Possible locations include pier S291 on Ford Island, Beckoning Point piers, or a mobile test site that could operate within the test area. Pinger training operations typically run for an 8-hour period once a week. Development of the Acoustic Test Facility would require minor modification to the pier to provide electrical cabling and pinger attach points.

Mobile Diving and Salvage Unit Training Area

The Navy would establish an underwater training area in which Mobile Diving and Salvage Unit ONE can conduct military diving and salvage training, including submerging a 100-ft by 50-ft barge. Figure 2.2.3.5.2-2 shows the proposed location and an alternative site, as Area 1 and Area 2, respectively. The vessel would be placed within a 328- by 328-ft area centered at Area 1. The type of training to be conducted would consist of various underwater projects designed to develop mission critical skills, such as hot tapping, welding, cutting, patching, plugging, drilling, tapping, and grinding.

2.2.3.5.3 Offshore Enhancements

Portable Undersea Tracking Range

The Portable Undersea Tracking Range would be developed to provide submarine training in areas where the ocean depth is between 300 ft and 12,000 ft and at least 3 nm from land. This proposed project would temporarily instrument 25-mi^2 or smaller areas on the seafloor within the area depicted on Figure 2.2.3.5.3-1. When training is complete, the Portable Undersea Tracking Range equipment could be recovered to be moved to another location. This tracking system is a modification of the previously used Portable Acoustic Range system. All of these areas have been used for submarine training since World War II. This project allows for better crew feedback and scoring of crew performance during the time allocated for training.

EXPLANATION

- Road
- Mobile NUWC Acoustic Test Facility Range
- Existing Structure
- Land

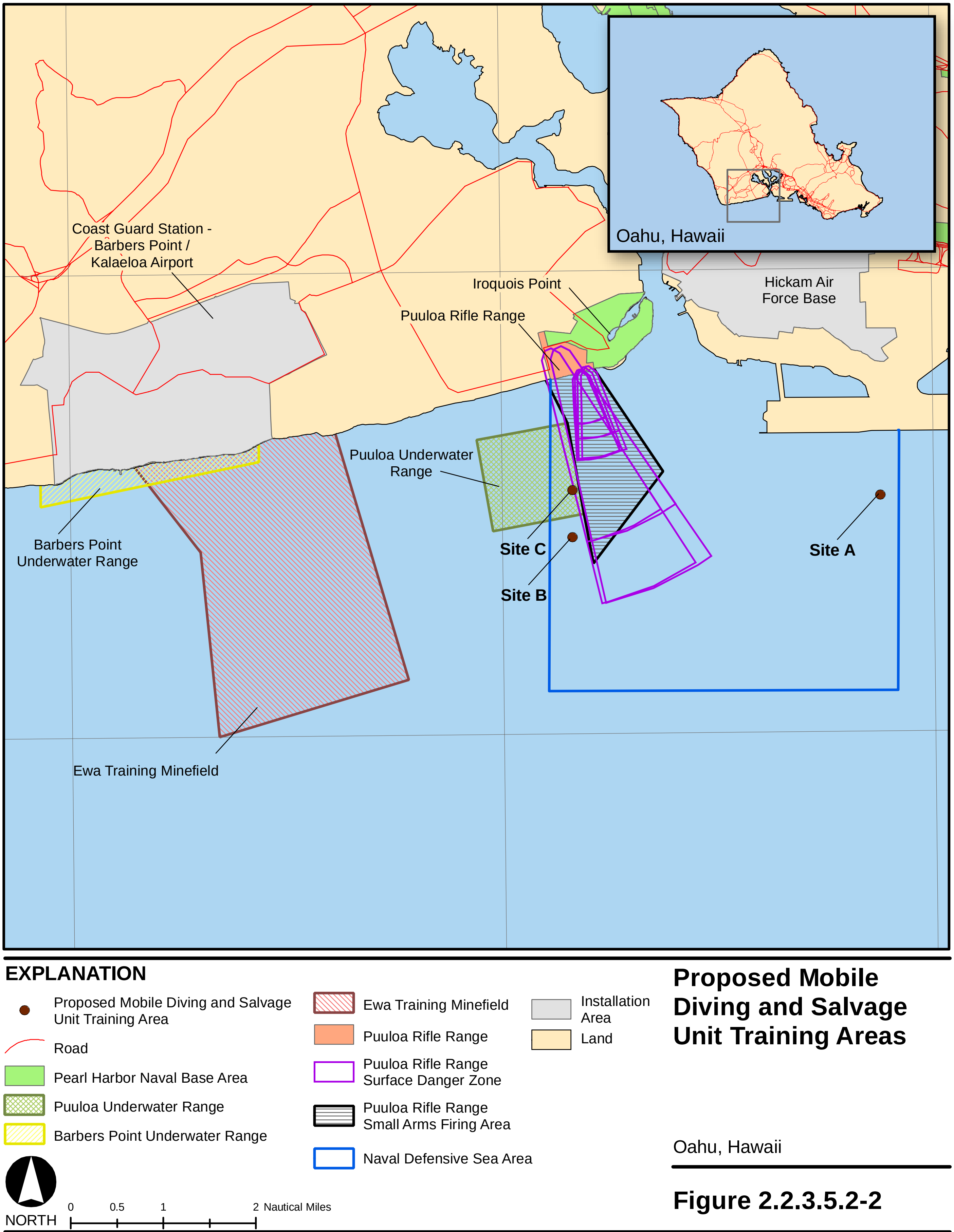
NORTH

0 495 990 1,980 Feet

Ford Island

Oahu, Hawaii

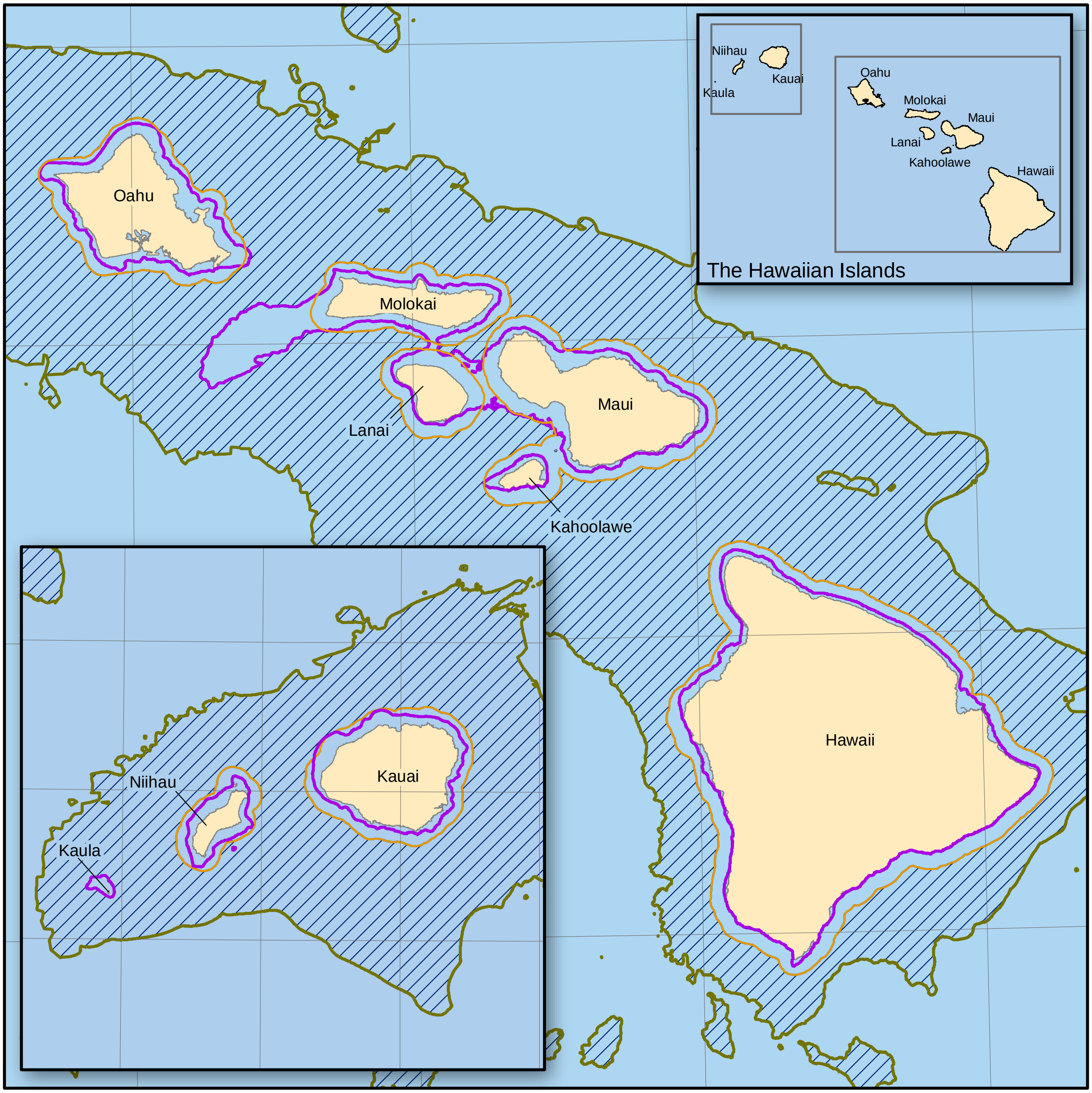
Figure 2.2.3.5.2-1



Proposed Mobile Diving and Salvage Unit Training Areas

Oahu, Hawaii

Figure 2.2.3.5.2-2



EXPLANATION

Three Nautical Mile Boundary
295-Foot (90-Meter) Bathymetric Line
12,007-Foot (3,660-Meter) Bathymetric Line
Potential Portable Undersea Tracking Range (PUTR) Area
Land

NORTH

0 10 20 40 Nautical Miles

Portable Undersea Tracking Range Potential Area

Hawaiian Islands

Figure 2.2.3.5.3-1

No on-shore construction would take place. Seven electronics packages, each approximately 3 ft long by 2 ft in diameter, would be temporarily installed on the seafloor by a range boat, in water depths greater than 600 ft. The anchors used to keep the electronics packages on the seafloor would be either concrete or sand bags. Operation of this range requires that underwater participants transmit their locations via pingers. Each package consists of a hydrophone that receives pinger signals, and a transducer that sends an acoustic "uplink" of locating data to the range boat. The uplink signal is transmitted at 8.8 kHz, 17 kHz, or 40 kHz, at a source level of 190 dB. The Portable Undersea Tracking Range system also incorporates an underwater voice capability that transmits at 8-11 kHz and a source level of 190 dB. Each of these packages is powered by a D cell alkaline battery. After the end of the battery life, the electronic packages would be recovered and the anchors would remain on the seafloor. The Navy proposes to use this portable instrumentation system for only 2 days per month in an area beyond 3 miles (mi) from shore. Fishermen would not be denied use of this area. Prior to operations in the area, the Coast Guard would be notified and a Notice to Mariners would be issued. If fishermen, boaters, or whales are observed in the area, training operations involving weapons training would be stopped or moved to another area.

2.2.3.5.4 PMRF Enhancements

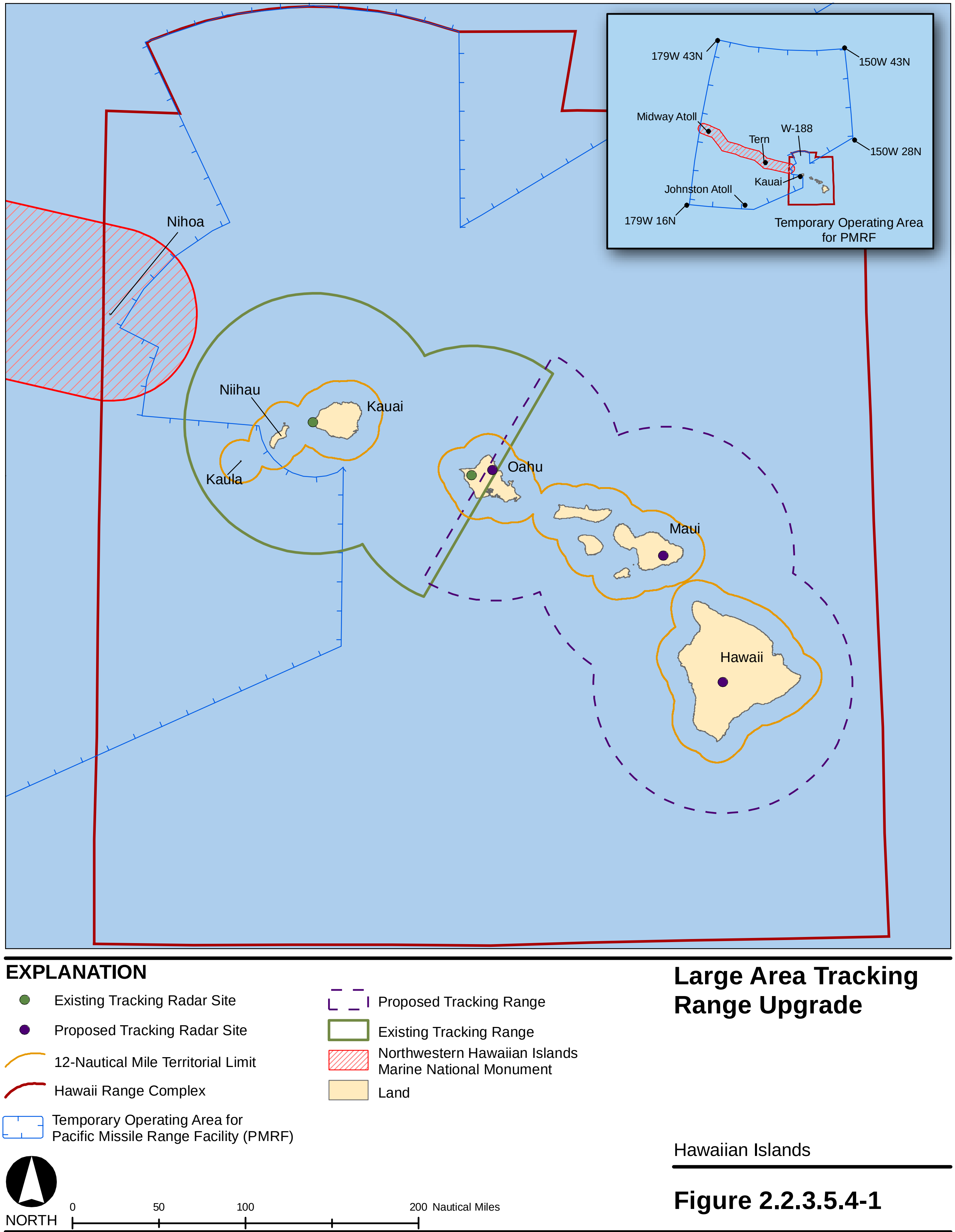
Large Area Tracking Range Upgrade

The Large Area Tracking Range (LATR) provides high fidelity time, space, and position information capability at PMRF (see Figure 2.2.3.5.4-1). Ground antenna stations detect participating ships and aircraft, relaying this information to PMRF. Each ground station comprises a Global Positioning System-based beacon and associated hardware, and a whip antenna. The stations transmit an ultra-high frequency signal at approximately 150 watts of power. Currently, only a small portion of the HRC is within range of the existing system. This capability is proposed to be upgraded with ground relay stations to cover training operations throughout much of the HRC. This upgrade would include Pohakuloa Training Area and the Warning Areas south of Oahu to provide seamless tracking within all warning areas, the Island of Hawaii, and throughout every island's offshore area (out to 150 nm). The upgrade of the LATR would expand the fleet training exercise capability by enlarging the training area and involving greater numbers of participants. The proposed ground relay stations would be modifications to existing facilities, and no new construction is expected.

Kingfisher Underwater Training Area

PMRF would also move the simulated underwater minefield used to exercise the Kingfisher mine detection system closer to Niihau (Figure 2.2.3.5.4-2). This underwater training area would be approximately 2 mi off the southeast coast of Niihau at a depth of between 300 and 400 ft. This training area had previously been located off the southwest coast of Kauai.

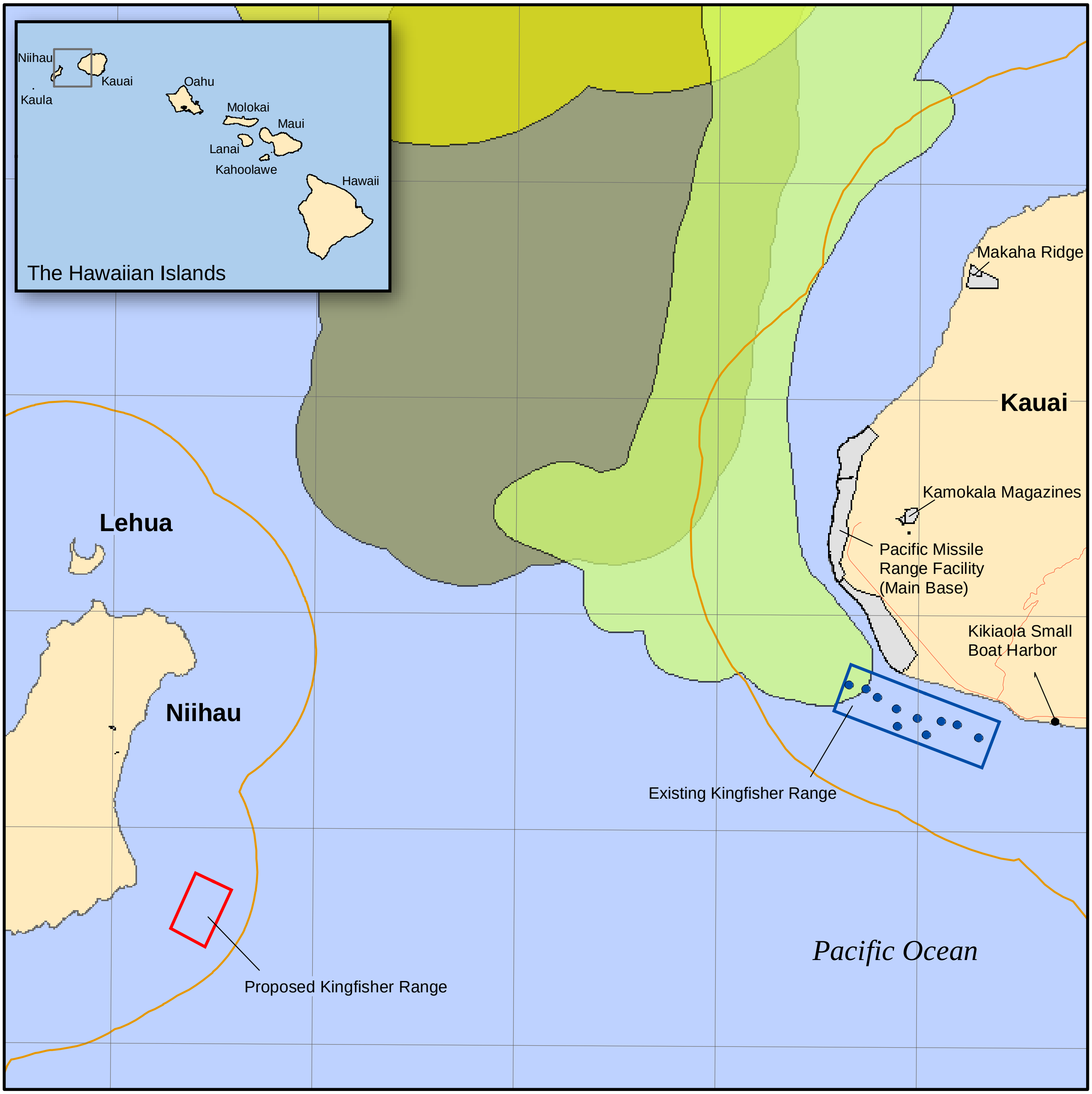
The Kingfisher system would consist of fewer than 20 steel sphere-shaped buoys that are approximately 37 inches in diameter. The buoys would be anchored to the ocean floor by a clump of chain weighing approximately 2,000 lb. A wire rope would be woven through the chain to attach to each buoy, suspending it between 60 and 120 ft from the ocean surface. The clump of chain would occupy an area of approximately 3 ft by 3 ft. The chain may eventually bury itself, depending on the current and the softness of the ocean floor.



Large Area Tracking Range Upgrade

Hawaiian Islands

Figure 2.2.3.5.4-1



EXPLANATION

- Kingfisher Mineshape
- Road
- 3-Nautical Mile Boundary
- Existing Kingfisher Range
- Proposed Kingfisher Range
- Barking Sands Tactical Underwater Range (BARSTUR)
- Barking Sands Underwater Range Expansion (BSURE)
- PMRF Shallow Water Training Range (SWTR)
- Installation Area
- Land

NORTH

0 1 2 4 Nautical Miles

Kingfisher Range

Hawaiian Islands

Figure 2.2.3.5.4-2

Each buoy would be deployed from a ship in a grid determined by the Navy. There would be no electronics and no emitters on the buoys.

FORCEnet Antenna

A site would be chosen at Makaha Ridge (Figure 2.2.3.5.4-3) or Kokee (Figure 2.2.3.5.4-4) to be the location of a FORCEnet integration laboratory. FORCEnet is an effort to integrate military personnel, sensors, networks, command and control, platforms, and weapons into a fully netted, combat force. The site chosen would be an existing building or a portable trailer. This new laboratory would bring a Cooperative Engagement Capability to PMRF. The purpose of the laboratory would be to demonstrate, experiment with, and evaluate emerging hardware and software technologies that support the FORCEnet architecture and standards as part of the Navy's SEA POWER 21, enhancing the United States' ability to project offensive power, defensive assurance, and operational independence around the globe.

Enhanced Electronic Warfare Training

The PMRF capability for EW training would be enhanced to include sites on other islands (e.g., Maui and Hawaii). PTA will receive two Joint Threat Emitters and PMRF will upgrade from its present Mobile Remote Emitter Simulator system. EW training is accomplished when EW emitters transmit signals that replicate hostile radars and weapon systems. Ship and aircraft crews attempt to identify the electronic signals, and react defensively if appropriate. Transmitters could be antennae or mobile vehicles. Where possible, existing towers would be chosen to incorporate new equipment with minimal modifications needed. If new towers were to be built and operated, follow-on environmental analyses beyond this EIS/OEIS would be required before such activities could occur.

Expanded Training Capability for Transient Air Wings

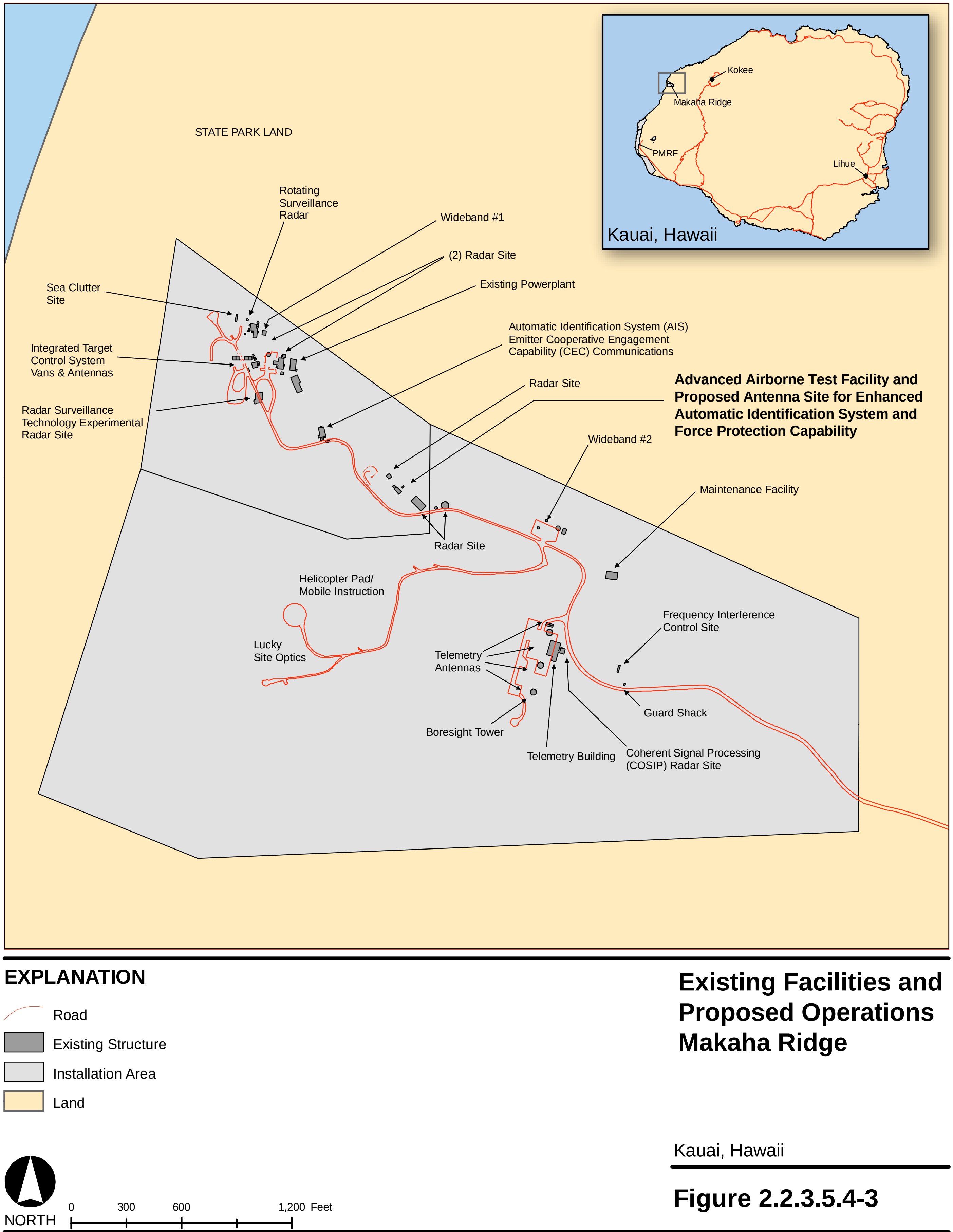
As part of the Joint National Training Capability, PMRF would provide dedicated equipment to enable Mid-Pacific and transiting Strike Groups, such as those deployed in Japan, as they go to/from San Diego, California, to participate in either live or virtual exercises. This capability would allow links between Third Fleet and Seventh Fleet to Mid-Pacific to demonstrate group level Navy Continuous Training Environment. PMRF would be able to participate in major in-port exercises with at-sea assets. No construction would be required.

Enhanced Automatic Identification System and Force Protection Capability

The Automatic Identification System (AIS), (recommended by the Navy in 2001 for Homeland Security) is similar to Identification Friend or Foe that aircraft use, except that AIS is designed for use on commercial vessels for Force Protection purposes. These systems automatically report identification, origin, destination, current location, course and speed, intermediate stops, and cargo. AIS equipment would be installed on each island so each ship would have sensor connectivity and communication connections. Antennas would be added to building 720 on Makaha Ridge and to building 282 on PMRF/Main Base as part of Alternative 1.

Construct Range Operations Control Building

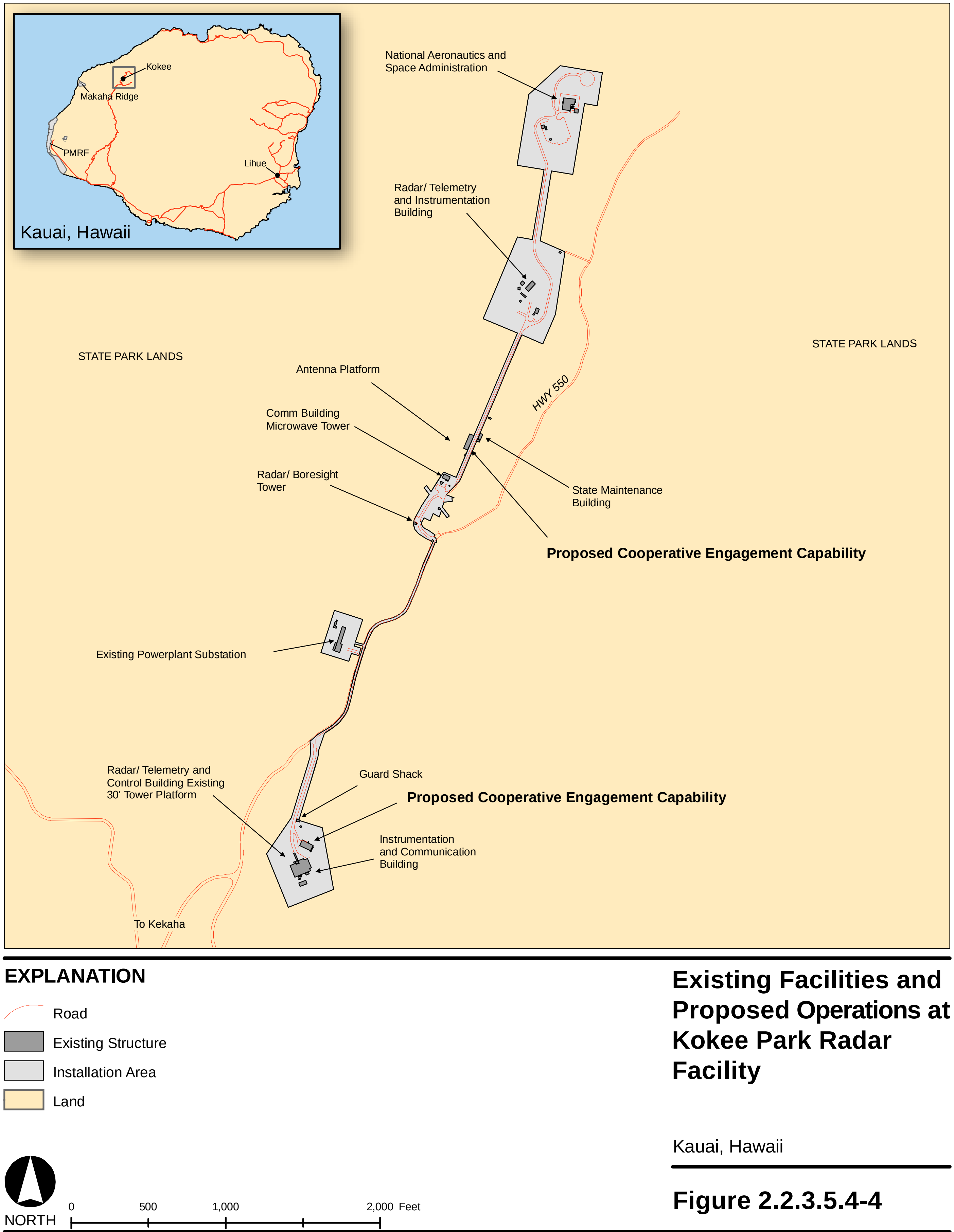
PMRF would build a new range operations building to consolidate the activities currently in 13 buildings. The facility would be almost 90,000 square feet (ft^2), and its proposed location on PMRF Main Base is shown in Figure 2.2.3.5.4-5.



Existing Facilities and Proposed Operations Makaha Ridge

Kauai, Hawaii

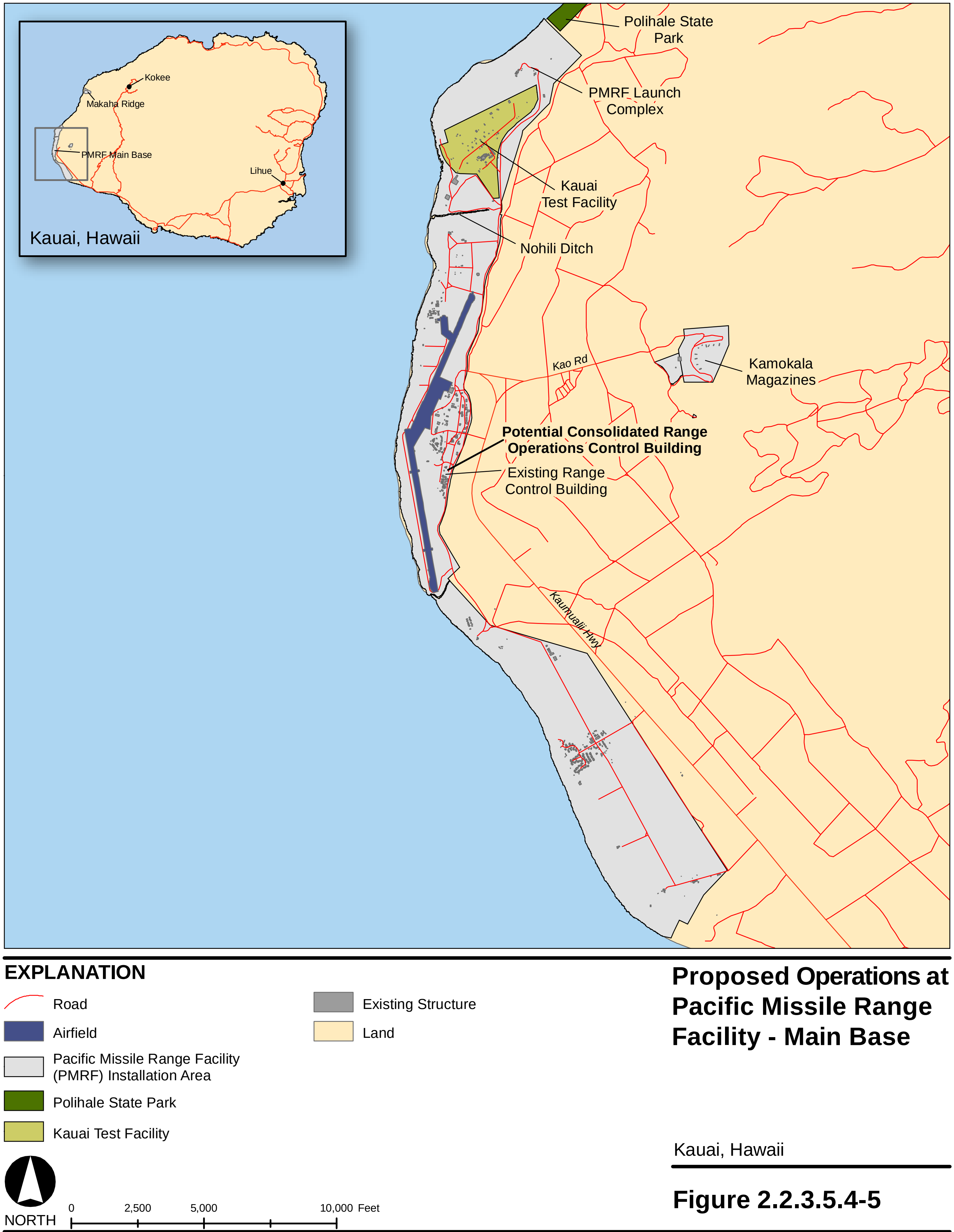
Figure 2.2.3.5.4-3



Existing Facilities and Proposed Operations at Kokee Park Radar Facility

Kauai, Hawaii

Figure 2.2.3.5.4-4



Proposed Operations at Pacific Missile Range Facility - Main Base

Kauai, Hawaii

Figure 2.2.3.5.4-5

070323_PMRF Activities.eps

The project also would include the following:

- Construction of a 4,200 ft^2 dehumidified warehouse to replace building 106, which would be displaced by the proposed Range Operations building
- Construction of a new bore site tower for the Q-1 radar
- Conversion of building 105 annex into an electrical and electronic system laboratory
- Demolition of 13 buildings (some are trailers) with a combined floor area of over 55,000 ft^2, as shown in Figure 2.2.3.5.4-6
- Construction of antenna supports
- Installation of utilities and parking lots

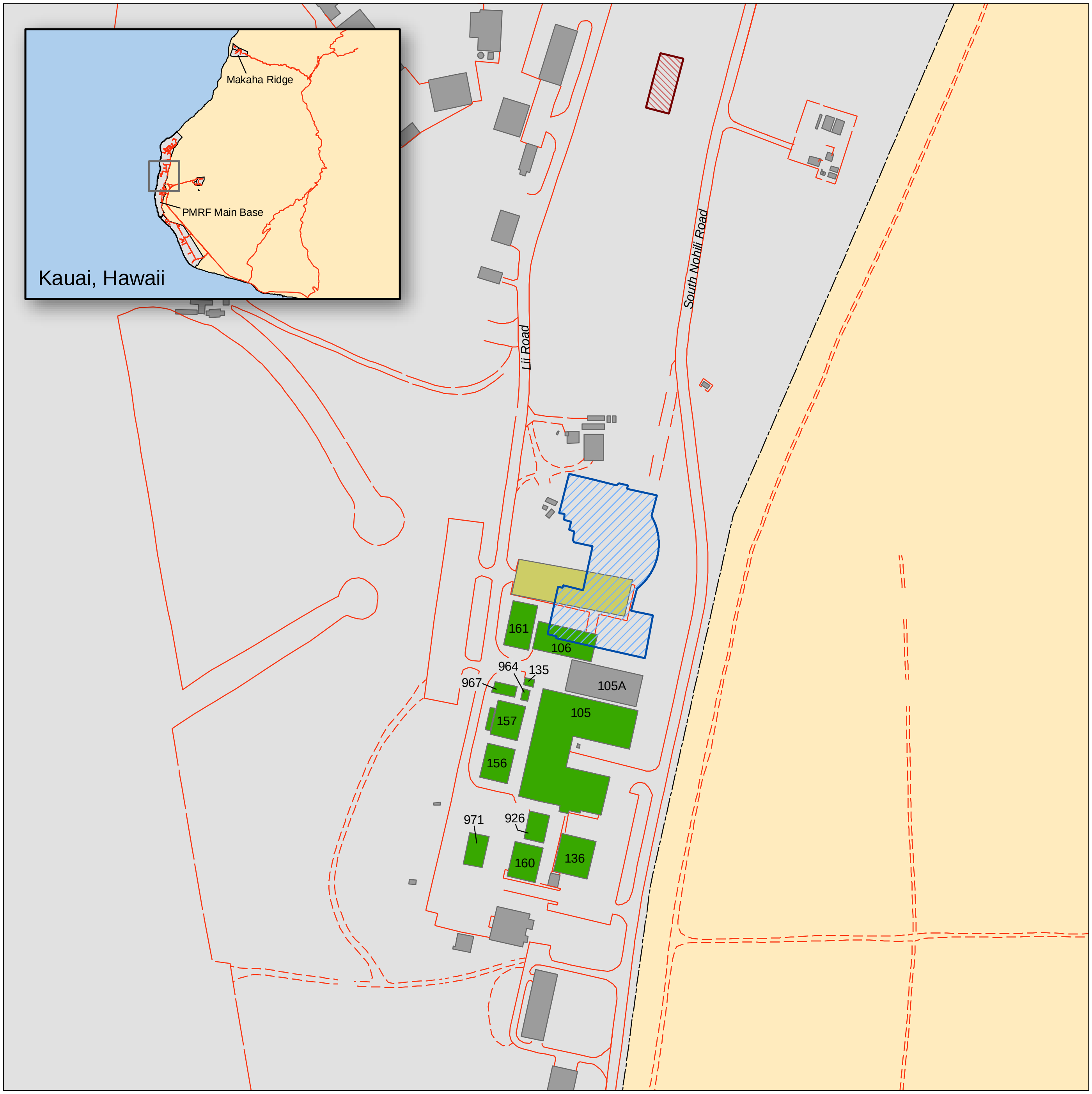
Improve Fiber Optic Infrastructure

To improve communications and data transmission, PMRF would install fiber optic cable between the Main Base and the sites at Kokee, shown in Figure 2.1-1. This project would involve the installation of approximately 23 mi of fiber optic cable, which would be hung on existing Kauai Island Utility Cooperative poles between PMRF/Main Base and Kokee. The existing poles run from Kekaha Mill, up a ridge, and intersect Kokee Highway at an existing substation. If exceptionally long spans are encountered, additional poles might need to be installed in some areas. It is expected that all equipment and installation activities would occur along existing public and Kauai Island Utility Cooperative access roads. Prior to implementation, PMRF would coordinate with Kauai Island Utility Cooperative and the local Department of Transportation for approvals.

2.2.3.6 MAJOR EXERCISES

The Navy proposes to continue RIMPAC and USWEX exercises described in the No-action Alternative. Under Alternative 1, USWEX frequency would increase from four to six times per year. Under Alternative 1, RIMPAC would include two Strike Groups, and FCLPs would occur in association with transiting Strike Groups participating in major exercises. The operations associated with major exercises would be chosen from the appropriate matrix of training operations in Appendix D.

For RIMPAC under Alternative 1, the marine mammal exposure modeling included 1064 hours of 53 C surface ship sonar and associated dipping sonar, sonobuoys, and MK-48 torpedoes. For USWEX under Alternative 1, the marine mammal exposure modeling included 1,167 hours of 53 C surface ship sonar and associated dipping sonar, and sonobuoys.



EXPLANATION

- Road
- Proposed Consolidated Range Operations Complex
- Proposed Warehouse
- Proposed Facilities for Demolition
- Proposed Parking Area for Demolition
- Existing Structure
- Installation Area
- Land

NORTH 0 100 200 400 Feet

Proposed Consolidated Range Operations Complex

Kauai, Hawaii

Figure 2.2.3.5.4-6

2.2.4 ALTERNATIVE 2 (PREFERRED ALTERNATIVE)

2.2.4.1 OPERATIONS ASSOCIATED WITH ALTERNATIVE 1

Alternative 2 would include all of the operations described in Alternative 1. In addition, Alternative 2 operations would include increased tempo and frequency of training operations, future RDT&E programs at PMRF and the addition of major fleet exercises, such as supporting three carrier Strike Groups training at the same time. Table 2.2.4.1-1 shows the number of operations proposed for Alternative 2, compared to baseline and the number of operations proposed under Alternative 1.

For RIMPAC under Alternative 2, the marine mammal exposure modeling included 1064 hours of 53 C surface ship sonar and associated dipping sonar, sonobuoys, and MK-48 torpedoes. For USWEX under Alternative 2, the marine mammal exposure modeling included 1167 hours of 53 C surface ship sonar and associated dipping sonar, and sonobuoys.

2.2.4.2 INCREASED TEMPO AND FREQUENCY OF TRAINING OPERATIONS

Under Alternative 2, the Navy proposes to increase the tempo and frequency of training exercises (above Alternative 1 levels) and compress the tempo of training exercises in the HRC. For example, instead of an exercise lasting 5 days, the same operations would be completed in 3 days. The frequency of exercises would also be increased.

Table 2.2.4.1-1. Baseline, Alternative 1, and Alternative 2 Proposed Training Operations

Mission Area	Operation	Area	Baseline (Operations/ Year)	Alt. 1 (Operations/ Year)	Alt. 2 (Operations/ Year)
OPEN OCEAN OPERATIONS					
Anti-Air Warfare (AAW)	Air Combat Maneuver	W-188, 189, 190, 192, 193, 194	738	774	814
	Air-to-Air Missile Exercise	W-188	12	16	24
	Surface-to-Air Gunnery Exercise	W-188, 192, Mela South	86	108	108
	Surface-to-Air Missile Exercise	W-188	17	26	26
	Chaff Exercise	Hawaii Offshore	34	34	37
Amphibious Warfare) (AMW)	Naval Surface Fire Support Exercise	W-188	22	28	28
Anti-Surface Warfare (ASUW)	Visit, Board, Search, and Seizure	Hawaii Offshore	60	60	66
	Surface-to-Surface Gunnery Exercise	W-191, 192, 193, 194, 196, Mela South, Pacific Missile Range Facility (PMRF)	69	91	91
	Surface-to-Surface Missile Exercise	PMRF (W-188)	7	12	12

Table 2.2.4.1-1. Baseline, Alternative 1, and Alternative 2 Proposed Training Activities (Continued)

Mission Area	Operation	Area	Baseline (Operations/ Year)	Alt. 1 (Operations/ Year)	Alt. 2 (Operations/ Year)
OPEN OCEAN OPERATIONS (Continued)					
	Air-to-Surface Gunnery Exercise	Hawaii Offshore, PMRF	128	152	152
	Air-to-Surface Missile Exercise	PMRF	36	50	50
	Bombing Exercise (Sea)	Hawaii Offshore, PMRF	35	35	38
	Sink Exercise	Hawaii Offshore, PMRF	6	6	6
	Antisurface Warfare Torpedo Exercise (Submarine-Surface)	Hawaii Offshore, PMRF	35	35	38
Anti-Submarine Warfare (ASW)	Antisubmarine Warfare Tracking Exercise	Hawaii Offshore, PMRF	372	372	414
	Antisubmarine Warfare Torpedo Exercise	Hawaii Offshore, PMRF	500	500	650
	Major Integrated ASW Training Exercise	Hawaii Offshore, PMRF	5	7	8
Electronic Combat (EC)	Electronic Combat Operations	Hawaii Offshore, PMRF	50	88	100
Mine Warfare (MIW)	Mine Countermeasures Exercise	PMRF, Submarine Operating Area	32	62	62
Naval Special Warfare (NSW)	Swimmer Insertion/Extraction	Hawaii Offshore, Marine Corps Training Area–Bellows (MCTAB), PMRF	80	80	88
Strike Warfare (STW)	Bombing Exercise (Land)	Kaula	165	216	250
	Air-to-ground Gunnery Exercise	Kaula	16	18	18
Other	Command and Control (C2)	U.S. Command Ship at sea	1	1	2
OFFSHORE OPERATIONS					
AMW	Expeditionary Assault	PMRF, MCTAB	11	11	12
ASUW	Flare Exercise	W-188	6	6	7
MIW	Mine Neutralization	Puuloa Underwater Range	62	62	68
	Mine Laying	PMRF	22	32	32
NSW	Swimmer Insertion/Extraction	Hawaii Offshore, MCTAB, PMRF	52	52	57
Other	Salvage Operations	Pearl Harbor, Puuloa Underwater Range, Keehi Lagoon, Eastern Naval Defense Sea Area	3	3	3
	In Port Ship Support Operations	Pearl Harbor	1	1	1

Table 2.2.4.1-1. Baseline, Alternative 1, and Alternative 2 Proposed Training Operations (Continued)

Mission Area	Operation	Area	Baseline (Operations/ Year)	Alt. 1 (Operations/ Year)	Alt. 2 (Operations/ Year)
ONSHORE TRAINING OPERATIONS					
MIW	Land Demolitions	Explosive Ordnance Disposal Land Range	85	85	93
NSW	SPECWAROPS	Bradshaw Army Airfield, Makua Military Reservation, Kahuku Military Training Area, Dillingham Military Reservation, Wheeler Army Airfield, Niihau, MCTAB, and PTA	30	30	30
Other	Command and Control (C2)	Pearl Harbor, Marine Corps Base Hawaii (MCBH), Hickam Air Force Base (AFB), Wheeler Army Airfield (AAF), Bradshaw AAF	1	1	2
	Aircraft Support Operations	PH, Kalaeloa Airport, MCBH, Hickam AFB, Wheeler AAF, Bradshaw AAF, PMRF	1	1	2
	Personnel Support Operations	Oahu, Kauai	1	1	2
	Air Operations	Pearl Harbor, Kalaeloa Airport, MCBH, Hickam AFB, Wheeler AAF, Bradshaw AAF, PMRF, Kona International Airport	2,600	2,600	2,600
	Field Carrier Landing Practice (FCLP)	MCBH, Barking Sands	0	12	16
	Live Fire Exercise	Makua, PTA	3	3	3
	Humanitarian Assistance / Non-combatant Evacuation Operations (HAO/NEO)	PMRF, Niihau, MCBH, MCTAB, Kahuku	1	1	1
	Humanitarian Assistance / Disaster Relief Operations (HA/DR)	MCBH, MCTAB, Kahuku	1	1	1

2.2.4.3 ENHANCED RDT&E OPERATIONS

The Navy proposes to enhance RDT&E operations from Alternative 1 levels as shown in Table 2.2.4.3-1.

Table 2.2.4.3-1. Baseline, Alternative 1, and Alternative 2 Proposed RDT&E Operations

Mission Area	Operation	Area	Baseline (Operations/ Year)	Alternative 1 (Operations/ Year)	Alternative 2 (Operations/ Year)
OPEN OCEAN OPERATIONS					
Pacific Missile Range Facility (PMRF)	Anti-air Warfare Research, Development, Testing, and Evaluation (RDT&E)	Open Ocean	35	40	44
	Antisubmarine Warfare	Open Ocean	19	21	23
	Combat System Ship Qualification Trial	Open Ocean	7	8	9
	Electronic Combat/Electronic Warfare	Open Ocean	65	72	80
	High Frequency	Open Ocean	9	10	11
	Missile Defense	Open Ocean	46	46	50
Naval Undersea Warfare Center Ranges	Shipboard Electronic Systems Evaluation Facility (SESEF) Quick Look Tests	Open Ocean	3,842	4,225	4,225
	SESEF System Performance Tests	Open Ocean	67	74	74
Planned Testing & Evaluation Operations	Additional Chemical Simulant	Open Ocean	0	Upgrade	Upgrade
	Intercept Targets launched into PMRF Controlled Area	Open Ocean	0	3	3
	Launched SM-6 from Sea-Based Platform (AEGIS)	Open Ocean	0	Upgrade	Upgrade
	Test Unmanned Surface Vehicles	Open Ocean	0	Upgrade	Upgrade
	Test Unmanned Aerial Vehicles	Open Ocean	0	Upgrade	Upgrade
	Test Hypersonic Vehicles	Open Ocean	0	Upgrade	Upgrade
Offshore Enhancements	Portable Undersea Tracking Range	Open Ocean	0	Upgrade	Upgrade
PMRF Enhancements	Large Area Tracking Range Upgrade	Open Ocean	0	Upgrade	Upgrade
	Enhanced Electronic Warfare Training	Open Ocean	0	Upgrade	Upgrade
	Expanded Training Capability for Transient Air Wings	Open Ocean	0	Upgrade	Upgrade
Future RDT&E Operations	Directed Energy	Open Ocean	0	0	Range Upgrade
	Advanced Hypersonic Weapon	Open Ocean	0	0	1

Table 2.2.4.3-1. Baseline, Alternative 1, and Alternative 2 Proposed RDT&E Operations (Continued)

Mission Area	Operation	Area	Baseline (Operations/ Year)	Alternative 1 (Operations/ Year)	Alternative 2 (Operations/ Year)
OFFSHORE OPERATIONS					
PMRF	Antisubmarine Warfare	Maui	19	21	23
	Electronic Combat/Electronic Warfare	PMRF (Main Base)	65	72	80
	High Frequency	PMRF	9	10	11
	Missile Defense	PMRF	46	46	50
Naval Undersea Warfare Center Ranges	Fleet Operational Readiness Accuracy Check Site (FORACS) Tests	Oahu	5	5	6
	SESEF Quick Look Tests	Oahu	3,842	4,225	4,225
	SESEF System Performance Tests	Oahu	67	74	74
Planned Testing & Evaluation Operations	Test Unmanned Surface Vehicles	PMRF	0	Upgrade	Upgrade
	Test Unmanned Aerial Vehicles	PMRF	0	Modification Construction	Modification Construction
Pearl Harbor Enhancements	MK-84/MK-72 Pinger Acoustic Test Facility	Ford Island	0	Upgrade Training Area	Upgrade Training Area
	Mobile Diving and Salvage Unit Training Area	Naval Defensive Sea Area	0	Upgrade	Upgrade
Offshore Enhancements	Portable Undersea Tracking Range	PMRF, Maui	0	Upgrade	Upgrade
PMRF Enhancements	Large Area Tracking Range Upgrade	Kauai, Oahu, Maui, Hawaii	0	Upgrade	Upgrade
	Kingfisher Underwater Training Area	Niihau	0	Construction Upgrade	Construction Upgrade
	Expanded Training Capability for Transient Air Wings	Kauai, Oahu, Maui, Hawaii	0	Upgrade	Upgrade
Future RDT&E Operations	Directed Energy	PMRF (Main Base)	0	0	Range Upgrade
	Advanced Hypersonic Weapon	PMRF (Main Base)	0	0	1
ONSHORE OPERATIONS					
PMRF	Anti-air Warfare RDT&E	Naval Station Pearl Harbor	35	40	44
	Electronic Combat/Electronic Warfare	PMRF/Main Base	65	72	80
	Joint Task Force Wide Area Relay Network	PMRF	2	3	4
	Missile Defense	PMRF/Main Base	46	46	50

1

Table 2.2.4.3-1. Baseline, Alternative 1, and Alternative 2 Proposed RDT&E Operations (Continued)

Mission Area	Operation	Area	Baseline (Operations/ Year)	Alternative 1 (Operations/ Year)	Alternative 2 (Operations/ Year)
ONSHORE OPERATIONS (Continued)					
Naval Undersea Warfare Center Ranges	SESEF Quick Look Tests	Oahu	3,842	4,225	4,225
	SESEF System Performance Tests	Oahu	67	74	74
Planned Testing & Evaluation Operations	Additional Chemical Simulant	PMRF/Main Base	0	Upgrade	Upgrade
	Test Unmanned Aerial Vehicles	Kauai	0	Upgrade	Upgrade
	Test Hypersonic Vehicles	Kauai	0	Upgrade	Upgrade
PMRF Enhancements	Large Area Tracking Range Upgrade	Kauai, Oahu, Maui, Hawaii	0	Upgrade	Upgrade
	FORCEnet Antenna	PMRF (Makaha Ridge or Kokee)	0	Construction	Construction
	Enhanced Electronic Warfare Training	Kauai, Maui, Hawaii	0	Construction	Construction
	Expanded Training Capability for Transient Air Wings	Kauai, Oahu, Maui, Hawaii	0	Construction	Construction
	Enhanced Auto Identification System and Force Protection Capability	PMRF (Makaha Ridge)	0	Construction	Construction
	Construct Range Operations Control Building	PMRF (Main Base)	0	Construction	Construction
	Improve Fiber Optics Infrastructure	PMRF (Main Base, Makaha Ridge)	0	Construction	Construction
Future RDT&E Operations	Directed Energy	PMRF (Main Base)	0	0	Range Upgrade
	Advanced Hypersonic Weapon	PMRF (Main Base)	0	0	1

Sources: PMRF, Fleet Area Control and Surveillance Facility Pearl Harbor Annual Report FY 2003, SESEF FY03 Test Data Summary, FORACS BRAC Data Call, EODMU-3 Det MIDPAC OIC

2.2.4.4 FUTURE RDT&E OPERATIONS

PMRF would develop the capability to support the Directed Energy and Advanced Hypersonic Weapon programs.

Directed Energy

The Navy proposes to establish a long-term support facility, the Maritime Directed Energy Test Center, at PMRF for directed energy programs, such as the High Energy Laser.

The high energy laser would require a permanent operations building with approximately 25,000 ft^2. Figure 2.2.4.4-1 shows the proposed location. During testing, the range would need to be cleared. Up to four air targets and up to four surface targets would be used for testing. The laser would require 30 megawatts of power. Up to 100 personnel would support this program. Construction of the Maritime Directed Energy Test Center would require separate/additional environmental documentation.

PMRF would develop the necessary standard operating procedures and range safety requirements necessary to provide safe operations associated with future high energy laser tests.

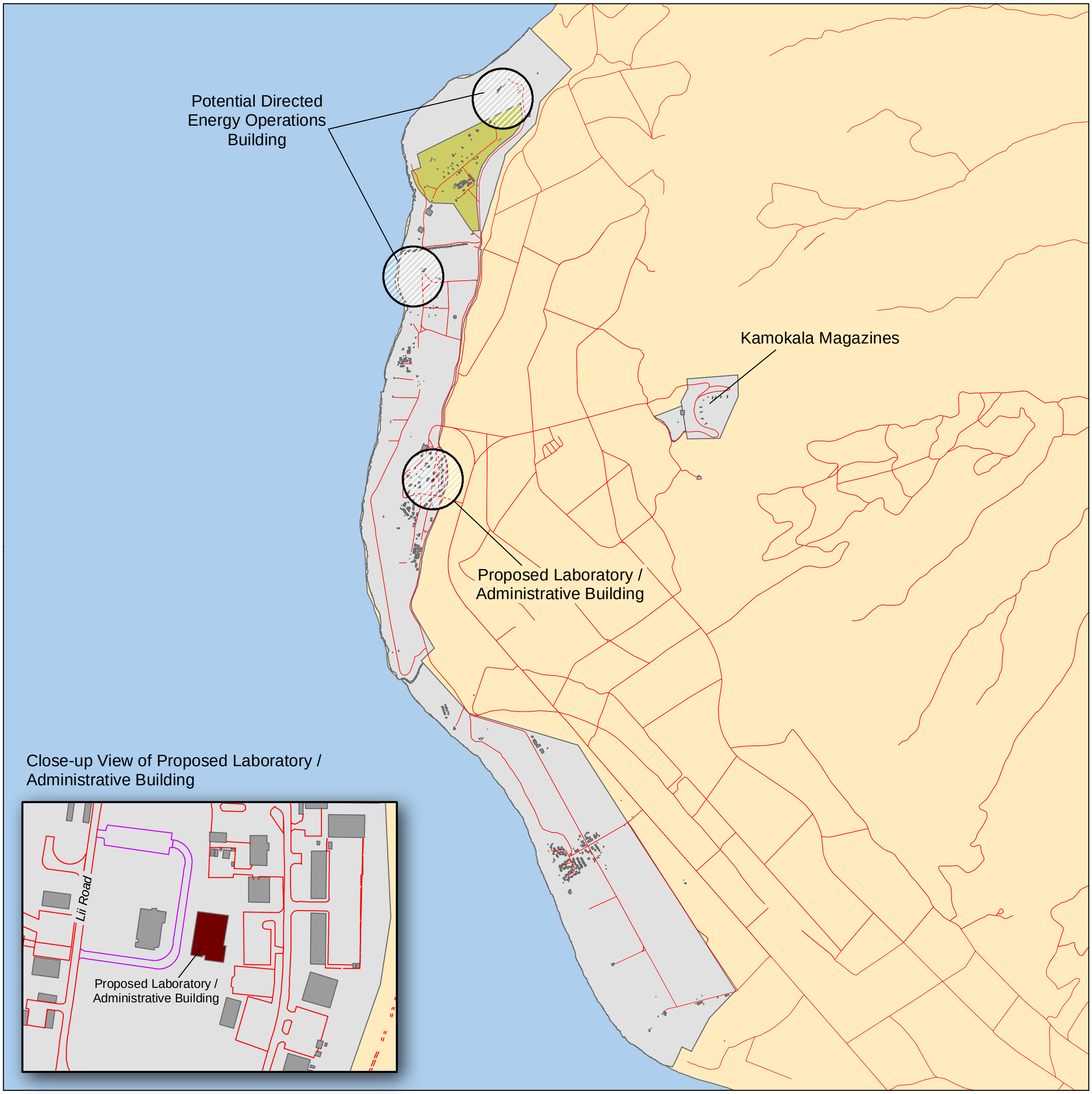
PMRF would add the capability to test non-eye-safe lasers. The range could also be used to support Airborne Laser program testing. The Airborne Laser aircraft would stage out of Hickam AFB on Oahu. The chemicals for operating the laser onboard the aircraft would be transported to Oahu by ship and would be stored at Hickam AFB. Should the Airborne Laser program decide to perform testing at PMRF, separate environmental documentation would be required to analyze potential impacts from training operations.

The following PMRF assets would be used to support any future laser testing:

- Numerous tracking sensors at Makaha Ridge
- Fleet assets (air, surface, subsurface, strategic) for open range testing
- Hawaiian Surveillance Network programs on Kauai, Maui, Hawaii, and Niihau
- Supercomputer center at Kihei, Maui, to support operational analyses

Advanced Hypersonic Weapon

The Advanced Hypersonic Weapon is a U.S. Army Space and Missile Defense Command RDT&E program that would eventually involve launches of long range (greater than 3,400 mi) missiles deploying an unpowered payload. This is proposed to be a four-missile launch program, with the first two tests using a Strategic Target System booster launched from the KTF at PMRF (Figure 2.2.2.4.1-2). The payload would travel a distance of approximately 2,500 mi from PMRF to Illeginni Island in U.S. Army Kwajalein Atoll. The first test is scheduled in the spring of 2008, and the second test would occur between 6 and 12 months later, again using a Strategic Target System following the same flight path. The third test would be approximately 1 year later and would use an Orion 50S XLG first stage (containing 33,105 lb of solid propellant) and Orion 50 XL second stage (containing 8,655 lb of solid propellant) launched from the same pad. The fourth test from the same launch site would again use Orion 50S XLG and Orion 50 XL boosters. Launches would average one per year. There are no fuels or oxidizers on the payloads themselves, and they would all impact on land. The modified 10,000-ft ground hazard area would be used for both systems.



EXPLANATION

- Road
- Proposed Road
- Kauai Test Facility
- Existing Structure
- Pacific Missile Range Facility (PMRF) Installation Area
- Proposed Laboratory / Administrative Building
- Land

NORTH

0 2,500 5,000 10,000 Feet

Proposed Directed Energy Facilities at Pacific Missile Range Facility

Kauai, Hawaii

Figure 2.2.4.4-1

070323_PMRF DirEngy.eps

2.2.4.5 HAWAII RANGE COMPLEX ENHANCEMENTS

Under Alternative 2, all HRC enhancements would be the same as those described under Alternative 1.

2.2.4.6 ADDITIONAL MAJOR EXERCISES—MULTIPLE STRIKE GROUP TRAINING

Up to three Strike Groups would conduct training exercises simultaneously in the HRC (Figure 1.1-1). The Strike Groups would not be home ported in Hawaii, but would stop in Hawaii en route to a final destination. The Strike Groups would be in Hawaii for up to 10 days per exercise.

The exercise would involve Navy assets engaging in a “free play” battle scenario, with U.S. forces pitted against an opposition force. The exercise provides realistic training on in-theater training operations. Proposed exercise operations would be similar to current operations for the RIMPAC and USWEX exercises. Also included in the training operations would be FCLP conducted at the following airfields: Marine Corps Base Hawaii and PMRF. With the increased Strike Group training required of this alternative, the potential for requiring FCLPs increases. Therefore, this alternative includes FCLPs for an additional Strike Group each year, increasing the total number of FCLPs to 16 per year.

The proposed exercise would provide Navy personnel realistic maritime training in a complex scenario that replicates the types of challenges that could be faced during real-world operations. Training would be provided to submarine, ship, and aircraft crews in tactics, techniques, and procedures for ASW, Defensive Counter Air, Maritime Interdiction, and operational level C2 of maritime forces. The three Strike Group marine mammal exposure modeling included 944 hours of 53 C surface ship sonar and associated dipping sonar, sonobuoys, and MK-48 torpedoes.

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3.0 Affected Environment

3.0 AFFECTED ENVIRONMENT

This chapter describes the environmental characteristics that may be affected by the No-action Alternative, Alternative 1, or Alternative 2. Baseline points of reference for understanding any potential impacts are the activities that have been historically conducted in the Hawaii Range Complex (HRC) since the 1980s. Available reference materials, including prior Environmental Assessments (EAs) and Environmental Impact Statements (EISs), were reviewed. Questions were directed to installation and facility personnel, and private individuals. Site visits were also conducted where necessary to gather the baseline data presented herein.

Fourteen environmental resource areas were evaluated to provide a context for understanding the potential effects of ongoing and proposed activities. These areas include air quality, airspace, biological resources (marine, offshore, and terrestrial), cultural resources, geology and soils, hazardous materials and waste, health and safety, land use, noise, socioeconomics, transportation, utilities, visual and aesthetic resources, and water resources. Each resource area is discussed for each proposed location unless the proposed activities at that location would not foreseeably result in an impact. Table 3-1 lists each location and the section of each of the resources addressed.

3.1 OPEN OCEAN AREA

Anti-submarine Warfare exercises, Special Warfare Operations, Ship Mining Exercise (MINEX), Air MINEX, Underwater MINEX, Underwater Demolition exercises, Submarine Operations, and Visit, Board, Search, and Seizure are typical activities that occur in open and offshore ocean areas.

The Open Ocean Area is the area within the HRC that is 100 fathoms, which is equal to 600 feet (ft) and deeper offshore of the Hawaiian Islands. The Open Ocean Area also includes the Pacific Missile Range Facility (PMRF) and Oahu Warning Areas and the Temporary Operating Area as shown in Figure 1.1-1. The Open Ocean Area, as part of the high seas, is subject to Executive Order (EO) 12114. Both sea and air operations are covered in this section. Both sea and air operations are covered in this section. Of the 14 environmental resources considered for analysis, air quality, geology and soils, land use, transportation, utilities, and visual and aesthetics resources are not addressed. There are no foreseeable impacts on air quality in the open ocean range area, however, any potential air quality issues would be addressed by maintaining compliance with national and state ambient air quality standards for any pollutant released during pre-launch and launch activities. All Open Ocean events associated with the No-action Alternative, Alternative 1, and Alternative 2 are performed 100 fathoms and deeper offshore where no land-encroachment, land-ordinances, or land-forms and associated soils development are affected by the events. Land-based modes of transportations and utility systems are not associated with Open Ocean events.

Table 3-1. Chapter 3.0 Locations and Resources

	Air Quality	Airspace	Biological Resources	Cultural Resources	Geology & Soils	Hazardous Materials & Waste	Health & Safety	Land Use	Noise	Socioeconomics	Transportation	Utilities	Water Resources
Open Ocean		3.1.1	3.1.2	3.1.3		3.1.4	3.1.5		3.1.6	3.1.7			3.1.8
Northwestern Hawaiian Islands			3.2.1	3.2.2									
Kauai													
Pacific Missile Range Facility													
PMRF/Main Base	3.3.1.1.1	3.3.1.1.2	3.3.1.1.3	3.3.1.1.4	3.3.1.1.5	3.3.1.1.6	3.3.1.1.7	3.3.1.1.8	3.3.1.1.9	3.3.1.1.10	3.3.1.1.11	3.3.1.1.12	3.3.1.1.13
Makaha Ridge	3.3.1.2.1		3.3.1.2.2	3.3.1.2.3		3.3.1.2.4	3.3.1.2.5						
Kokee	3.3.1.3.1		3.3.1.3.2			3.3.1.3.3	3.3.1.3.4						
HIANG Kokee			3.3.1.4.1										
Kamokala Magazines						3.3.1.5.1	3.3.1.5.2						
Port Allen*													
Kikiaola Small Boat Harbor*													
Mt Kahili*													
Niihau			3.3.1.9.1			3.3.1.9.2	3.3.1.9.3						
Kaula		3.3.1.10.1	3.3.1.10.2	3.3.1.10.3	3.3.1.10.4		3.3.1.10.5	3.3.1.10.6					
Oahu													
Pearl Harbor													
Naval Station Pearl Harbor			3.4.1.1.1	3.4.1.1.2						3.4.1.1.3			
Ford Island			3.4.1.2.1	3.4.1.2.2									3.4.1.2.3
Naval Inactive Ship Maintenance Facility, Pearl Harbor			3.4.1.3.1			3.4.1.3.2							3.4.1.3.3
EOD Shore Range NAVMAG Pearl Harbor West Loch			3.4.1.4.1	3.4.1.4.2	3.4.1.4.3		3.4.1.4.4						3.4.1.4.5
Lima Landing			3.4.1.5.1	3.4.4.5.2		3.4.1.5.3	3.4.1.5.4						
Puuloa Underwater Range			3.4.1.6.1	3.4.1.6.2		3.4.1.6.3	3.4.1.6.4						
Naval Defensive Sea Area			3.4.1.7.1	3.4.1.7.2			3.4.1.7.3						
CG Station Barbers Point/Kalaeola		3.4.2.1	3.4.2.2						3.4.2.3				
Marine Corps Base Hawaii		3.4.3.1	3.4.3.2	3.4.3.3					3.4.3.4				
Marine Corps Training Area/Bellows			3.4.4.1	3.4.4.2									
Hickam Air Force Base		3.4.5.1	3.4.5.2										
Wheeler Army Airfield		3.4.6.1	3.4.6.2										
Makua Military Reservation			3.4.7.1	3.4.7.2			3.4.7.3		3.4.7.4				
Kahuku Training Area			3.4.8.1	3.4.8.2									
Dillingham Military Reservation			3.4.9.1	3.4.9.2									
Ewa Training Minefield			3.4.10.1			3.4.10.2	3.4.10.3						
Barbers Point Underwater Range			3.4.11.1			3.4.11.2	3.4.11.3						
Naval Undersea Warfare Center													
Shipboard Electronic Systems Evaluation Facility			3.4.12.1.1				3.4.12.1.2						
Fleet Operational Readiness Accuracy Check Site			3.4.12.2.1				3.4.12.2.2						
Keehi Lagoon*													
Kaena Point*													
Mt Kaala*													
Wheeler Network Communications													
Mauna Kapu Communication Site*													
Makua Radio/Repeater/Cable Head*													
Maui													
Maui Offshore			3.5.1.1										
Maui Space Surveillance Site*													
Shallow Water Minefield Sonar Training													
Maui High Performance Computing													
Sandia Maui Haleakala Facility*													
Hawaii													
Pohakuloa Training Area													
Pohakuloa Training Area		3.6.1.1.1	3.6.1.1.2	3.6.1.1.3			3.6.1.1.4		3.6.1.1.5				
Bradshaw Army Airfield		3.6.1.2.1	3.6.1.2.2	3.6.1.2.3									
Kawaihae Pier			3.6.1.3.1										

*A review of the 14 environmental resources against program activities determined there would be no impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.

3.1.1 AIRSPACE—OPEN OCEAN AREA

Airspace, or that space which lies above a nation and comes under its jurisdiction, is generally viewed as being unlimited. However, it is a finite resource that can be defined vertically and horizontally, as well as temporally, when describing its use for aviation purposes. The time dimension is a very important factor in airspace management and air traffic control.

Under Public Law (PL) 85-725, *Federal Aviation Act of 1958*, the Federal Aviation Administration (FAA) is charged with the safe and efficient use of our nation's airspace, and has established certain criteria for and limits to its use. The method used to provide this service is the National Airspace System. This system is "…a common network of U.S. airspace; air navigation facilities, equipment and services, airports or landing areas; aeronautical charts, information and services; rules, regulations and procedures, technical information and manpower and material." Appendix C includes a detailed definition of airspace.

Region of Influence

For this EIS/Overseas EIS (OEIS), the region of influence for the Open Ocean Area airspace is defined as those areas beyond the territorial limit which is otherwise known as international airspace.

Affected Environment

The affected airspace environment in the Open Ocean Area region of influence is described below in terms of its principal attributes: controlled and uncontrolled airspace, special use airspace, en route airways and jet routes, airports and airfields, and air traffic control. There are no military training routes in the region of influence.

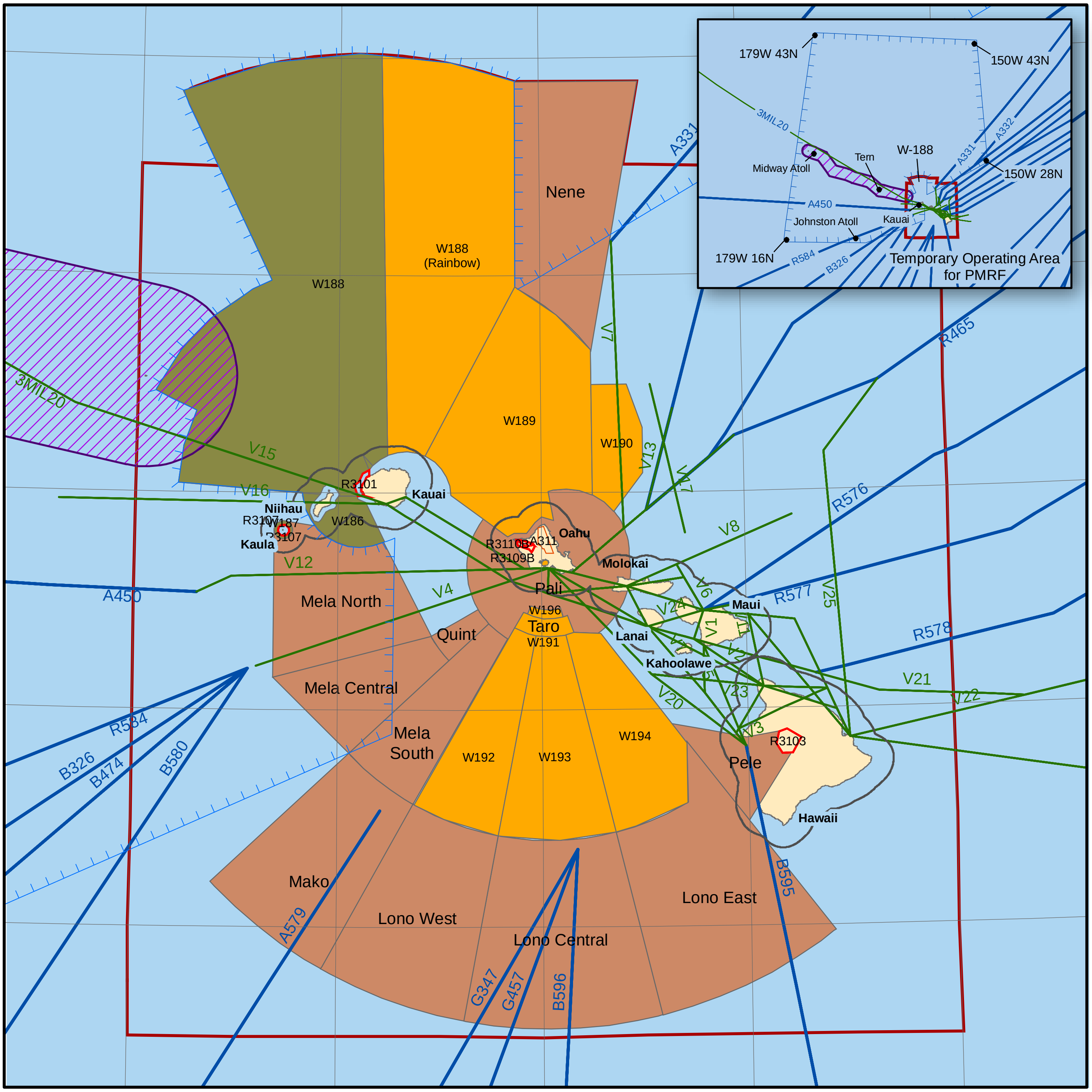
Controlled and Uncontrolled Airspace

Most of the airspace within the region of influence is in international airspace, and air traffic is managed by the Hawaii Combined Facility. The Honolulu Combined Facility includes the Air Route Traffic Control Center (ARTCC), the Honolulu Control Tower, and the Combined Radar Approach Control collocated in a single facility. Airspace outside that managed by the Hawaii Combined Facility is managed by the Oakland ARTCC.

Special Use Airspace

The special use airspace in the region of influence (Figure 3.1.1-1) consists of Warning Area W-188 north of Kauai, and Warning Area W-186 southwest of Kauai, controlled by PMRF. Warning Areas W-188 Rainbow, W-189 and W-190 north of Oahu, W-187 surrounding Kaula, and W-191, W-192, W-193, W-194 and W-196 south of Oahu are scheduled through the Navy Fleet Area Control and Surveillance Facility (FACSFAC) Pearl Harbor who then coordinates with the Honolulu Combined Facility. There are also 12 Air Traffic Control Assigned Airspace (ATCAA) areas within the region of influence. These ATCAA areas provide additional controlled airspace adjacent to and between the Warning Areas.

Table 3.1.1-1 lists the affected Warning Areas and ATCAA areas and their effective altitudes, times used, and their manager or scheduler. There are no prohibited or alert special use airspace areas in the Open Ocean Area airspace use region of influence.



EXPLANATION

Temporary Operating Area

Air Traffic Services (ATS) Route

Oceanic Route

12-nautical mile Territorial Limit

Hawaii Range Complex

Restricted Airspace

Northwestern Hawaiian Islands Marine National Monument

Air Traffic Control Assigned Airspace (ATCAA)

Oahu Warning Area

Pacific Missile Range Facility (PMRF) Warning Area

Land

NORTH

0 50 100 200 Nautical Miles

Airways and Special Use Airspace

Hawaiian Islands

Figure 3.1.1-1

Table 3.1.1-1. Special Use Airspace in the Open Ocean Area Airspace Use Region of Influence

Warning/ATCAA Number/Name	Location	Altitude (Feet)	Time of Use Days	Time of Use Hours	Controlling Agency
W-186	Northern Warning Areas	To 9,000	Cont[1]	Cont[1]	PMRF
W-187	Northern Warning Areas	To 18,000	M-F S-Su	0700-2200 0800-1600	PMRF
W-188	Northern Warning Areas	To unlimited	Cont[1]	Cont[1]	PMRF/ HCF
W-189	Northern Warning Areas	To unlimited	M-F S-Su	0700-2200 0800-1600	HCF
W-190	Southern Warning Areas	To unlimited	M-F S-Su	0700-2200 0800-1600	HCF
W-191	Southern Warning Areas	To 3,000	M-F S-Su	0700-2200 0800-1600	HCF
W-192	Southern Warning Areas	To unlimited	M-F S-Su	0700-2200 0800-1600	HCF
W-193	Southern Warning Areas	To unlimited	M-F S-Su	0700-2200 0800-1600	HCF
W-194	Southern Warning Areas	To unlimited	M-F S-Su	0700-2200 0800-1600	HCF
W-196	Southern Warning Areas	To 2,000	M-F S-Su	0700-2200 0800-1600	HCF
Nene	Northern Warning Areas	1,200 to unlimited		By request	HCF
Pali	Above Oahu	FL250 to unlimited		By request	HCF
Taro	Above W-191	3,000 to 16,000		By request	HCF
Quint		FL250 to unlimited		By request	HCF
Mela North	Between W-192 and W-186	1,200 to 15,000		By request	HCF
Mela Central	Between W-192 and W-186	to unlimited		By request	HCF
Mela South	Between W-192 and W-186	1,200 to unlimited		By request	HCF
Mako	Southern Area	1,200 to unlimited		By request	HCF
Lono West	Southern Area	1,200 to unlimited		By request	HCF
Lono Central	Southern Area	1,200 to unlimited		By request	HCF
Lono East	Southern Area	1,200 to unlimited		By request	HCF
Pele	Between W-194 and R-3101	16,000 to FL290		By request	HCF
Kapu/Quickdraw, Wela Hot Areas	Within W-192			By request	HCF

[1]Cont = Continuous
W- = Warning Area
ATCAA = Air Traffic Control Assigned Airspace
FL = Flight Level (FL 180 = 18,000 ft)
HCF = Honolulu Combined Facility (ARTCC, Combined Radar Approach Control, and Honolulu Control Tower)
PMRF = Pacific Missile Range Facility

Source: National Aeronautical Charting Office, 2006; Federal Aviation Administration

En Route Airways and Jet Routes

The Open Ocean Area airspace use region of influence has several en route high altitude jet routes, as shown on Figure 3.1.1-1. Most of the oceanic routes enter the region of influence from the northeast and southwest, and are generally outside the special use airspace warning areas described above. The Air Traffic Services routes are concentrated along the Hawaiian Islands chain. Most of the Open Ocean Area region of influence is well removed from the jet routes that crisscross the North Pacific Ocean.

As an alternative to aircraft flying above 29,000 ft following published, preferred Instrument Flight Rules (IFR) routes (shown in Figure 3.1.1-1), the Federal Aviation Administration (FAA) is gradually permitting aircraft to select their own routes. This “Free Flight” program is an innovative concept designed to enhance the safety and efficiency of the National Airspace System. The concept moves the National Airspace System from a centralized command-and-control system between pilots and air traffic controllers to a distributed system that allows pilots, whenever practical, to choose their own route and file a flight plan that follows the most efficient and economical route.

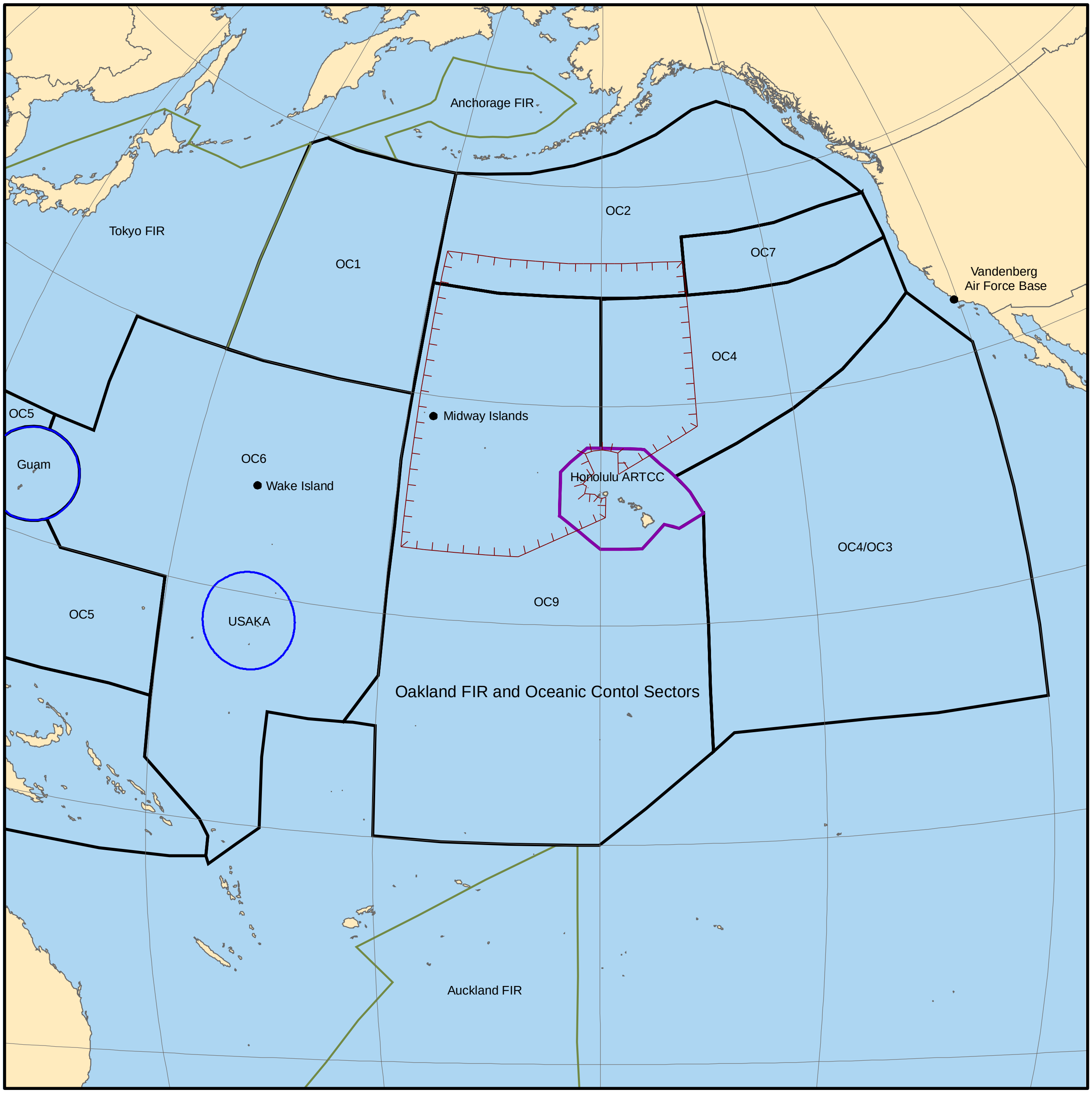
The Central Pacific Oceanic Program is one of the Free Flight programs underway. In the airspace over the Central Pacific Ocean, advanced satellite voice and data communications are being used to provide faster and more reliable transmission to enable reductions in vertical, lateral, and longitudinal separation, more direct flights and tracks, and faster altitude clearances. With the full implementation of this program, the amount of airspace in the region of influence that is likely to be clear of traffic may decrease as pilots, whenever practical, choose their own route and file a flight plan that follows the most efficient and economical route.

Airports and Airfields

There are no airports or airfields in the Open Ocean Area airspace use region of influence. However, a small portion of the Honolulu Class B airspace extends beyond the territorial limit into the region of influence.

Air Traffic Control

Air traffic in the region of influence is managed by the Honolulu and Oakland ARTCCs (see Figure 3.1.1-2).



EXPLANATION

Temporary Operating Area

Radar Control Area

Flight Information Region (FIR)

Oakland FIR and Oceanic Control (OC) Sector

Honolulu Air Route Traffic Control Center Area

Land

Note:
USAKA = U.S. Army Kwajalein Atoll
ARTCC = Air Route Traffic Control Center

NORTH

0 300 600 1,200 Nautical Miles

Airspace Managed by Oakland and Honolulu Air Route Traffic Control Centers

Pacific Ocean

Figure 3.1.1-2

3.1.2 BIOLOGICAL RESOURCES (MARINE)—OPEN OCEAN AREA

Native or naturalized vegetation, wildlife, and the habitats in which they occur are collectively referred to as biological resources. Existing information on plant and animal species and habitat types in the vicinity of the proposed sites was reviewed, with special emphasis on the presence of any species listed as threatened or endangered by Federal or State agencies, to assess their sensitivity to the effects of the No-action Alternative, Alternative 1, or Alternative 2. Appendix C includes a definition of biological resources and the main regulations and laws that govern their protection.

Region of Influence

The region of influence for open ocean species includes the areas of the Pacific Ocean within the HRC at depths of 100 fathoms and greater. Offshore areas discussed within this section refer to those areas at depths of 100 fathoms or less.

Affected Environment

Coral

The Hawaiian Islands have 6,764.5 square miles (mi^2) of coral reef area, representing 84 percent of the coral reef area in the United States (Maragos, 1977). Due to the motion of the Pacific Plate, the Hawaiian Islands have been transported in a north to northwest direction away from their original location of formation over the hot spot at a rate of about 4 inches per year (Grigg, 1988; 1997b). The youngest island in the archipelago is Hawaii, where the youngest fringing reefs and barrier reefs are found. Fringing reefs on the western coast of Hawaii are from 100 to 1,000 years old.

Wave action is the main natural control on coral reef structure along the coastline of the Hawaiian Islands (Grigg, 1997a; Jokiel et al., 2001; 2004). Corals in wave-exposed areas die as fast as they can be replaced (Grigg, 1997a). The breaking, scouring, and abrading action caused by waves on corals yields high mortality. Hence, no coral growth takes place in wave-exposed areas. Other natural factors that influence the formation of coral reefs along the Hawaiian Islands include sedimentation, turbidity, incident light, and dissolved nutrients (Grigg, 1997a). The greatest reef accretion occurs in areas sheltered from wave action such as embayments and on the leeward side of islands (Grigg, 1997a; Jokiel et al., 2001, 2004). Despite the fact that wave action limits the accretion of reef building corals, reefs are also found along the south and northeast coastlines of Oahu and the north coastline of Kauai (Maragos, 2000). Stony corals, or reef-building corals, are primarily located on the seaward edge of fringing reefs and the fore reef slope (Maragos, 2000); in the absence of stony corals crustose (crust-like) coralline algae colonize coastlines that are exposed to wave action (Maragos, 2000).

There are 59 known species of stony corals occupying the reefs of the Hawaiian archipelago (Maragos et al., 2004). Compared to the coral reefs of the Indo-Pacific, which can contain up to 500 species of stony corals, the reefs of Hawaii have a low diversity (Grigg, 1997a). The scarcity of reef corals is due in part to the geographic isolation of Hawaii from larval sources (Grigg, 1988). Prevailing surface water transport is from east to west, driven by the northeast trade winds. There are no coral reef ecosystems to the east of the Hawaiian archipelago capable of acting as a source of coral larvae.

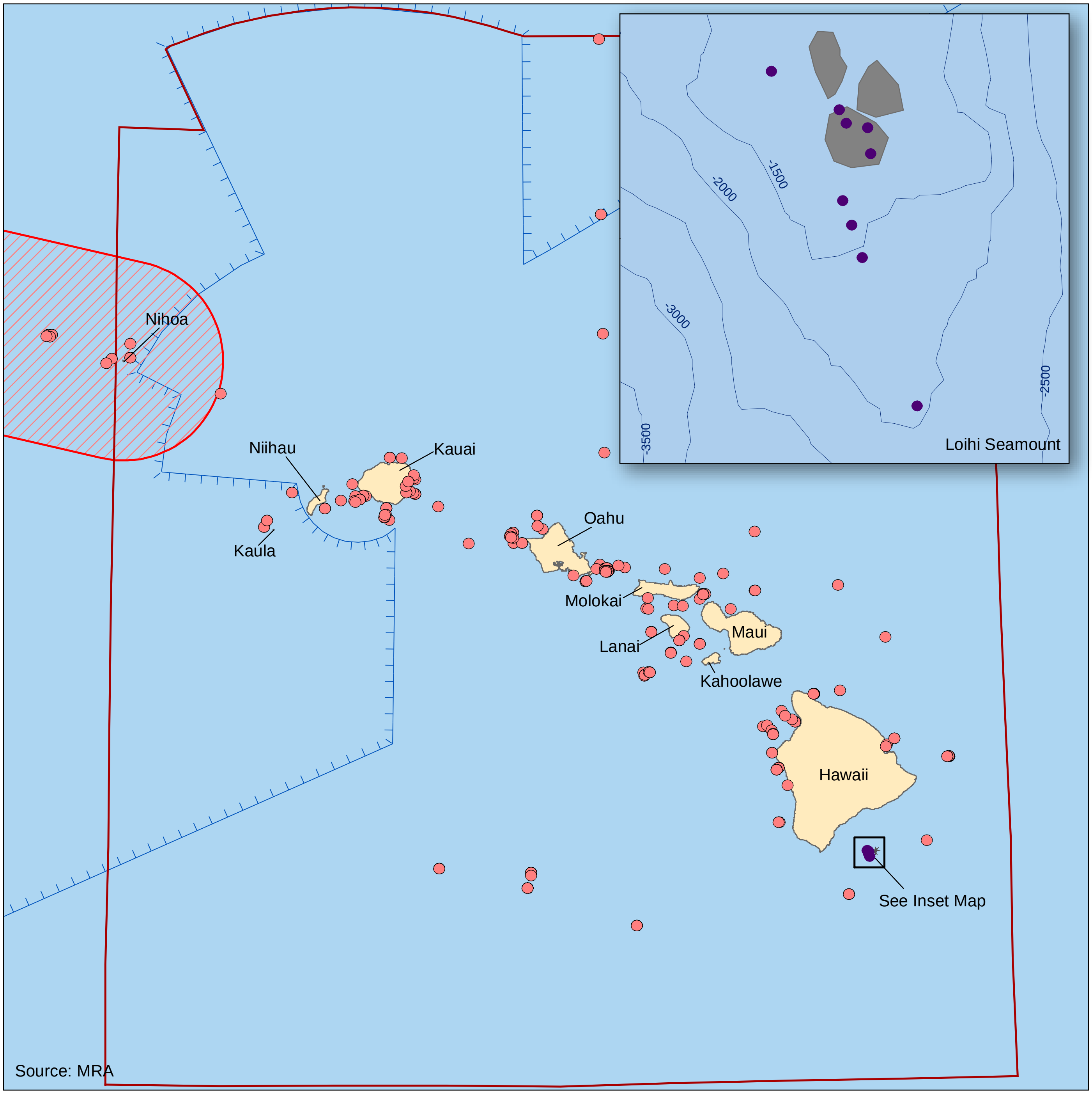
More recently, human impacts have affected the reefs of Hawaii including coastal development, urbanization, coastal pollution, increased sedimentation, excessive offshore fishing, resort development, overuse of offshore reefs (including reef walking and snorkeling), ship groundings, anchor damage, and invasive species (Maragos, 2000; Jokiel et al., 2001; 2004; Friedlander et al., 2004).

Coral reefs and offshore hard bottom communities are depicted for Kauai, Oahu, Marine Corps Base Hawaii and Marine Corps Training Area–Bellows, U.S. Coast Guard Station–Barbers Point/Kalaeloa Airport, Dillingham Military Reservation, Makua Military Reservation, and Kaena Point, Kahuku Training Area, and Kawaihae Pier. A focused discussion including regional distribution, composition, and condition of coral reefs and communities in the offshore area of the Hawaiian Islands Operating Area is provided in Appendix G.

Deep-sea coral communities are prevalent throughout the Hawaiian archipelago (Figure 3.1.2-1). They often form offshore reefs that surround all of the Main Hawaiian Islands at depths between 27 and 109 fathoms (Maragos, 1998). Although light penetrates to these depths, it is normally insufficient for photosynthesis. The term "deep-sea corals" may be misleading because substrate (surface for growth), currents, temperature, salinity, and nutrient supply are more important factors in determining the distribution of growth rather than depth (Chave and Malahoff, 1998).

Deep-sea coral communities provide habitat, feeding grounds, recruitment, and nursery grounds for a range of deep-water organisms including epibenthic invertebrates (e.g., echinoderms, sponges, polychaetes, crustaceans, and mollusks), fishes, solitary precious corals (e.g., black corals), and marine mammals (e.g., monk seals) (Maragos, 1998; Midson, 2000; Coral Reef Information System, 2003; Roberts and Hirshfield, 2003; Freiwald et al., 2004). Deep-sea corals live in complete darkness, in temperatures as low as 39 degrees Fahrenheit (°F), and in waters as deep as 19,685 ft (Coral Reef Information System, 2003).

Deep-sea corals can form large communities ranging in size from patches of small solitary colonies to massive reef structures (mounds, banks, and forests) spanning an estimated total spatial coverage of about of 772 mi^2 (Cairns, 1994; Freiwald, 2004). Much like shallow-water corals, deep-sea corals are fragile, slow growing, and can survive for hundreds of years (Roberts and Hirshfield, 2003). Deep-sea corals can be of two basic types: (1) the hard or stony corals which are related to those found on tropical coral reefs; and (2) the soft corals which include the familiar gorgonians of tropical shallow seas, as well as a broad diversity of other fleshy or tree-like forms. Some of the stony corals are small but they can grow to be very massive. The soft corals may be small and delicate or very large and tree-like (Watling, 2003). In the Hawaiian Islands, gorgonians are the most common group of deep-sea corals. Of the gorgonians, primnoids are the most abundant group in the Hawaiian archipelago and are dominant off Molokai (Chave and Malahoff, 1998). Potential threats to deep-sea corals includes fishing (e.g., bottom trawling), oil- and gas-related activities, cable laying, seabed aggregate extraction, shipping activities, the disposal of waste in deep waters, coral exploitation, other mineral exploration, and increased atmospheric carbon dioxide (Gass, 2003; Freiwald et al., 2004).



EXPLANATION

- Deep-Sea Coral
- Hydrothermal Vent
- Temporary Operating Area for Pacific Missile Range Facility
- Hawaii Range Complex
- Isobath (meters)
- Northwestern Hawaiian Islands Marine National Monument
- Crater
- Land

NORTH

0 50 100 200 Nautical Miles

Distribution of Deep-Sea Corals and Hydrothermal Vents

Hawaiian Islands

Figure 3.1.2-1

Fish

Distribution and abundance of fisheries, as well as the individual species, depends greatly on the physical and biological factors associated with an ecosystem. Physical parameters include habitat quality variables such as salinity, temperature, dissolved oxygen, and large-scale environmental disturbances (e.g., El Niño Southern Oscillation [ENSO]). Biological factors affecting distribution are complex and include variables such as population dynamics, predator/prey oscillations, seasonal movements, reproductive/life cycles, and recruitment success (Helfman et al., 1999). A single factor is rarely responsible for the distribution of fishery species; more often, a combination of factors is accountable. For example, pelagic or open ocean species optimize their growth, reproduction, and survival by tracking gradients of temperature, oxygen, or salinity (Helfman et al., 1999). Additionally, the spatial distribution of food resources is variable and changes with prevailing physical habitat parameters. Another major component in understanding species distribution is the location of highly productive regions such as frontal zones.

The prevailing oceanographic current in the Hawaiian archipelago is the westward flowing north equatorial current. Due to the origin of the north equatorial current (cool waters and distance from Hawaii), it is not likely to have had a major impact on fish species occurring in the Hawaiian Islands archipelago. Based on the present current system, most fish larvae would probably arrive at the Northwestern Hawaiian Islands via an eddy of the warm Kuroshio Current that bathes southern Japan and heads northeast where it becomes the North Pacific Current (Randall, 1998).

Environmental variations, such as ENSO events, change the normal characteristics of water temperature, thereby changing the patterns of water flow. In the northern hemisphere, El Niño events typically result in tropical, warm-water species moving north (extending species range), and cold-water species moving north or into deeper water (restricting their range). Surface-oriented, schooling fish often disperse and move into deeper waters. ENSO events alter normal current patterns, alter productivity, and have dramatic effects on distribution, habitat range, and movement of pelagic species (National Marine Fisheries Service, 2002a). Fishes that remain in an affected region experience reduced growth, reproduction, and survival (National Marine Fisheries Service, 2002a). El Niño events have caused fisheries such as that of the skipjack tuna to shift over 621 miles (mi) (National Marine Fisheries Service-Pacific Islands Region, 2001).

The Hawaiian archipelago distinguishes itself as a subprovince of the spacious tropical and subtropical Indo-Pacific region, which extends from the Red Sea and coast of East Africa to the easternmost islands of Oceania (Hawaii and Easter Island). The composition of the Hawaiian marine life varies enough from the rest of the Indo-Pacific to be treated as a distinct faunal subregion. Hawaii's unique fish fauna can be explained by its geographical and hydrographical isolation (Randall, 1998). Pelagic fishes such as the larger tunas, the billfishes, and some sharks are able to traverse the great distance that separates the Hawaiian Islands from other islands or continents in the Pacific Ocean; however, shore fishes are dependent on passive transport as larvae in ocean currents for distribution. As would be expected, the fish families that have a high percentage of species in the Hawaiian Islands compared to elsewhere tend to be those with a long larval life stage, such as the moray eels and surgeonfishes. Families that contain mainly species with short larval life stages, such as the gobies, blennies, and cardinal fishes, are not as well represented in Hawaii as in the rest of the Indo-Pacific region (Randall, 1995).

Offshore Ocean or Pelagic Species

The temperate species includes those that are found in greater abundance outside tropical waters at higher latitudes (e.g., broadbill swordfish [*Xiphias gladius*], bigeye tuna [*Thunnus obesus*], northern bluefin tuna [*T. thynnus*], and albacore tuna [*T. alalunga*]). Additionally, a potential squid group consisting of three flying squids (neon flying squid [*Ommastrephes bartramii*], diamondback squid [*Thysanoteuthis rhombus*], and purpleback flying squid [*Sthenoteuthis oualaniensis*]) has been proposed by the Western Pacific Regional Fishery Management Council incorporation into the existing Pelagic Management Unit Species (National Marine Fisheries Service, 2004b). Currently, no data are available to determine if the pelagic species are approaching an overfished situation (National Marine Fisheries Service 2004c), except for the bigeye tuna. The National Marine Fisheries Service (NMFS) (2004d) determined that overfishing was occurring Pacific wide for this species. In addition, shark species are afforded protection under the *Shark Finning Prohibition Act* (National Marine Fisheries Service, 2002b).

The broadbill swordfish, albacore tuna, common thresher shark (*Alopias vulpinus*), and salmon shark (*Lamna ditropis*) have been listed as data deficient on the International Union for Conservation of Nature and Natural Resources (IUCN) Red List due to inadequate information to make a direct, or indirect assessment of its risk of extinction based on its distribution and/or population status (Safina, 1996; Uozumi, 1996a; Goldman and Human, 2000; Goldman et al., 2001). The shortfin mako shark (*Isurus oxyrinchus*), oceanic whitetip shark (*Carcharhinus longimanus*), crocodile shark (*Pseudocarcharius kamoharai*), blacktip shark (*C. limbatus*), and blue shark (*Prionace glauca*) have been listed as near threatened (Compagno and Musick, 2000; Shark Specialist Group, 2000a; Smale, 2000; Stevens, 2000a; 2000b). The bigeye tuna and the great white shark (*Carcharadon carcharias*) are listed as vulnerable on the IUCN Red List (Uozumi, 1996b; Fergusson et al., 2000).

<u>Distribution</u>

The pelagic species occur in tropical and temperate waters of the western Pacific Ocean (National Marine Fisheries Service-Pacific Islands Region, 2001). Geographical distribution among these species is governed by seasonal changes in ocean temperature. These species range from as far north as Japan, to as far south as New Zealand. Albacore tuna, striped marlin (*Tetrapurus audax*), and broadbill swordfish have broader ranges and occur from 50°N to 50°S (Western Pacific Regional Fishery Management Council, 1998). Some species of tuna may aggregate near sea mounts (Yasui, 1986; Itano and Holland, 2000).

<u>Habitat Preference</u>

Pelagic species are typically found in epipelagic to pelagic waters; however, shark species can be found in inshore benthic, neritic to epipelagic, and mesopelagic (ocean zone from 656 to 3,280 ft) waters. Factors such as gradients in temperature, oxygen, or salinity can affect the suitability of a habitat for pelagic fishes. Skipjack tuna (*Katsuwonus pelamis*), yellowfin tuna (*T. albacares*), and Indo-Pacific blue marlin (*Makaira nigricans*) prefer warm surface layers where the water is well-mixed and relatively uniform in temperature (Western Pacific Regional Fishery Management Council, 1998). Species such as albacore tuna, bigeye tuna, striped marlin, and broadbill swordfish prefer temperate waters associated with higher latitudes and greater depths (Western Pacific Regional Fishery Management Council, 1998). Certain species, such as broadbill swordfish and bigeye tuna, are known to aggregate near the surface at night. During the day broadbill swordfish can be found at depths of about 437 fathoms and bigeye tuna around 150 to 301 fathoms (Table 3.1.2-1; Western Pacific Regional Fishery Management

Council, 1998). Juvenile albacore tuna generally concentrate above 49 fathoms, with adults found in deeper waters (about 49 to 150 fathoms) (Western Pacific Regional Fishery Management Council, 1998).

Fish

Broadly, fishes can be categorized as hearing specialists (broad hearing frequency range with low auditory thresholds) or hearing generalists (narrower frequency range with higher auditory thresholds) (Scholik and Yan, 2002). Fishes in the hearing specialist category have a broad hearing frequency range with a low auditory threshold due to a mechanical connection between the swimbladder and the inner ear. The majority of hearing specialists are in the family Cyprinidae (e.g., carp and minnows) and in the family Ictaluridae (e.g., catfish) (Mann et al., 1998), which are typically freshwater fishes, although the designations of hearing specialists and generalists cannot be applied wholesale across taxonomic groups. Marine fishes that are hearing specialist include some species of the family Clupeidae (e.g., herring, shad, anchovies, and sardines) (Mann et al., 2001, Plachta and Popper 2003) and at least one species of the family Gadidae (i.e., Atlantic cod, *Gadus morhua*) (Mann et al., 1998, Astrup and Mohl, 1993). A few other marine fishes may be able to detect mid-frequency sounds, but their most sensitive hearing range is generally below the mid-frequency bandwidth. Other fish species that may be able to detect mid-frequency sounds occur in the families Carcharhinidae (i.e., bull shark) (Mann et al., 1998, Kritzler and Wood, 1961), Haemulidae (i.e., blue-striped grunt) (Mann et al., 1998), Labridae (i.e., blue-head wrasse) (Mann et al., 1998), Pomacentridae (e.g., damselfish) (Mann et al., 1998), Sciaenidae (e.g., drum weakfish, and croaker) (Mann et al., 1998), and Scombridae (e.g., tuna, mackerel, and bonita). Most marine species of bony fish are hearing generalists, with their best hearing range below 300 hertz (Hz) frequency (Popper, 2003).

Wysocki and Ladich (2005) investigated the influence of noise exposure on the auditory sensitivity of two hearing specialists, goldfish (*Carassius auratus*) and lined Raphael catfish (*Platydoras costatus*) and a hearing generalist, sunfish (*Lepomis gibbosus*). Baseline thresholds showed greatest hearing sensitivity around 0.5 kilohertz (kHz) (500 Hz) in the goldfish and catfish and at 0.1 kHz (100 Hz) in the sunfish. For the hearing specialists (goldfish and catfish), continuous white noise of 130 decibels (dB) resulted in a significant threshold shift of 23 to 44 dB. In contrast, the auditory thresholds in the hearing generalist (sunfish) declined by 7 to 11 dB. It was concluded that acoustic communication and orientation of fishes, in particular of hearing specialists, may be limited by noise regimes in their environment (Wysocki and Ladich, 2005).

Fish can also sense pressure using the lateral line, a system of sensory cells with hair like projections similar to the hair cells of the cochlea. The lateral line can detect the pressure from currents, waves from other animals or low frequency sound below 100 Hz (Popper and Platt 1993).

Table 3.1.2-1. Summary of Pelagic or Open Water Species and Depth Distribution

Species	Depth Distribution
Temperate Species	
Striped marlin, *Tetrapurus audax*	Governed by temperature stratification
Broadbill swordfish, *Xiphias gladius*	Surface to 547 fathoms
Northern bluefin tuna, *Thunnus thynnus*	No data
Albacore tuna, *Thunnus alalunga*	Surface to 208 fathoms
Bigeye tuna, *Thunnus obesus*	Surface to 328 fathoms
Mackerel, *Scomber* spp.	No data
Sickle pomfret, *Tatactichthys steindachneri*	Surface to 164 fathoms
Lustrous pomfret, *Eumegistus illustris*	Surface to 300 fathoms
Tropical Species	
Yellowfin tuna, *Thunnus albacares*	Upper 55 fathoms with marked oxyclines
Kawakawa, *Euthynnus affinis*	20 to 109 fathoms
Skipjack tuna, *Katsuwonus pelamis*	Surface to 144 fathoms
Frigate tuna, *Auxis thazard*	No data
Bullet tuna, *Auxis rochei*	No data
Indo-Pacific blue marlin, *Makaira nigricans*	44 to 55 fathoms
Black marlin, *Makaira indica*	250 to 500 fathoms
Shortbill spearfish, *Tetrapturus angustirostris*	22 to 1,000 fathoms
Sailfish, *Istiophorus platypterus*	6-11 to 109-137 fathoms
Dolphinfish, *Coryphaena hippurus*	No data
Pompano dolphinfish, *Coryphaena equiselas*	No data
Wahoo, *Acanthocybium solandri*	Adult depth <109 fathoms
Moonfish, *Lampris guttatus*	Surface to 273 fathoms
Escolar, *Lepidocybium flavobrunneum*	Surface to 109 fathoms
Oilfish, *Ruvettus pretiosus*	Surface to 383 fathoms
Shark Species	
Crocodile shark, *Pseudocarcharias kamoharai*	Surface to 164 fathoms
Common thresher shark, *Alopias vulpinus*	Surface to 200 fathoms
Pelagic thresher shark, *Alopias pelagicus*	Surface to 83 fathoms
Bigeye thresher shark, *Alopias superciliosus*	Surface to 273 fathoms
Shortfin mako shark, *Isurus oxyrinchus*	Surface to 273 fathoms
Longfin mako shark, *Isurus paucus*	No data
Salmon shark, *Lamna ditropis*	Surface to 83 fathoms
Silky shark, *Carcharhinus falcirormis*	Adult depth of 10 to 273 fathoms
Oceanic whitetip shark, *Carcharhinus longimanus*	Adult depth of 20 to 83 fathoms
Blue shark, *Prionace glauca*	Surface to 83 fathoms

Source: Western Pacific Regional Fishery Management Council 1998, 2001

Behavioral Effects

Behavioral studies have shown that most fish only detect sound within the 1 to 3 kHz (1,000 to 3,000 Hz) frequency range (Popper, 2000) with most hearing specialist fish responding best at around 2 kHz (Popper, 2003). The mid-frequency active sonar operations would use mid-frequency sound sources, which range from approximately 3 kHz (3,000 Hz) to 4 kHz (4,000 Hz). Thus, it is expected that some fish species would be able to detect the mid-frequency sonar. It has been demonstrated that a few species (i.e., bay anchovy [*Anchoa mitchilli*]; scaled sardine [*Harengula jaguana*]; and Spanish sardine [*Sardinella aurita*] can detect sounds to about 4 kHz (4,000 Hz) and that one species (American shad [*Alosa sapidissima*]) is able to detect sounds up to 180 kHz (180,000 Hz) (Mann, et al., 2001).

Other studies have also found that fish hearing generalists normally experience only minor or no hearing loss when exposed to continuous noise, but that hearing specialists may be affected by noise exposure and that acoustic communication might be restricted in noisy habitats (Amoser and Ladich, 2003; Smith, et al., 2004 a; b).

With respect to fish behavior, studies have shown that low frequency noise (below mid-frequency active sonar) will alter the behavior of fish. For example, research has been conducted on the use of low frequency devices to deter fish away from potentially dangerous situations, such as turbine inlets of hydroelectric power plants (Knudsen et al., 1994). Stronger avoidance responses are exhibited from sounds in the infrasound range (5 to 10 Hz) than from 50 and 150 Hz sounds (Knudsen et al., 1992). In test pools, wild salmon will swim to a deeper section of the test pool, even if that deep section was near the sound source, when exposed to low frequency sound. In regard to high frequency sound, one behavioral response study demonstrated that exposure to broadband bio-sonar-type sounds with high frequencies (different from the mid-frequency sonar that would be used during Navy exercises) causes behavioral modification in Pacific herring (Wilson and Dill, 2002).

Research has been conducted on mid frequency acoustic devices designed to deter marine mammals from gillnet fisheries (Gearin et al., 2000; Culik et al., 2001) to ascertain how noise may affect fish behavior. These devices generally have a mid-frequency (approximately 10 kHz) which is a higher frequency than then sonar devices that would be used during Navy exercises. Adult sockeye salmon exhibited an initial startle response to the placement of inactive acoustic alarms (control) (Gearin et al., 2000). The fish resumed their normal swimming pattern within 10 to 15 seconds (sec). After 30 sec, the fish approached the inactive alarm to within 1 ft.

The same experiment was conducted with the alarm active. The fish exhibited the same initial startle response from the insertion of the alarm into the tank; however, within 30 sec, the fish were swimming within 1 ft of the active alarm. After 5 minutes (min) of observation, the fish did not exhibit any reaction or behavior change except for the initial startle response (Gearin et al., 2000). The alarms were either inaudible to the fish, or the fish were not disturbed by the mid-frequency sound (Gearin et al., 2000).

Most noise effects studies on fish have used low frequency (< 1,000 Hz) impulse type sounds such as pile driving or seismic airguns which cause physical damage to the hair cells (Hastings et al., 1996; McCauley et al., 2003; Nedwell et al., 2006). Some clupeid species, including the alewife (*Alosa pseudoharengus*), American shad (*Alosa sapidissima*) and gulf menhaden (*Brevoortia patronus*) can detect sounds higher than 20 kHz and will avoid sounds in the ultrasonic range (Reviewed by the ICES AGISC 2005; Dunning et al., 1992; Nestler et al., 1992; Ross et al., 1995, 1996; Mann et al., 1997, 1998, 2001).

Physiological Effects

In a study of the response of fishes to mid-frequency active sonars (1.6 and 4 kHz), Jorgensen et al. (2005) observed the behavior of four unrelated marine species (saithe, *Pollachius virens*, wolf fish *Anarhichas minor*, cod *Gadus morhua*, herring *Clupea harengus*). Juvenile herring responded with startle behaviors from sonar signals around 170 dB re 1 micropascal (μPa), but resumed normal activity after the first few pulses. However, in tests with received levels around 180–189 dB re 1 μPa, juvenile herring exhibited startle behaviors followed by abnormal swimming. In addition, strong distress was evident during presentation of a series of 100 frequency modulated sonar pulses at around 180 dB re 1 μPa. The other species of juvenile fishes did not exhibit startle responses, or any other behavioral evidence, from the mid-frequency sonar pulses that were detected at any level as expected for fishes with no known auditory specializations for reception of frequencies above 1 kHz. Jorgensen et al. (2005) and Kvadsheim and Sevaldsen (2005) found that juvenile herring may sustain mortal injuries from intense mid-frequency sonar pulses (1–3 kHz) and hull-mounted and towed arrays with frequencies up to 8 kHz, respectively.

Wysocki and Ladich (2005) investigated the influence of noise exposure on the auditory sensitivity of two hearing specialists (goldfish [*Carassius auratus*] and lined Raphael catfish [*Platydoras costatus*]) and a hearing generalist (sunfish – *Lepomis gibbosus*). Baseline thresholds showed greatest hearing sensitivity around 0.5 kHz (500 Hz) in the goldfish and catfish and at 0.1 kHz (100 Hz) in the sunfish, the hearing specialists. For the hearing specialists (goldfish and catfish), continuous white noise of 130 dB resulted in a significant threshold shift of 23–44 dB. In contrast, the auditory thresholds in the hearing generalist (sunfish) declined by 7–11 dB. It was concluded that acoustic communication and orientation of fishes, in particular of hearing specialists, may be limited by noise regimes in their environment.

Studies have also found that hearing generalists normally experience only minor or no hearing loss when exposed to continuous noise, but that hearing specialists may be affected by noise exposure, for example acoustic communication might be restricted in noisy habitats (Amoser and Ladich, 2003; Smith, et al., 2004a and 2004b).

To summarize the results of some of the recent research on fish and acoustics, it is expected that some fish species would be able to detect the mid-frequency sonar. The results of several studies have indicated that acoustic communication and orientation of fishes, in particular of hearing specialists, may be limited by noise sources in their environment. Further, some fish species may initially respond behaviorally to sound frequencies, including possible mid-frequency sources (similar to the sonar sources that would be used during Navy exercises).

Sea Turtles

Sea turtles are long lived reptiles that can be found throughout the world's tropical, subtropical, and temperate seas (Caribbean Conservation Corporation and Sea Turtle Survival League, 2003). There are seven living species of sea turtles from two distinct families, the Cheloniidae (hard-shelled sea turtles; six species) and the Dennochelyidae (leatherback sea turtle; one species). These two families can be distinguished from one another on the basis of their carapace (upper shell) and other morphological features. Sea turtles are an important marine resource in that they provide economic, arid existence (non-use) value to humans (Witherington and Frazer, 2003). Over the last few centuries, sea turtle populations have declined dramatically due to anthropogenic (human-related) activities such as coastal development, oil exploration, commercial fishing, marine-based recreation, pollution, and over-harvesting (Natural Research Council, 1990; Eckert, 1995). As a result, all six species of sea turtles found in U.S. waters are currently listed as either threatened or endangered under the Endangered Species Act (ESA).

Sea turtles are highly adapted for life in the marine environment. Unlike terrestrial and freshwater turtles, sea turtles possess powerful, modified forelimbs (or flippers) that enable them to swim continuously for extended periods of time (Wyneken, 1997). They also have compact and streamlined bodies that help to reduce drag. Additionally, sea turtles are among the longest and deepest diving of the air-breathing vertebrates, spending as little as 3 to 6 percent of their time at the water's surface (Lutcavage and Lutz, 1997). Sea turtles often travel thousands of miles between their nesting beaches and feeding grounds, which makes the aforementioned suite of adaptations very important (Ernst et al., 1994; Meylan, 1995). Sea turtle traits and behaviors also help protect them from predation. Sea turtles have a tough outer shell and grow to a large size as adults; mature leatherback turtles (*Dermochelys coriacea*) can weigh up to 2,091 pounds (lb) (Eckert and Luginbuhl, 1988). Sea turtles cannot withdraw their head or limbs into their shell, so growing to a large size as adults is important.

Although they are specialized for life at sea, sea turtles begin their lives on land. Aside from this brief terrestrial period, which lasts approximately 3 months as eggs and an additional few minutes to a few hours as hatchlings scrambling to the surf, sea turtles are rarely encountered out of the water. Sexually mature females return to land in order to nest, while certain species in the Hawaiian Islands, Australia, and the Galapagos Islands haul out on land in order to bask (Carr, 1995; Spotila et al., 1997). Sea turtles bask to thermoregulate, elude predators, avoid harmful mating encounters, and possibly to accelerate the development of their eggs, accelerate their metabolism, and destroy aquatic algae growth on their carapaces (Whittow and Balazs, 1982: Spotila et al., 1997). On occasion, sea turtles can unintentionally end up on land if they are dead, sick, injured, or cold-stunned. These events, also known as strandings, can be caused by either biotic (e.g., predation and disease) or abiotic (e.g., water temperature) factors.

Female sea turtles nest in tropical, subtropical, and warm-temperate latitudes, often in the same region or on the same beach where they hatched (Miller, 1997). Upon selecting a suitable nesting beach, most sea turtles tend to re-nest in close proximity during subsequent nesting attempts. The leatherback turtle is a notable divergence from this pattern. This species nests primarily on beaches with little reef or rock offshore. On these types of beaches erosion reduces the probability of nest survival. To compensate, leatherbacks scatter their nests over larger geographic areas and lay on average two times as many clutches as other species (Eckert, 1987).

At times, sea turtles may fail to nest after emerging from the ocean. These non-nesting emergences known as false crawls, can occur if sea turtles are obstructed from laying their eggs (by debris, rocks, roots, or other obstacles), are distracted by surrounding conditions (by noise, lighting, or human presence), or are uncomfortable with the consistency or moisture of the sand on the nesting beach. Turtles that are successful at nesting usually lay several clutches of eggs during a nesting season with each clutch containing between 50 and 200 eggs depending upon the species (Witzell, 1983: Dodd, 1988; Hirth, 1997). Most sea turtles, with the possible exception of Kemp's ridley turtles (*Lepidochelys kempii*), do not nest in consecutive years; instead, they will often skip 2 or 3 years before returning to the nesting grounds (Márquez-M., 1990; Ehrhart, 1995). Nesting success is vital to the long-term existence of sea turtles since it is estimated that only 1 out of every 1,000 hatchlings survives long enough to reproduce (Frazer, 1986).

During the nesting season, daytime temperatures can be lethal on tropical, subtropical, and warm-temperate beaches. As a result, adult sea turtles most often nest and hatchlings most often emerge from their nest at night (Miller, 1997). After emerging from the nest, sea turtle hatchlings use visual cues (e.g., light intensity or wavelengths) to orient themselves towards the sea (Lohmann et al., 1997).

Hatchlings that make it into the water will end up spending the first few years of their lives in offshore waters, drifting in convergence zones or amidst floating vegetation, where they find food (mostly pelagic invertebrates) and refuge in flotsam that accumulates in surface circulation features (Carr, 1987). Originally labeled the lost year, this stage in a sea turtle's life history is now known to be much longer in duration, possibly lasting a decade or more (Chaloupka and Musick, 1997; Bjorndal et al., 2000). Sea turtles will spend several years growing in the early juvenile "nursery habitat," which is usually pelagic and oceanic, before migrating to distant feeding grounds that comprise the later juvenile "developmental habitat," which is usually demersal and neritic (in shallow water) (Musick and Limpus, 1997; Frazier, 2001). Hard-shelled sea turtles most often utilize shallow offshore and inshore waters as later juvenile developmental habitats; whereas leatherback turtles, depending on the season, can utilize either coastal feeding areas in temperate waters or offshore feeding areas in tropical waters (Frazier, 2001).

Once in the later juvenile developmental habitat, most sea turtles change from surface to benthic feeding and begin to feed upon larger items such as crustaceans, mollusks, sponges. coelenterates, fishes, macroalgae, and seagrasses (Bjorndal, 1997). A sea turtle's diet varies according to its feeding habitat and its preferred prey. Upon moving from the later juvenile developmental habitat to the adult foraging habitat, sea turtles may demonstrate further changes in prey preference, dietary composition, and feeding behavior (Bjorndal, 1997; Musick and Limpus, 1997).

Throughout their life cycles sea turtles undergo complex seasonal movements. Sea turtle movement patterns are influenced by changes in ocean currents, turbidity, salinity, and food availability. In addition to these factors, the distribution of many sea turtle species is dependent upon and often restricted by water temperature (Epperty et al., 1995; Davenport, 1997; Coles and Musick, 2000). Most sea turtles become lethargic at temperatures below 50°F and above 104°F (Spotila et al., 1997).

Sea turtles do not have an auditory meatus or pinna that channels sound to the middle ear, nor do they have a specialized tympanum (eardrum). Instead, they have a cutaneous layer and underlying subcutaneous fatty layer that function as a tympanic membrane. The subcutaneous fatty layer receives and transmits sound to the extracolumella, a cartilaginous disk, located at the entrance to the columella, a long, thin bone that extends from the middle ear cavity to the entrance of the inner ear or otic cavity (Ridgway et al., 1969). Sound arriving at the inner ear via the columella is transduced by the bones of the middle ear. Sound also arrives by bone conduction through the skull.

Sea turtle auditory sensitivity is not well studied, though a few preliminary investigations suggest that it is limited to low frequency bandwidths, such as the sounds of waves breaking on a beach. The role of underwater low frequency hearing in sea turtles is unclear. It has been suggested that sea turtles may use acoustic signals from their environment as guideposts during migration and as a cue to identify their natal beaches (Lenhardt et al., 1983). The range of maximum sensitivity for sea turtles is 100 to 800 Hz, with an upper limit of about 2,000 Hz (Lenhardt, 1994). Hearing below 80 Hz is less sensitive but still potentially usable to the animal (Lenhardt, 1994). Ridgway et al. (1969) used aerial and mechanical stimulation to measure the cochlea in three specimens of green turtle, and concluded that they have a useful hearing span of perhaps 60-1000 Hz, but hear best from about 200 Hz up to 700 Hz, with their sensitivity falling off considerably below 200 Hz. The maximum sensitivity for one animal was at 300 Hz, and for another was at 400 Hz. At the 400 Hz frequency, the turtle's hearing threshold was about 64 dB in air (approximately 126 dB in water). At 70 Hz, it was about 70 dB in air (approximately 132 dB in water). Bartol et al. (1999) reported that juvenile loggerhead sea turtles (*Caretta caretta*) hear sounds between 250 and 1,000 Hz. Lenhardt et al. (1983) applied audiofrequency vibrations at 250 Hz and 500 Hz to the heads of loggerheads and Kemp’s ridleys submerged in salt water to observe their behavior, measure the attenuation of the vibrations, and assess any neural-evoked response. These stimuli (250 Hz, 500 Hz) were chosen as representative of the lowest sensitivity area of marine turtle hearing (Wever, 1978). At the maximum upper limit of the vibratory delivery system, the turtles exhibited abrupt movements, slight retraction of the head, and extension of the limbs in the process of swimming. Lenhardt et al. (1983) concluded that bone-conducted hearing appears to be a reception mechanism for at least some of the sea turtle species, with the skull and shell acting as receiving surfaces. Finally, sensitivity even within the optimal hearing range is apparently low as threshold detection levels in water are relatively high at 160 to 200 dB re 1 micropascal-meter (µPa-m) (Lenhardt, 1994).

Five of the seven living species of sea turtles are known to occur in the HRC: the green, hawksbill (*Eretmochelys imbricata*), loggerhead, olive ridley (*Lepidochelys olivacea*), and leatherback sea turtles. Each of these species is protected under the ESA. However, critical habitat has not yet been designated for any of these species in the U.S. Pacific. A draft proposed rule was prepared in 1980 to designate critical habitat for the green turtle in the Hawaiian Islands, American Samoa, and the Trust Territories of the United States, but it was never approved by the U.S. Fish and Wildlife Service (USFWS) (Eckert, 1993).

Green, hawksbill, loggerhead, olive ridley, and leatherback sea turtles are all regular inhabitants of the HRC (i.e., they occur as a regular or normal part of the fauna in the HRC, regardless of how abundant or common they are). Green and hawksbill turtles are most common in offshore waters around the Main Hawaiian Islands and Nihoa, as they prefer to reside in reef-type environments that are less than about 55 fathoms in depth (U.S. Department of the Navy, 2005). The green turtle is by far the most common species occurring in the offshore waters around the Hawaiian Islands; this is highly evidenced by the available stranding data for the Main Hawaiian Islands. More than 90 percent of all green turtle breeding and nesting activity in Hawaiian waters occurs at French Frigate Shoals in the Northwestern Hawaiian Islands, yet a substantial foraging population resides in and returns to the shallow, coastal waters surrounding the Main Hawaiian Islands (especially around Maui and Kauai). Hawksbill turtles are the second most common species in the offshore waters of the Hawaiian Islands, as also reflected by the stranding records, yet they are far less abundant than green turtles. Hawksbills occur around and nest on several of the Main Hawaiian Islands. Hawksbill nesting occurs primarily on the southeastern end of Hawaii and on the eastern end of Molokai (Aki et al., 1994).

Further offshore (in waters beyond the 55-fathom isobath), juvenile loggerheads forage in or migrate through the HRC as they move between North American developmental habitats and Japan. The highest densities of loggerheads can be found just north of the HRC within the North Pacific transition zone (Polovina et al., 2000). The highest densities of olive ridleys, on the other hand, are likely found just south of the HRC. The distribution of the olive ridley in the central Pacific Ocean is primarily tropical; as a result, they are often found in warmer waters than loggerheads (Polovina et al., 2004). The primary migration corridor for leatherbacks moving west from U.S. west coast foraging areas to western Pacific nesting and foraging areas lies along the southern edge of the HRC, while an eastward return corridor appears to pass through the northern portion of the HRC (U.S. Department of the Navy, 2005).

Due to the offshore habitat preferences of the green and hawksbill turtles and the oceanic habitat preferences of the loggerhead, olive ridley, and leatherback turtles, the entire HRC is recognized as an area of primary occurrence for sea turtles. Since the Hawaiian Islands are situated in tropical waters that are warm year-round, the area of primary occurrence is the same in fall and winter as it is in spring and summer. Sea turtles are also known to come ashore at several locations throughout the Main Hawaiian Islands, be it for terrestrial basking (green turtles only) or nesting (primarily green and hawksbill turtles). Nesting/basking sites for sea turtles occur on all eight of the Main Hawaiian Islands. Of note are green turtle nesting/basking beaches located at PMRF Barking Sands on Kauai and a green turtle basking beach located along Kiholo Bay off the northwestern shore of Hawaii (National Ocean Service, 2001; U.S. Department of the Navy, 2004). These beaches are located in areas where the HRC runs right up to the shoreline.

Sea turtle fibropapilloma is caused by a virus similar to herpes and affects the skin with large tumors (Quackenbush et al., 1998). Fibropapilloma may be caused by exposure to marine areas impacted by pollution such as runoff from agricultural, industrial, or urban sources (Aquirre and Lutz, 2004). Growth rates of green sea turtles were significantly lower in those with fibropapilloma tumors (Chaloupka and Balazs, 2005). Despite the effects of fibropapilloma on green sea turtles, the population has been increasing in the Hawaiian Islands (Balazs and Chaloupka, 2004).

Green Sea Turtle (*Chelonia mydas*)

Status. The green sea turtle is listed as threatened under the ESA. Green turtle populations are in serious decline throughout much of the Pacific Ocean but their status is currently improving in Hawaiian waters. This is presumably due to effective protection at primary nesting areas in the Northwest Hawaiian Islands and better enforcement of regulations prohibiting take of the species. However, the relatively recent increase in fibropapillomatosis, a tumor-producing disease in green turtles that is likely caused by a herpes-type virus, threatens to eliminate improvements in the status of the Hawaiian stock. There are no estimates of the current population size of green turtles in the Pacific Ocean (National Marine Fisheries Service and U.S. Fish and Wildlife Service, 1998a; 1998b).

Abundance and Distribution. Green turtles occur in the coastal waters surrounding the Main Hawaiian Islands throughout the year and also migrate seasonally to the Northwest Hawaiian Islands in order to reproduce.

Adult green turtles that breed in the Northwest Hawaiian Islands make regular reproductive migrations from their foraging grounds either around the Main Hawaiian Islands or around the westernmost atolls in the Northwest Hawaiian Islands. This has been evidenced by frequent mark-recapture and satellite-tracking studies on both adult male and female green turtles (Balazs, 1976; 1983; Balazs and Ellis, 2000; Balazs et al., 1994). Juvenile green turtles can also make long-range movements throughout the Hawaiian archipelago. From June 2002 to March 2003, a captive-reared green turtle released off northwestern Hawaii traveled over 2,983 mi around the Hawaiian Islands, swimming as far west as the waters between Nihoa and Necker Islands before turning around and heading back to the Main Hawaiian Islands (Thompson, 2003).

The largest nesting colony in the central Pacific Ocean occurs at French Frigate Shoals in the Northwest Hawaiian Islands, where about 200 to 700 females nest each year. On occasion, green turtles also nest in the Main Hawaiian Islands. The most famous nesting green turtle in the Main Hawaiian Islands is turtle 5690, known by sea turtle biologists as "Maui Girl." This turtle, which was raised to a year old at Oahu's Sea Life Park and then tagged and released, has nested on beaches near Lahaina, Maui in 2000, 2002, and 2004 (Leone, 2004). Other sporadic nesting events in the Main Hawaiian Islands have occurred along the north shore of Molokai, the northwest shore of Lanai, and the south, northeast, and southwest shores of Kauai (U.S. Department of the Navy, 2001b, 2002; National Ocean Service, 2001).

Green turtles outnumber all other species combined in the offshore waters of the Hawaiian archipelago. The available sighting and stranding data for the HRC clearly evidence this. The area of year-round primary occurrence for green turtles is located in waters inshore of the 55-fathom isobath (bathymetric contour of equal depth) around all of the Main Hawaiian Islands and Nihoa. It is in these areas where reefs, their preferred habitats for foraging and resting, are most abundant. The area of secondary occurrence encompasses an oceanic zone surrounding the Hawaiian Islands. This area is frequently inhabited by adults that are migrating to the Northwest Hawaiian Islands to reproduce and by pelagic stage individuals that have yet to settle into coastal feeding grounds of the Main Hawaiian Islands. Further offshore of this seasonal use zone is the area of year-round rare occurrence, as green turtles are not likely to be found in portions of the HRC that are extremely far from land.

Hawksbill Sea Turtle (*Eretmochelys imbricata*)

Status. The hawksbill sea turtle is listed as endangered under the ESA. A lack of regular quantitative surveys for hawksbill turtles in the Pacific Ocean and the discrete nature of this species' nesting have made it extremely difficult for scientists to assess the distribution and population status of hawksbills in the region (National Marine Fisheries Service and U.S. Fish and Wildlife Service, 1998c; Seminoff et al., 2003).

Abundance and Distribution. Around the Hawaiian Islands, hawksbills are only known to occur in the coastal waters of the eight main and inhabited islands of the archipelago. Hawksbills forage throughout the Main Hawaiian Islands, although in much fewer numbers than green turtles. Hawksbills have been captured at several locations including Kiholo Bay and Kau (Hawaii), Palaau (Molokai), and Makaha (Oahu) (Hawaii Department of Land and Natural Resources, 2002). Strandings have been reported in Kaneohe and Kahana Bays (Oahu) as well as in other locations throughout the Main Hawaiian Islands (Eckert, 1993; National Marine Fisheries Service and U.S. Fish and Wildlife Service, 1998c). No reliable reports are known from Niihau (U.S. Department of the Navy, 2001b). Hawksbills are much more abundant in the shallow, offshore waters of the Hawaiian Islands than they are in deeper, offshore waters of the central Pacific Ocean.

Throughout the year, the area of primary occurrence for hawksbill turtles can be found in HRC waters shoreward of the 55-fathom isobath. Beyond the 55-fathom isobath, hawksbill occurrence is rare year round. Pelagic stage individuals may occur in oceanic waters off the Main Hawaiian Islands and Nihoa, but these life stages are nearly impossible to sight during surveys and rarely, if ever, interact with the pelagic longline fishery. Of the five sea turtle species known to occur in the HRC, the hawksbill is the only one that is not taken by Hawaiian longliners (Kobayashi and Polovina, 2005).

Leatherback Sea Turtle (*Dermochelys coriacea*)

Status. The leatherback sea turtle is listed as endangered under the ESA. There are few quantitative data available concerning the seasonality, abundance, or distribution of leatherbacks in the central North Pacific Ocean. The leatherback is not typically associated with insular habitats, such as those characterized by coral reefs, yet individuals are occasionally encountered in deep ocean waters near prominent archipelagos such as the Hawaiian Islands (Eckert, 1993).

Abundance and Distribution. Leatherbacks are regularly sighted by fishermen in offshore waters surrounding the Hawaiian Islands, generally beyond the 647-fathom contour, and especially at the southeastern end of the island chain and off the north coast of Oahu (Nitta and Henderson, 1993; Balazs, 1995; 1998). Leatherbacks encountered in these waters, including those caught incidental to fishing operations, may represent individuals in transit from one part of the Pacific Ocean to another (National Marine Fisheries Service and U.S. Fish and Wildlife Service, 1998f). Leatherbacks apparently have a wide geographic distribution throughout the region where the Hawaiian longline fishery operates, with sightings and reported interactions commonly occurring around seamount habitats located above the Northwest Hawaiian Islands (from 35° to 45°N and 175° to 180°W) (Skillman and Balazs, 1992; Skillman and Kleiber, 1998). McCracken (2000) has also documented incidental captures of leatherbacks at several offshore locations around the Main Hawaiian Islands. Although leatherback bycatch events are common occurrences off the archipelago, leatherback stranding events on its beaches are not. Since 1982, only five leatherbacks have stranded in the Hawaiian Islands (National Marine Fisheries Service, Pacific Islands Fisheries Science Center, 2004).

Satellite-tracking studies, a lack of Hawaiian stranding records, and occasional incidental captures of the species in the Hawaii-based longline fishery indicate that deep, oceanic waters are the most preferred habitats of leatherback turtles in the central Pacific Ocean. As a result, the area of year-round primary occurrence for the leatherback turtle encompasses all HRC waters beyond the 55-fathom isobath. Inshore of the 55-fathom isobath is the area of rare leatherback occurrence. This area is also the same year round. Leatherbacks were not sighted during any of the aerial surveys for which data were collected, all of which took place over waters lying close to the Hawaiian shoreline. Leatherbacks were not sighted during any of the NMFS shipboard surveys either, although their deep diving capabilities and long submergence times lessen the probability that observers would be able to spot them during marine surveys.

Loggerhead Sea Turtle (*Caretta caretta*)

Status. The loggerhead sea turtle is listed as threatened under the ESA.

Abundance and Distribution. The NMFS and USFWS (1998d) listed four records of this species for the Hawaiian Islands: two from the southeastern end of the archipelago, one from Kure Atoll (recovered from the stomach of a tiger shark), and a fourth from the coast of Oahu (seen just offshore of the Sheraton Waikiki hotel). All four individuals were identified as juvenile loggerheads and most likely drifted or traveled to the region from either Mexico or Japan. A single male loggerhead turtle has also been reported to visit Lehua Channel and Keamano Bay (located off the north coast of Niihau) every June through July (U.S. Department of the Navy, 2001b; National Ocean Service, 2001). Only one loggerhead stranding has been recorded in the Hawaiian Islands since researchers began documenting them in 1982. This event, which was recorded along the shores of Kaneohe Bay, Oahu, was determined to be the result of a shark attack (National Marine Fisheries Service, Pacific Islands Fisheries Science Center, 2004).

Genetic analyses indicate that nearly all of the loggerheads found in the North Pacific Ocean are born on nesting beaches in Japan (Bowen et al., 1995; Resendiz et al., 1998). Pacific loggerheads appear to utilize the entire North Pacific Ocean during the course of development, much like Atlantic loggerheads use the North Atlantic Ocean. There is substantial evidence that both stocks make two separate transoceanic crossings. The first crossing (west to east) is made immediately after hatching from the nesting beach, while the second (east to west) is made upon reaching either the late juvenile or adult life stage.

The area of primary occurrence for the loggerhead turtle spans all ocean waters off the Main Hawaiian Islands and Nihoa beyond the 55-fathom isobath. This area, like the area of rare occurrence, which can be found between the Hawaiian Islands shoreline and the 55-fathom isobath, is the same throughout the year. Occurrence in offshore waters is believed to be rare due to a lack of sighting and stranding records in those waters. Except for the four sighting and one stranding records listed previously, loggerheads have not been recorded at all on the Hawaiian shelf.

Olive Ridley Sea Turtle (*Lepidochelys olivacea*)

Status. The olive ridley sea turtle is listed as threatened under the ESA. Until the advent of commercial exploitation, the olive ridley was highly abundant in the eastern tropical Pacific Ocean probably outnumbering all other sea turtle species combined in the area (National Marine Fisheries Service and U.S. Fish and Wildlife Service, 1998e). Clifton et al. (1995) estimated that a minimum of 10 million olive ridleys were present in ocean waters off the Pacific coast of Mexico prior to 1950. Even though there are no current estimates of worldwide abundance, the olive ridley is still considered the most abundant of the world's sea turtles. However, the number of olive ridley turtles occurring in U.S. territorial waters is believed to be small (National Marine Fisheries Service and U.S. Fish and Wildlife Service, 1998e).

Abundance and Distribution. Olive ridleys are rare visitors to the offshore waters around the Hawaiian Islands, although they have been recorded in increasing numbers over the past two decades. Juveniles and adults have become entangled in fishing gear and other marine debris in offshore waters off Hawaii, Molokai, Maui, and Oahu (Eckert, 1993). A total of 26 olive ridley turtles have stranded in the Hawaiian Islands since 1982, making it the third most common species to strand after greens and hawksbills (Hawaii Department of Land and Natural Resources, 2002). Available information suggests that olive ridleys traverse through the oceanic waters surrounding the Hawaiian Islands during foraging and developmental migrations (Nitta and Henderson, 1993).

In the Hawaiian Islands, a single nesting was recorded along Paia Bay, Maui in September 1985; however, there was no successful hatching associated with this event (Balazs and Hau 1986; National Ocean Service, 2001). Since there are no other known nesting records for the central Pacific Ocean, the above nesting attempt should be considered an anomaly (National Marine Fisheries Service and U.S. Fish and Wildlife Service, 1998e).

About two-thirds of all olive ridleys found in the vicinity of the Hawaiian Islands are derived from eastern Pacific nesting populations, while the remaining one-third originate in the western Pacific Ocean or Indian Ocean. As a result, the Hawaiian Islands represent a point of convergence for these source areas (Hawaii Department of Land and Natural Resources, 2002).

Based on the oceanic habitat preferences of this species throughout the Pacific Ocean, the area of year-round primary occurrence in the HRC lies in waters beyond the 55-fathom isobath. Olive ridleys are frequently captured by pelagic longline fishermen in deep, offshore waters of the HRC, especially during spring and summer. Inside of the 55-fathom isobath, olive ridley occurrence in the HRC is rare year round. Like the loggerhead turtle, there have been few recorded sightings and strandings of this species in the offshore waters of the Main Hawaiian Islands and Nihoa (as compared to the green and hawksbill turtles, which are primarily offshore species). A significant number of strandings in an area likely indicates a strong presence in waters nearby, which is not the case here. A single recorded nesting attempt for the olive ridley over the past 20 years also indicates the lack of a need for this species to enter coastal waters surrounding the Hawaiian Islands.

Marine Mammals

Marine mammals addressed within this EIS include members of two orders: Cetacean, which includes whales, dolphins, and porpoises; and Carnivora, which includes true seals (family Phocidae), sea lions (family Otariidae). Cetaceans spend their lives entirely at sea. Pinnipeds (seals and sea lions) hunt and feed exclusively in the ocean, and one of the species occurring in the areas addressed in this EIS/OEIS come ashore to rest, mate, and bear young. There are 27 species of marine mammals that occur in the Hawaiian Islands area (Table 3.1.2-2). Most of the marine mammal species found in the Hawaiian Islands area are cetaceans, including seven mysticetes (baleen whales) and 18 odonocetes (tooth whales and dolphins) with two pinniped

Table 3.1.2-2. Summary of Hawaiian Islands Stock or Population of Marine Mammals

Order Cetacea	Scientific Name	Status	Occurs[1]	Group Size[2]	Detection Probability[3] Group 1-20	Group >20	Hawaii Abundance
MYSTICETES (baleen whales)							
Family Balaenidae (right whales)							
North Pacific right whale	*Eubalaena japonica*	E	Rare				UNK
Family Balaenopteridae (rorquals)							
Humpback whale	*Megaptera novaeangliae*	E	Regular	1.7			4,005
Minke whale	*Balaenoptera acutorostrata*		Rare				UNK
Sei whale	*Balaenoptera borealis*	E	Rare	3.4	0.90	0.90	77
Fin whale	*Balaenoptera physalus*	E	Rare	2.6	0.90	0.90	174
Blue whale	*Balaenoptera musculus*	E	Rare				UNK
Bryde's whale	*Balaenoptera edini/brydei**		Regular	1.5	0.90	0.90	469
ODONTOCETES (toothed whales)							
Family Physeteridae (sperm whale)							
Sperm whale	*Physeter macrocephalus*	E	Regular	7.3	0.87	0.87	6,919
Family Kogiidae (pygmy sperm whales)							
Pygmy sperm whale	*Kogia breviceps*		Regular	1.0	0.35	0.35	7,138
Dwarf sperm whale	*Kogia sima*		Regular	2.3	0.35	0.35	17,519
Family Ziphiidae (beaked whales)							
Cuvier's beaked whale	*Ziphius cavirostris*		Regular	2.0	0.23	0.23	15,242
Blainville's beaked whale	*Mesoplodon densirostris*		Regular	2.3	0.45	0.45	2,872
Longman's beaked whale	*Indopacetus pacificus*		Regular	17.8	0.76	1.00	1.00
Family Delphinidae (dolphins)							
Rough-toothed dolphin	*Steno bredanensis*		Regular	14.8	0.76	1.00	8,709
bottlenose dolphin	*Tursiops truncatus*		Regular	9.0	0.76	1.00	3,215
Pantropical spotted dolphin	*Stenella attenuata*		Regular	60.0	0.76	1.00	8,978
Spinner dolphin	*Stenella longirostris*		Regular	31.7	0.76	1.00	3,351
Striped dolphin	*Stenella coeruleoalba*		Regular	37.3	0.76	1.00	13,143
Risso's dolphin	*Grampus griseus*		Regular	15.4	0.76	1.00	2,372
Melon-headed whale	*Peponocephala electra*		Regular	89.2	0.76	1.00	2,950
Fraser's dolphin	*Lagenodelphis hosei*		Rare	286.3	0.76	1.00	10,226
Pygmy killer whale	*Feresa attenuata*		Regular	14.4	0.76	1.00	956
False killer whale	*Pseudorca crassidens*		Regular	10.3	0.76	1.00	236
Killer whale	*Orcinus orca*		Regular	6.5	0.90	0.90	349
Short-finned pilot whale	*Globicephala macrorhynchus*		Regular	22.5	0.76	1.00	8,870
Total Number of Delphinids in Hawaiian Waters (from Barlow 2006)							63,354
Total Number of Beaked Whales in Hawaiian Waters (from Barlow 2006)							19,492
PINNIPEDS (seals, sea lions, walruses)							
Family Phocidae (true seals)							
Hawaiian monk seal	*Monachus schauinslandi*	E	Regular				
Northern elephant seal	*Mirounga angustirostris*		Rare				

Source: U.S. Department of the Navy 2005a; Barlow, 2003; Mobley, 2001; Barlow 2006

Notes: Taxonomy follows Rice (1998) for pinnipeds and sirenians and the International Whaling Commission (2004) for cetaceans.

[1] Occurrence: **Regular** = A species that occurs as a regular or normal part of the fauna of the area, regardless of how abundant or common it is; **Rare** = A species that only occurs in the area sporadically; *includes more than one species, but nomenclature is still unsettled.

[2] Mean group sizes are the geometric mean of best estimates from multiple observers and have not been corrected for bias.

[3] Barlow (2006)

[4] Central North Pacific Stock

[5] Carreta et al. 2006

E = Endangered UNK = Unknown

species, both phocids (true seals). No otariids (sea lions and fur seals) or sirenians (dugongs and manatees) are found in the Hawaiian Islands area. Of the 27 marine mammal species, seven species are considered endangered under the ESA and are considered a depleted and strategic stock under the 1972 Marine Mammal Protection Act (MMPA).

Marine mammals inhabit most marine environments from deep ocean canyons to shallow estuarine waters. They are not randomly distributed. Marine mammal distribution is affected by demographic, evolutionary, ecological, habitat-related, and anthropogenic factors (Bowen et al*.,* 2002; Bjørge, 2002; Forcada, 2002; Stevick et al*.,* 2002). Marine mammal movements are often related to feeding or breeding activity (Stevick et al*.,* 2002). A migration is the periodic movement of all, or significant components of an animal population from one habitat to one or more other habitats and back again. Some baleen whale species, such as humpback whales, make extensive annual migrations to low-latitude mating and calving grounds in the winter and to high-latitude feeding grounds in the summer (Corkeron and Connor, 1999).

The oceanic waters surrounding the Hawaiian Islands do not contain a true continental shelf, and therefore no true shelf break—the region in which there is a sharp break in the slope of the island shelf (Kennett, 1982; Thurman, 1997). Rather, the HRC and vicinity is composed of a series of volcanic seamounts, several of which have broken the surface to form the Hawaiian Islands. Seamount topography has been previously correlated with enhanced production due to the formation of vortices capable of mixing nutrients to the surface and entraining phytoplankton in the overlying waters (Rogers, 1994).

In addition, the passage of the North Equatorial Current through the Hawaiian archipelago is capable of creating regions of enhanced turbulence. Passage of the current of the North Equatorial Current can initiate the formation of eddies on the lee side of the islands (Wolanski et al*.,* 2003); these are capable of entraining phytoplankton and creating localized regions of enhanced primary production. In addition, passage of currents through a narrow channel (as found in the Alenuehaha Channel between Hawaii and Maui) can create localized zones of turbulent flow capable of mixing nutrients into the surface layer to fuel primary production (Gilmartin and Revelante, 1974; Simpson et al*.,* 1982).

Marine Mammal Occurrence

Information on the abundance, behavior, distribution, and diving behavior of marine mammals species in the Hawaiian waters is based on peer review literature including the most recent publications, the Navy Marine Resource Assessment, NMFS Stock Assessment Reports, marine mammals surveys using acoustics or visual observations from aircraft or ships, and previous environmental documents such as the Rim of the Pacific (RIMPAC) EA and supplements and the Undersea Warfare Exercise EA/Overseas EA and Incidental Harassment Authorization applications. Information on each species is given relative to offshore (within 25 nautical miles [nm] of shore) and offshore (beyond 25 nm from shore) habitats. In this section, mysticetes are listed first, followed by odontocetes, then pinniped species (Table 3.1.2-2).

Mysticetes

<u>North Pacific Right Whale (*Eubalaena japonica*)</u>

<u>Stock</u>. Eastern North Pacific

<u>Status</u>. The north Pacific right whale is listed as endangered under the ESA and as a depleted and strategic stock under the MMPA (Carretta et al., 2005). Until recently, right whales in the North Atlantic and North Pacific were classified together as a single species, referred to as the "northern right whale." Genetic data indicate that these two populations represent separate species: the North Atlantic right whale (*Eubalaena glacialis*) and the North Pacific right whale (*Eubalaena japonica*) (Rosenbaum et al., 2000).

The North Pacific right whale is perhaps the world's most endangered large whale species (Perry et al., 1999; International Whaling Commission, 2001). North Pacific right whales are classified as endangered both under the ESA and on the IUCN Red List (Reeves et al., 2003). There are insufficient genetic or resighting data to address whether there is support for the traditional separation into eastern and western stocks (Brownell et al., 2001); however, Clapham et al. (2004) noted that north–south migratory movements support the hypothesis of two largely discrete populations of right whales in the eastern and western North Pacific. No reliable population estimate presently exists for this species; the population in the eastern North Pacific is considered to be very small, perhaps only in the tens of animals (National Marine Fisheries Service, 2002; Clapham et al., 2004), while in the western North Pacific, the population may number at least in the low hundreds (Brownell et al., 2001; Clapham et al., 2004). There is no proposed or designated critical habitat for the North Pacific right whale in the HRC.

<u>Abundance and Distribution</u>. Right whales occur in sub-polar to temperate waters. The North Pacific right whale historically occurred across the Pacific Ocean north of 35 degrees north, with concentrations in the Gulf of Alaska, eastern Aleutian Islands, south-central Bering Sea, Sea of Okhotsk, and the Sea of Japan (Omura et al., 1969; Scarff, 1986; Clapham et al., 2004). Presently, sightings are extremely rare, occurring primarily in the Okhotsk Sea and the eastern Bering Sea (Brownell et al., 2001; Shelden et al., 2005). Prior to 1996, right whale sightings were very rare in the eastern North Pacific (Scarff, 1986; Brownell et al., 2001). Recent summer sightings of right whales in the eastern Bering Sea represent the first reliable consistent observations in this area since the 1960s (Tynan et al., 2001; LeDuc, 2001).).

Neither the west coast of North America nor the Hawaiian Islands constituted a major calving ground for right whales within the last 200 years (Scarff, 1986). No coastal calving grounds for right whales have been found in the western North Pacific either (Scarff, 1986). Mid-ocean whaling records of right whales in the winter suggest that right whales may have wintered and calved far offshore in the Pacific (Scarff, 1986; 1991; Clapham et al., 2004). Such pelagic calving would appear to be inconsistent with the records of offshore calving grounds in other locales for the other right whale species.

There are very few recorded sightings from the Hawaiian Islands; they are from both shallow and deep waters (Herman et al., 1980; Rowntree et al., 1980; Salden and Mickelsen, 1999). Secondary occurrence is expected from the coastline to seaward of the HRC boundaries. Right whales are not expected to make their way into lagoons or busy harbors; therefore, occurrence in Pearl Harbor is expected to be rare (U.S. Department of the Navy, 2005). Right whale occurrence patterns are assumed to be similar throughout the year. Based on migration patterns and whaling data, the Hawaiian Islands may have been a breeding ground for North Pacific right whales in the past (Clapham et al., 2004).

Diving Behavior. Dives of 5 to 15 min or even longer have been reported (Winn et al., 1995; Mate et al., 1997; Baumgartner and Mate, 2003). Baumgartner and Mate (2003) found that the average depth of a North Atlantic right whale dive was strongly correlated with both the average depth of peak copepod abundance and the average depth of the bottom mixed layer's upper surface. North Atlantic right whale feeding dives are characterized by a rapid descent from the surface to a particular depth between 262 and 574 ft, remarkable fidelity to that depth for 5 to 14 min and then rapid ascent back to the surface (Baumgartner and Mate, 2003). Longer surface intervals have been observed for reproductively active females and their calves (Baumgartner and Mate, 2003).

Acoustics. North Pacific right whale calls are classified into five categories: (1) up; (2) down-up; (3) down; (4) constant; and (5) unclassified (McDonald and Moore, 2002). The 'up' call is the predominant type (McDonald and Moore, 2002; Mellinger et al., 2004). Typically, the 'up' call is a signal sweeping from about 90 to 150 Hz in 0.7 sec and could be detected out to 13.5 nm (McDonald and Moore, 2002). Wiggins et al. (2004) recorded upsweeping low frequency (90-160 kHz) calls of north Pacific right whales in the Bering Sea. Right whales commonly produce calls in a series of 10 to 15 calls lasting 5 to 10 min, followed by silence lasting an hour or more; some individuals do not call for periods of at least 4 hours (McDonald and Moore, 2002). This calling pattern is similar to the 'moan cluster' reported for North Atlantic right whales by Matthews et al. (2001). Vocalization rates of North Atlantic right whales are also highly variable, and individuals have been known to remain silent for hours (Gillespie and Leaper, 2001).

Frequencies of these vocalizations are between 50 and 500 Hz (Matthews et al., 2001; Laurinolli et al., 2003); typical sounds are in the 300 to 600 Hz range with up- and down-sweeping modulations (Vanderlaan et al., 2003). Vanderlaan et al. (2003) found that lower (<200 Hz) and higher (>900 Hz) frequency sounds are relatively rare. Source levels have been estimated only for pulsive calls of North Atlantic right whales, which are 172 to 187 dB re 1 µPa-m (Richardson et al., 1995).

Morphometric analyses of the inner ear of right whales resulted in an estimated hearing frequency range of approximately 10 Hz to 22 kHz, based on established marine mammal models (Parks et al., 2004). Research by Nowacek et al. (2004) on North Atlantic right whales suggests that received sound levels of only 133 to 148 dB re 1 µPa at 120 Hz to 4.5 kHz for the duration of the sound exposure (three signals of 2 min each played over 18 min) are likely to disrupt feeding behavior. The authors did note, however, that a return to normal behavior within minutes of when the source is turned off would be expected. While some of the upper frequencies approach those of mid-frequency active sonar, the signal is not similar because they were either too low in frequency range or longer and contains a down sweep signal 4500 – 500 Hz.

Humpback Whale (Megaptera novaeangliae)
Stock. Central North Pacific

Status. The humpback whale is listed as endangered under the ESA and as a depleted and strategic stock under the MMPA (Carretta et al*.,* 2005). There is no designated critical habitat for this species in the North Pacific.

Abundance and Distribution. The best available estimate of abundance for the Central West Pacific stock of the humpback whales is 4005 individuals (Carretta et al*.,* 2005).Humpback whales use Hawaiian waters as a major breeding ground during winter and spring (November through April). Peak abundance around the Hawaiian Islands is from late February through early April (Mobley et al*.,* 2001; Carretta et al*.,* 2005). During the fall-winter period, primary occurrence is expected from the coast to 50 nm offshore, which takes into consideration both the available sighting data and the preferred breeding habitat (shallow waters) (Herman and Antinoja, 1977; Mobley et al*.,* 1999, 2000, 2001). The greatest densities of humpback whales (including calves) are in the four-island region consisting of Maui, Molokai, Kahoolawe, and Lanai, as well as Penguin Bank (Baker and Herman, 1981; Mobley et al*.,* 1999; Maldini, 2003) and around Kauai (Mobley, 2005). Secondary occurrence is expected from seaward of this area, past the HRC boundaries. Humpback whales are not expected to be in Pearl Harbor, though an anomalous sighting of an adult and calf was reported during 1998 and 2003 (U.S. Department of the Navy, 2005). The occurrence of humpback whales in deeper waters is based on work in the Caribbean (the breeding ground for humpback whales in the North Atlantic), where humpback whale calls were acoustically detected over deep water, far from any banks or islands (Swartz et al*.,* 2002).

During the spring–summer period, secondary occurrence is expected offshore out to 50 nm, mainly to account for the possible occurrence of humpback whales during the end of the breeding season (April). Humpback whales return to the feeding grounds of near northern California to the Aleutian Islands as determined by comparing songs (McSweeney et al., 1989) and recording the migration path of animals with satellite tags (Mate et al., 1998). Occurrence further offshore, as well as in Pearl Harbor, is expected to be rare.

The Hawaiian Islands Humpback Whale National Marine Sanctuary was signed into law in November 1992. The Final EIS/Management Plan was released in March 1997, and the final rule was published in November 1999. Activities allowed within the Sanctuary are all classes of military activities, internal or external to the Sanctuary, that are being or have been conducted before the effective date of the regulations, as identified in the Final EIS/Management Plan. The sanctuary includes specific areas from the coast of the Hawaiian Islands seaward to the 100-fathom isobath.

Diving Behavior. Humpback whale diving behavior depends on the time of year (Clapham and Mead, 1999). In summer, most dives last less than 5 min; those exceeding 10 min are atypical. In winter (December through March), dives average 10 to 15 min; but dives of greater than 30 min have also been recorded (Clapham and Mead, 1999). Although humpback whales have been recorded to dive as deep as about 273 fathoms (Dietz et al., 2002), on the feeding grounds they spend the majority of their time in the upper 66 fathoms of the water column (Dolphin, 1987; Dietz et al., 2002). Humpback whales on the wintering grounds do dive deeply; Baird et al. (2000) recorded dives to a maximum of 577 ft.

Acoustics. Humpback whales are known to produce three classes of vocalizations: (1) "songs" in the late fall, winter, and spring by solitary males; (2) sounds made within groups on the wintering (calving) grounds; and (3) social sounds made on the feeding grounds (Richardson et al., 1995). The best-known types of sounds produced by humpback whales are songs, which are thought to be breeding displays used only by adult males (Helweg et al., 1992). Singing is most common on breeding grounds during the winter and spring months, but is occasionally heard outside breeding areas and out of season (Matilla et al., 1987; Clark and Clapham, 2004). There is geographical variation in humpback whale song, with different populations singing different songs, and all members of a population using the same basic song. However, the song evolves over the course of a breeding season, but remains nearly unchanged from the end of one season to the start of the next (Payne et al., 1983). Social calls are from 50 Hz to over 10 kHz, with the highest energy below 3 kHz (Silber, 1986). Female vocalizations appear to be simple; Simão and Moreira (2005) noted little complexity. The male song, however, is complex and changes between seasons. Components of the song range from under 20 Hz to 4 kHz and occasionally 8 kHz, with source levels of 144 to 174 dB re 1 µPa-m, with a mean of 155 dB re 1 µPa-m. Au et al. (2001) recorded high-frequency harmonics (out to 13.5 kHz) and source level (between 171 and 189 dB re 1 µPa-m) of humpback whale songs. Songs have also been recorded on feeding grounds (Mattila et al., 1987; Clark and Clapham, 2004).

The main energy lies between 0.2 and 3.0 kHz, with frequency peaks at 4.7 kHz. Feeding calls, unlike song and social sounds, are highly stereotyped series of narrow-band trumpeting calls. They are 20 Hz to 2 kHz, less than 1 sec in duration, and have source levels of 175 to 192 dB re 1 µPa-m. The fundamental frequency of feeding calls is approximately 500 Hz (D'Vincent et al., 1985).

No tests on humpback whale hearing have been made. Houser et al. (2001) constructed a humpback audiogram using a mathematical model based on the internal structure of the ear. The predicted audiogram indicates sensitivity to frequencies from 700 Hz to 10 kHz, with maximum relative sensitivity between 2 and 6 kHz. Maybaum (1989) reported that humpback whales showed a mild response to a hand held sonar marine mammal detection and location device (frequency of 3.3 kHz at 219 dB re 1µPa @ 1 meter or frequency sweep of 3.1-3.6 kHz) although this system is very different from the Navy's haul mounted sonars. In addition, the system had some low frequency components (below 1 kHz) which may be an artifact of the acoustic equipment. This may have affected the response of the whales to both the control and sonar playbacks. Humpback whales also stop singing in response to playbacks of the singing or social sounds of conspecifics (Tyack 1983). Miller et al. (2000) reported that humpback whales sang longer during playbacks of LFA sonar which is much lower in frequency than the mid-frequency active sonar proposed in this EIS.

Minke Whale (*Balaenoptera acutorostrata*)

Stock. Hawaiian

Status. The minke whale is not listed as endangered under the ESA and is not a depleted or strategic stock under the MMPA (Carretta et al., 2005). The International Whaling Commission (IWC) recognizes three stocks of minke whales in the North Pacific: one in the Sea of Japan/East China Sea, one in the rest of the western Pacific west of 180°N, and one in the remainder of the Pacific (Donovan, 1991). For the National Oceanic and Atmospheric Administration stock assessment report, there are three stocks of minke whales within the U.S. Pacific Exclusive Economic Zone (EEZ): (1) a Hawaiian stock; (2) a California/Oregon/

Washington stock; and (3) an Alaskan stock (Carretta et al., 2005). There currently is no abundance estimate for the Hawaiian stock of minke whales, which appears to occur seasonally (approximately November through March) around the Hawaiian Islands (Carretta et al., 2005).

Abundance and Distribution. There currently is no abundance estimate for the Hawaiian stock of minke whales, which appears to occur seasonally (approximately November through March) around the Hawaiian Islands (Carretta et al., 2005). There is no estimate of abundance for the Hawaiian stock of the minke whale (Carretta et al., 2005).

Minke whales are distributed in polar, temperate, and tropical waters (Jefferson et al., 1993); they are less common in the tropics than in cooler waters. Minke whales are present in the North Pacific from near the equator to the Arctic (Horwood, 1990). The summer range extends to the Chukchi Sea (Perrin and Brownell, 2002). In the winter, minke whales are found south to within 2° of the equator (Perrin and Brownell, 2002). The distribution of minke whale vocalizations (specifically, "boings") suggests that the winter breeding grounds are the offshore tropical waters of the North Pacific Ocean (Rankin and Barlow, 2003). There is no obvious migration from low-latitude, winter breeding grounds to high-latitude, summer feeding locations in the western North Pacific, as there is in the North Atlantic (Horwood, 1990); however, there are some monthly changes in densities in both high and low latitudes (Okamura et al., 2001). In the northern part of their range, minke whales are believed to be migratory, whereas they appear to establish home ranges in the inland waters of Washington and along central California (Dorsey et al., 1983) and exhibit site fidelity to these areas between years (Borggaard et al., 1999).

The minke whale is expected to occur seasonally in the HRC (Barlow, 2003). Abundance is expected to be higher between November and March (Carretta et al., 2005). Therefore, an area of secondary occurrence is seaward of the shoreline during the fall-winter period. Both visual and acoustic detections of minke whales have been reported for this area (Balcomb, 1987; Thompson and Friedl, 1982; Barlow et al., 2004; Carretta et al., 2005; Norris et al., 2005). The occurrence pattern takes into account both sightings in shallow waters in some locales globally as well as the anticipated oceanic occurrence of this species (U.S. Department of the Navy 2005). "Boings" were recorded in waters with a bottom depth of approximately 700 to 2,100 fathoms (Norris et al., 2005). Norris et al. (2005) reported sighting a minke whale 58 mi southwest of Kauai, in waters with a bottom depth of approximately 1,400 fathoms (U.S. Department of the Navy, 2005). During the spring-summer period, there is a rare occurrence for the minke whale throughout the entire HRC although recent evidence from passive acoustic monitoring suggests that there may be more minke whales in the HRC than previously thought (Rankin and Barlow, 2005; Barlow 2006).

Diving Behavior. Stern (1992) described a general surfacing pattern of minke whales consisting of about four surfacings, interspersed by short-duration dives averaging 38 sec. After the fourth surfacing, there was a longer duration dive ranging from approximately 2 to 6 min. Minke whales are "gulpers," like the other rorquals (Pivorunas, 1979). Hoelzel et al. (1989) reported on different feeding strategies used by minke whales. In the North Pacific, major food items include krill, Japanese anchovy, Pacific saury, and walleye Pollock (Perrin and Brownell, 2002).

Acoustics. Recordings in the presence of minke whales have included both high-and low-frequency sounds (Beamish and Mitchell, 1973; Winn and Perkins, 1976; Mellinger et al., 2000). Mellinger et al. (2000) described two basic forms of pulse trains that were attributed to minke whales: a “speed up” pulse train with energy in the 200 to 400 Hz band, with individual pulses lasting 40 to 60 milliseconds, and a less-common “slow-down” pulse train characterized by a decelerating series of pulses with energy in the 250 to 350 Hz band. Recorded vocalizations from minke whales have dominant frequencies of 60 Hz to greater than 12,000 Hz, depending on vocalization type (Richardson et al., 1995). Recorded source levels, depending on vocalization type, range from 151 to 175 dB re 1 µPa-m (Ketten, 1998). Gedamke et al. (2001) recorded a complex and stereotyped sound sequence (“star-wars vocalization”) in the Southern Hemisphere that spanned a frequency range of 50 Hz to 9.4 kHz. Broadband source levels between 150 and 165 dB re 1 µPa-m were calculated. “Boings,” recently confirmed to be produced by minke whales and suggested to be a breeding call, consist of a brief pulse at 1.3 kHz, followed by an amplitude-modulated call with greatest energy at 1.4 kHz, with slight frequency modulation over a duration of 2.5 sec (Anonymous, 2002; Rankin and Barlow, 2003). While no data on hearing ability for this species are available, Ketten (1997) hypothesized that mysticetes have acute infrasonic hearing.

Sei Whale (*Balaenoptera borealis*)

Stock. Hawaiian

Status. The sei whale is listed as endangered under the ESA and as a depleted and strategic stock under the MMPA (Carretta et al., 2005). The IWC designates the entire North Pacific Ocean as one sei whale stock unit (Donovan, 1991), although some evidence exists for multiple stocks National Marine Fisheries Service, 1998; Carretta et al., 2005). For the National Oceanic and Atmospheric Administration stock assessment reports, sei whales within the Pacific EEZ are divided into three discrete, non-contiguous areas: (1) the Hawaiian stock; (2) California/ Oregon/Washington stock; and (3) the Eastern North Pacific (Alaska) stock (Carretta et al., 2005).

The taxonomy of the baleen whale group formerly known as sei and Bryde’s whales is currently confused and highly controversial (see Reeves et al., 2004) for a recent review, also see the Bryde’s whale species account below for further explanation).

Abundance and Distribution. The best available estimate of abundance for the Hawaiian stock of the sei whale is 77 (Coefficient of Variation [CV] = 1.06) individuals (Carretta et al., 2005). There is no information on the population trend of sei whales. Sei whales have a worldwide distribution, but are found primarily in cold temperate to subpolar latitudes, rather than in the tropics or near the poles (Horwood, 1987). Sei whales are also known for occasional irruptive occurrences in areas followed by disappearances for sometimes decades (Horwood, 1987; Schilling et al., 1992; Clapham et al., 1997).

Sei whales spend the summer months feeding in the subpolar higher latitudes and return to the lower latitudes to calve in winter. There is some evidence from whaling catch data of differential migration patterns by reproductive class, with females arriving at and departing from feeding areas earlier than males (Horwood, 1987; Perry et al., 1999). For the most part, the location of winter breeding areas remains a mystery (Rice, 1998; Perry et al., 1999). In the North Pacific, sei whales are thought to occur mainly south of the Aleutian Islands. They are present all across the temperate North Pacific north of 40°N (National Marine Fisheries Service, 1998) and are seen at least as far south as 20°N (Horwood, 1987). In the east, they range as far south as Baja California, Mexico, and in the west, to Japan and Korea (Reeves et al., 1999). As noted by

Reeves et al. (1999), reports in the literature from any time before the mid-1970s are suspect, because of the frequent failure to distinguish sei from Bryde's whales, particularly in tropical to warm temperate waters where Bryde's whales are generally more common than sei whales.

The sei whale is considered to be rare in Hawaiian waters based on reported sighting data and the species' preference for cool, temperate waters. Secondary occurrence is expected seaward of the 1,640-fathom isobath on the north side of the islands only. This pattern was based on sightings made during the NMFS–Southwest Fisheries Science Center shipboard survey assessment of Hawaiian cetaceans (Barlow et al., 2004). Sei whales are expected to be rare throughout the remainder of the HRC. Occurrence patterns are expected to be the same throughout the year.

<u>Diving Behavior</u>. There are no reported diving depths or durations for sei whales.

<u>Acoustics</u>**.** Sei whale vocalizations have been recorded only on a few occasions. They consist of paired sequences (0.5 to 0.8 sec, separated by 0.4 to 1.0 sec) of 7 to 20 short (4 milliseconds) frequency modulated sweeps between 1.5 and 3.5 kHz; source level is not known (Richardson et al., 1995). Sei whales in the Antarctic produced broadband "growls" and "whooshes" at frequency of 433 ±192 kHz and source level of 156 ±3.6 dB re 1 µPa at 1 m (Mc Donald et al., 2005).

Although no data on hearing ability for this species are available, Ketten (1997) hypothesized that mysticetes have acute infrasonic hearing.

<u>Fin Whale (*Balaenoptera physalus*)</u>

<u>Stock</u>. Hawaiian

<u>Status</u>. The fin whale is listed as endangered under the ESA and as a depleted and strategic stock under the MMPA. There is no designated critical habitat for this species in the North Pacific. The IWC recognizes two management stocks in the North Pacific: a single widespread stock in the North Pacific and a smaller stock in the East China Sea (Donovan, 1991). The National Oceanic and Atmospheric Administration stock assessment report recognizes three stocks of fin whales in the North Pacific: (1) the Hawaii stock; (2) the California/Oregon/ Washington stock; and (3) the Alaska stock (Carretta et al., 2005). There is no information on the population trend of fin whales.

<u>Abundance and Distribution</u>. The best available estimate of abundance for the Hawaiian stock of the fin whale is 174 (CV = 0.72) individuals (Barlow, 2003; Carretta et al., 2005). There is no information on the population trend of fin whales. Fin whales are broadly distributed throughout the world's oceans, usually in temperate to polar latitudes, and less commonly in the tropics (Reeves et al., 2002). Fin whales are distributed across the North Pacific during the summer (May through October) from the southern Chukchi Sea (69°N) south to the Subarctic Boundary (approximately 42°N) and to 30°N in the California Current (Mizroch et al., 1999). They have been observed during the summer in the central Bering Sea (Moore et al., 2000).

Fin whales are not common in the Hawaiian Islands. Sightings were reported north of Oahu in May 1976, the Kauai Channel in February 1979, and north of Kauai during February 1994 (Shallenberger, 1981; Mobley et al., 1996). Thompson and Friedl (1982) suggested that fin whales migrate into Hawaiian waters mainly during fall and winter, based on acoustic recordings off the islands of Oahu and Midway (Northrop et al., 1971; McDonald and Fox, 1999). Primary occurrence is expected seaward of the 330 ft isobath during the fall-winter period to account for possible stragglers migrating through the area. There is a rare occurrence for the fin whale from the shore to the 55-fathom isobath. There is a rare occurrence of fin whales throughout the Hawaiian Islands during the spring-summer period.

Diving Behavior. Fin whales typically dive for 5 to 15 min, separated by sequences of 4 to 5 blows at 10 to 20 sec intervals (Cetacean and Turtle Assessment Program, 1982; Stone et al., 1992; Lafortuna et al., 2003). Kopelman and Sadove (1995) found significant differences in blow intervals, dive times, and blows per hour between surface feeding and non-surface-feeding fin whales. Croll et al. (2001) determined that fin whales dived to 321 ft (98 m)± 106.8 ft) with a duration of 6.3 min (SD = ±1.53 min) when foraging and to 194 ft (SD = ±97 ft) with a duration of 4.2 min (SD = ±1.67 min) when not foraging. Goldbogen et al. (2006) reported that fin whales in California made foraging dives to a maximum of 748-889 ft and dive durations of 6.2-7.0 min. Fin whale dives exceeding 492 ft and coinciding with the diel migration of krill were reported by Panigada et al. (1999).

Acoustics. Fin and blue whales produce calls with the lowest frequency and highest source levels of all cetaceans. Infrasonic, pattern sounds have been documented for fin whales (Watkins et al., 1987; Clark and Fristrup, 1997; McDonald and Fox, 1999). Fin whales produce a variety of sounds with a frequency range up to 750 Hz. The long, patterned 15 to 30 Hz vocal sequence is most typically recorded; only males are known to produce these (Croll et al., 2002). The most typical fin whale sound is a 20 Hz infrasonic pulse calls (actually an FM sweep from about 23 to 18 Hz) with durations of about 1 sec and can reach source levels of 184 to 186 dB re 1 µPa-m (maximum up to 200) (Richardson et al., 1995; Charif et al., 2002). Croll et al. (2002) recently suggested that these long, patterned vocalizations might function as male breeding displays, much like those that male humpback whales sing. The source depth, or depth of calling fin whales, has been reported to be about 27 fathoms (Watkins et al., 1987). While no data on hearing ability for this species are available, Ketten (1997) hypothesized that mysticetes have acute infrasonic hearing.

Blue Whale (*Balaenoptera musculus*)

Stock. Western North Pacific

Status. The blue whale is listed as endangered under the ESA and as a depleted and strategic stock under the MMPA. The NMFS considers blue whales found in Hawaii as part of the Western North Pacific stock (Carretta et al., 2005) due to differences in call types with the Eastern North Pacific stock (Stafford et al., 2001; Stafford, 2003). The blue whale was severely depleted by commercial whaling in the twentieth century (National Marine Fisheries Service, 1998). There is no designated critical habitat for this species in the North Pacific. There is no information on the population trend of blue whales.

<u>Distribution</u>. Blue whales are distributed from the ice edges to the tropics in both hemispheres (Jefferson et al., 1993). Blue whales summer in high latitudes and move into the subtropics and tropics during the winter (Yochem and Leatherwood, 1985). Data from both the Pacific and Indian Oceans, however, indicate that some individuals may remain in low latitudes year-round, such as over the Costa Rican Dome (Wade and Friedrichsen, 1979; Reilly and Thayer, 1990). The productivity of the Costa Rican Dome may allow blue whales to feed during their winter calving/breeding season and not fast, like humpback whales (Mate et al., 1999).

The only reliable sighting report of this species in the central North Pacific was a sighting made from a scientific research vessel about 216 nm northeast of Hawaii in January 1964 (National Marine Fisheries Service, 1998). There is a rare occurrence for the blue whale throughout the year throughout the entire HRC. Blue whale calls have been recorded off Midway and Oahu (Northrop et al., 1971; Thompson and Friedl, 1982; McDonald and Fox, 1999); these provide evidence of blue whales occurring within several hundred kilometers of these islands (National Marine Fisheries Service, 1998). The recordings made off Oahu showed bimodal peaks throughout the year, suggesting that the animals were migrating into the area during summer and winter (Thompson and Friedl, 1982; McDonald and Fox, 1999). The greatest likelihood of encountering blue whales would be in waters greater than 100 m, based on observations in locales that blue whales are seen regularly (Schoenherr, 1991).

<u>Diving Behavior</u>. Blue whales spend more than 94 percent of their time below the water's surface (Lagerquist et al., 2000). Croll et al. (2001) determined that blue whales dived to an average of 462 ft and for 7.8 min when foraging and to 222 ft and for 4.9 min when not foraging. Calambokidis et al. (2003) deployed tags on blue whales and collected data on dives as deep as about 164 fathoms.

<u>Acoustics</u>. Blue and fin whales produce calls with the lowest frequency and highest source levels of all cetaceans. Blue whale vocalizations are long, patterned low-frequency sounds with durations up to 36 sec (Richardson et al., 1995) repeated every 1 to 2 min (Mellinger and Clark, 2003). Their frequency range is 12–400 Hz, with dominant energy in the infrasonic range at 12–25 Hz (Ketten, 1998; Mellinger and Clark, 2003). Source levels are up to 188 dB re 1 µPa-m over a frequency of 10–110 kHz (Ketten, 1998; McDonald et al., 2001). During the Magellan II Sea Test (at-sea exercises designed to test systems for antisubmarine warfare), off the coast of California in 1994, blue whale vocalization source levels at 17 Hz were estimated in the range of 195 dB re 1 µPa-m (Aburto et al., 1997).

Vocalizations of blue whales appear to vary among geographic areas (Rivers, 1997), with clear differences in call structure suggestive of separate populations for the western and eastern regions of the North Pacific (Stafford et al., 2001). Stafford et al. (2005) recorded the highest calling rates when blue whale prey was closest to the surface during its vertical migration. Wiggins et al. (2005) reported the same trend of reduced vocalization during daytime foraging and then an increase in vocalizations at dusk as prey move up into the water column and disperse. Blue whales make seasonal migrations to areas of high productivity to feed and vocalize less in the feeding grounds than during the migration (Burtenshaw et al., 2004). Oleson et al. (2007) reported higher calling rates in shallow diving (<30 m) whales while deeper diving (> 50 m) whales were likely feeding and calling less.

While no data on hearing ability for this species are available, Ketten (1997) hypothesized that mysticetes have acute infrasonic hearing.

Bryde's Whale (*Balaenoptera edeni*)

Stock. Hawaiian

Status. The Bryde's whale is not listed as endangered under the ESA and is not a depleted or strategic stock under the MMPA (Carretta et al., 2005). Bryde's whales can be easily confused with sei whales. It is not clear how many species of Bryde's whales there are, but genetic analyses suggest the existence of at least two species (Rice, 1998; Kato, 2002). The taxonomy of the baleen whale group formerly known as sei and Bryde's whales is currently confused and highly controversial (see Reeves et al., 2004 for a recent review).

The IWC recognizes three management stocks of Bryde's whales in the North Pacific: western North Pacific, eastern North Pacific, and East China Sea (Donovan, 1991). There is currently no biological basis for defining separate stocks of Bryde's whales in the central North Pacific (Carretta et al., 2005). For the National Oceanic and Atmospheric Administration stock assessment reports, Bryde's whales within the U.S. Pacific EEZ are divided into two areas: (1) Hawaiian waters, and (2) the eastern tropical Pacific (east of 150°W and including the Gulf of California and waters off California) (Carretta et al., 2005).

Abundance and Distribution. The best available estimate of abundance for the Hawaiian stock of the sei whale is 493 (CV = 0.34) individuals (Carretta et al., 2005).The Bryde's whale is found in tropical and subtropical waters, generally not moving poleward of 40° in either hemisphere (Jefferson et al., 1993). Long migrations are not typical of Bryde's whales, though limited shifts in distribution toward and away from the equator, in winter and summer, respectively, have been observed (Cummings, 1985). In summer, the distribution of Bryde's whales in the western North Pacific extends as far north as 40°N, but many individuals remain in lower latitudes, as far south as about 5°N. Data also suggest that winter and summer grounds partially overlap in the central North Pacific (Kishiro, 1996; Ohizumi et al., 2002). Bryde's whales are also distributed in the central North Pacific in summer; the southernmost summer distribution of Bryde's whales inhabiting the central North Pacific is about 20°N (Kishiro, 1996). Some whales remain in higher latitudes (around 25°N) in both winter and summer (Kishiro, 1996).

Bryde's whales are seen year-round throughout tropical and subtropical waters (Kato, 2002) and are also expected in the HRC year-round (U.S. Department of the Navy 2005). It should be noted that more sightings are reported for the Northwest Hawaiian Islands than in the Main Hawaiian Islands (Barlow et al., 2004; Carretta et al., 2005). Bryde's whales have been reported to occur in both deep and shallow waters globally. There is a secondary occurrence of Bryde's whales seaward of the 27-fathom isobath in the HRC. Bryde's whales are sometimes seen very close to shore and even inside enclosed bays (Best et al., 1984). Occurrence is expected to be rare inshore of this area.

Diving Behavior. Bryde's whales are lunge-feeders, feeding on fish and krill (Nemoto and Kawamura, 1977). Cummings (1985) reported that Bryde's whales might dive as long as 20 min.

Acoustics. Bryde's whales produce low frequency tonal and swept calls similar to those of other rorquals (Oleson et al., 2003). Calls vary regionally, yet all but one of the call types have a fundamental frequency below 60 Hz; they last from 0.25 sec to several seconds; and they are produced in extended sequences (Oleson et al., 2003). Heimlich et al. (2005) recently described five tone types. While no data on hearing ability for this species are available, Ketten (1997) hypothesized that mysticetes have acute infrasonic hearing.

Odontocetes

Sperm Whale (*Physeter macrocephalus*)

Stock. Hawaiian

Status. The sperm whale is listed as endangered under the ESA and as a depleted and strategic stock under the MMPA (Carretta et al., 2005). There is no designated critical habitat for this species in the North Pacific. Although many sperm whale populations have been depleted to varying degrees by past whaling activities, sperm whales remain one of the more globally common great whale species. In fact, in some areas, they are actually quite abundant. For example, there are estimated to be about 21,200 to 22,700 sperm whales in the eastern tropical Pacific Ocean (Wade and Gerrodette, 1993).

For management purposes, the IWC has divided the North Pacific into two management regions defined by a zig-zag line which starts at 150°W at the equator, is at 160°W between 40° to 50°N, and ends up at 180°W north of 50°N (Donovan, 1991). Preliminary genetic analyses reveal significant differences between sperm whales off the coast of California, Oregon, and Washington and those sampled offshore to the Hawaiian Islands (Mesnick et al., 1999; Carretta et al., 2005). The National Oceanic and Atmospheric Administration stock assessment report divides sperm whales within the U.S. Pacific EEZ into three discrete, noncontiguous areas: (1) waters around the Hawaiian Islands, (2) California, Oregon, and Washington waters, and (3) Alaskan waters (Carretta et al., 2005). The best available abundance estimate for the Hawaiian Islands stock of the sperm whale is 7,082 (CV = 0.30) individuals (Barlow, 2003; Carretta et al., 2005). Sperm whale abundance in the eastern temperate North Pacific is estimated to be 32,100 individuals and 26,300 individuals by acoustic and visual detection methods, respectively (Barlow and Taylor, 2005).

Abundance and Distribution. The best available estimate of abundance for the Hawaiian stock of the sperm whale is 7,082 (CV = 0.30) individuals (Carretta et al., 2005).Sperm whales are found from tropical to polar waters in all oceans of the world between approximately 70°N and 70°S (Rice, 1998). Females use a subset of the waters where males are regularly found. Females are normally restricted to areas with sea surface temperatures greater than approximately 15°C, whereas males, especially the largest males, can be found in waters as far poleward as the pack ice within approximately to the 40° parallels (50° in the North Pacific) (Whitehead, 2003).

Sperm whales are widely distributed throughout the Hawaiian Islands year-round (Rice, 1960; Shallenberger, 1981; Lee, 1993; and Mobley et al., 2000). Sperm whale clicks recorded from hydrophones off Oahu confirm the presence of sperm whales near the Hawaiian Islands throughout the year (Thompson and Friedl, 1982). Globally, sperm whales are typically distributed in waters over the shelf break and continental slope. The primary area of occurrence for the sperm whale is seaward of the shelf break in the HRC. There is a rare occurrence of sperm whales from the shore to the shelf break. This occurrence prediction is based on the possibility of this typically deepwater species being found in insular shelf waters that are in such close proximity to deep water. Occurrence patterns are assumed to be similar throughout the year.

<u>Diving Behavior</u>. Sperm whales forage during deep dives that routinely exceed a depth of 219 fathoms and 30 min duration (Watkins et al., 2002). Sperm whales are capable of diving to depths of over 1,094 fathoms with durations of over 60 min (Watkins et al., 1993). Sperm whales spend up to 83 percent of daylight hours underwater (Jaquet et al., 2000; Amano and Yoshioka, 2003). Males do not spend extensive periods of time at the surface (Jaquet et al., 2000). In contrast, females spend prolonged periods of time at the surface (1 to 5 hours daily) without foraging (Whitehead and Weilgart, 1991; Amano and Yoshioka 2003). The average swimming speed is estimated to be 0.7 meters per second (m/sec) (Watkins et al., 2002). Dive descents averaged 11 min at a rate of 1.52 m/sec, and ascents averaged 11.8 min at a rate of 1.4 m/sec (Watkins et al., 2002).

<u>Acoustics</u>. Sperm whales produce short-duration (generally less than 3 sec), broadband clicks. These clicks range in frequency from 100 Hz to 30 kHz, with dominant energy in two bands (2 to 4 kHz and 10 to 16 kHz). Generally, most of the acoustic energy is present at frequencies below 4 kHz, although diffuse energy up to past 20 kHz has been reported (Thode et al., 2002). The source levels can be up to 236 dB re 1 µPa-m (Møhl et al., 2003). Thode et al. (2002) suggested that the acoustic directivity (angular beam pattern) from sperm whales must range between 10 and 30 dB in the 5 to 20 kHz region. The clicks of neonate sperm whales are very different from usual clicks of adults in that they are of low directionality, long duration, and low-frequency (centroid frequency between 300 and 1,700 Hz) with estimated source levels between 140 and 162 dB re 1 µPa-m (Madsen et al., 2003). Clicks are heard most frequently when sperm whales are engaged in diving/foraging behavior (Whitehead and Weilgart, 1991; Miller et al., 2004; Zimmer et al., 2005). These may be echolocation clicks used in feeding, contact calls (for communication), and orientation during dives. When sperm whales are socializing, they tend to repeat series of clicks (codas), which follow a precise rhythm and may last for hours (Watkins and Schevill, 1977). Codas are shared between individuals of a social unit and are considered to be primarily for intragroup communication (Weilgart and Whitehead, 1997; Rendell and Whitehead, 2004).

The anatomy of the sperm whale's ear indicates that it hears high-frequency sounds (Ketten 1992). Anatomical studies also suggest that the sperm whale has some ultrasonic hearing, but at a lower maximum frequency than many other odontocetes (Ketten, 1992). The sperm whale may also possess better low-frequency hearing than some other odontocetes, although not as extraordinarily low as many baleen whales (Ketten, 1992). Auditory brainstem response in a neonatal sperm whale indicated highest sensitivity to frequencies between 5 and 20 kHz (Ridgway and Carder, 2001).

<u>Pygmy Sperm Whale (*Kogia breviceps*) and Dwarf Sperm Whale (*Kogia sima*)</u>

<u>Status</u>. The pygmy sperm whale is not listed as endangered under the ESA and is not a depleted or strategic stock under the MMPA (Carretta et al., 2005). There is no information on the population trend of pygmy sperm whales.

The difficulty in identifying pygmy and dwarf sperm whales is exacerbated by their avoidance reaction towards ships and change in behavior towards approaching survey aircraft (Würsig et al., 1998). Based on the cryptic behavior of these species and their small group sizes (much like that of beaked whales), as well as similarity in appearance, it is difficult to identify these species in sightings at sea. Neither species of *Kogia* is listed as endangered under the ESA or considered depleted under the MMPA.

<u>Abundance and Distribution</u>. The best available estimate of abundance for the Hawaiian stock of the pygmy sperm whale is 7,251 (CV = 0.77) individuals (Barlow 2003; Carretta et al., 2005).Both *Kogia* species have a worldwide distribution in tropical and temperate waters (Jefferson et al., 1993).

Dwarf sperm whales within the U.S. Pacific EEZ are each divided into two discrete, non-contiguous areas: (1) Hawaiian waters, and (2) waters off California, Oregon, and Washington (Carretta et al., 2005). The best available estimate of abundance for the Hawaiian stock of the dwarf sperm whale is 19,172 individuals (Barlow, 2003; Carretta et al., 2005). Both *Kogia* species have a worldwide distribution in tropical and temperate waters (Jefferson et al., 1993).

Both species of *Kogia* generally occur in waters along the continental shelf break and over the continental slope (Baumgartner et al., 2001; McAlpine, 2002; Baird, 2005). The primary occurrence for *Kogia* is seaward of the shelf break in the HRC and in deep water with a mean depth of 1.425 m (Baird, 2005). This takes into account their preference for deep waters. There is a rare occurrence for *Kogia* inshore of the area of primary occurrence. Occurrence is expected to be the same throughout the year. Dwarf sperm whales showed a high degree of site fidelity, determined from photo identification over several years, in area of west of the island of Hawaii (Baird et al., 2006).

Both species of *Kogia* generally occur in waters along the continental shelf break and over the continental slope (e.g., Baumgartner et al., 2001; McAlpine, 2002; Baird, 2005). The primary occurrence for *Kogia* is seaward of the shelf break in the HRC and in deep water with a mean depth of 1.425 m (Baird 2005). This takes into account their preference for deep waters. There is a rare occurrence for *Kogia* inshore of the area of primary occurrence. Occurrence is expected to be the same throughout the year.

<u>Diving Behavior</u>. *Kogia* feed on cephalopods and, less often, on deep-sea fishes and shrimps (Caldwell and Caldwell, 1989; Baird et al., 1996; Willis and Baird, 1998; Wang et al., 2002). Willis and Baird (1998) reported that *Kogia* make dives of up to 25 min. Median dive times of around 11 min have been documented for *Kogia* (Barlow, 1999). A satellite-tagged pygmy sperm whale released off Florida was found to make long nighttime dives, presumably indicating foraging on squid in the deep scattering layer (Scott et al., 2001). Most sightings of *Kogia* are brief; these whales are often difficult to approach and they actively avoid aircraft and vessels (Würsig et al., 1998).

<u>Acoustics</u>. Pygmy sperm whale clicks range from 60 to 200 kHz, with a dominant frequency of 120 kHz (Richardson et al., 1995). There is no information available on dwarf sperm whale vocalizations or hearing capabilities. An auditory brainstem response study indicates that pygmy sperm whales have their best hearing between 90 and 150 kHz (Ridgway and Carder, 2001).

Dwarf Sperm Whale (*Kogia sima*)

Status. The difficulty in identifying pygmy and dwarf sperm whales is exacerbated by their avoidance reaction towards ships and change in behavior towards approaching survey aircraft (Würsig et al., 1998). Based on the cryptic behavior of these species and their small group sizes (much like that of beaked whales), as well as similarity in appearance, it is difficult to identify these species in sightings at sea. Neither species of *Kogia* is listed as endangered under the ESA or considered depleted under the MMPA.

Abundance and Distribution. Dwarf sperm whales within the U.S. Pacific EEZ are each divided into two discrete, non-contiguous areas: (1) Hawaiian waters, and (2) waters off California, Oregon, and Washington (Carretta et al., 2005). The best available estimate of abundance for the Hawaiian stock of the dwarf sperm whale is 19,172 individuals (CV = 0.66) (Barlow, 2003; Carretta et al., 2005). Both *Kogia* species have a worldwide distribution in tropical and temperate waters (Jefferson et al., 1993).

Both species of *Kogia* generally occur in waters along the continental shelf break and over the continental slope (e.g., Baumgartner et al., 2001; McAlpine, 2002; Baird, 2005). The primary occurrence for *Kogia* is seaward of the shelf break in the HRC and in deep water with a mean depth of 779 fathoms (Baird, 2005). This takes into account their preference for deep waters. There is a rare occurrence for *Kogia* inshore of the area of primary occurrence. Occurrence is expected to be the same throughout the year. Dwarf sperm whales showed a high degree of site fidelity, determined from photo identification over several years, in area of west of the island of Hawaii (Baird et al., 2006).

Diving Behavior. *Kogia* feed on cephalopods and, less often, on deep-sea fishes and shrimps (Caldwell and Caldwell, 1989; Baird et al., 1996; Willis and Baird, 1998; Wang et al., 2002). Willis and Baird (1998) reported that *Kogia* make dives of up to 25 min. Median dive times of around 11 min have been documented for *Kogia* (Barlow, 1999). A satellite-tagged pygmy sperm whale released off Florida was found to make long nighttime dives, presumably indicating foraging on squid in the deep scattering layer (Scott et al., 2001). Most sightings of *Kogia* are brief; these whales are often difficult to approach and they actively avoid aircraft and vessels (Würsig et al., 1998).

Acoustics. There is no information available on dwarf sperm whale vocalizations or hearing capabilities. Pygmy sperm whale clicks range from 60 to 200 kHz, with a dominant frequency of 120 kHz (Richardson et al., 1995). An auditory brainstem response study indicates that pygmy sperm whales have their best hearing between 90 and 150 kHz (Ridgway and Carder, 2001).

Cuvier's Beaked Whale (*Ziphius cavirostris*)

Status. The Cuvier's beaked whale is not listed as endangered under the ESA and is not a depleted or strategic stock under the MMPA (Carretta et al., 2005). There is no information on the population trend of Cuvier's beaked whales.

Abundance and Distribution. The best available estimate of abundance for the Hawaiian stock of the Cuvier's beaked whale is 12,728 (CV = 0.83) individuals (Barlow, 2003; Carretta et al., 2005). Recent information collected from photo identification studies of Cuvier's beaked whale shows a degree of site fidelity near the Island of Hawaii (Baird et al., 2006). The same individuals had been observed multiple times off of the west coast of the Island of Hawaii during a 15 year period suggesting a island associated population (McSweeney et al., in press). Mobley et al. (2006) report the presence of a Cuvier's beaked whale in the Alenuihaha Channel area between the islands or Maui and Hawaii during the RIMPAC 06 exercise. There is no information on the population trend of Cuvier's beaked whales. Recent information shows that Cuvier's beaked whales may not always inhabit deep ocean areas and may be found over the continental slope (Ferguson et al., 2006).

Diving Behavior. Cuvier's beaked whales are generally sighted in waters with a bottom depth greater than about 109 fathoms and are frequently recorded at depths of 547 fathoms or more (Gannier, 2000; MacLeod, et al., 2004). They are commonly sighted around seamounts, escarpments, and canyons. In the eastern tropical Pacific Ocean, the mean bottom depth for Cuvier's beaked whales is approximately 1,859 fathoms, with a maximum depth of over 16,732 ft (Ferguson, 2005). Recent studies by Baird et al. (2006) show that Cuvier's beaked whales dive deeply (maximum of 4,757 ft) and for long periods (maximum dive duration of 68.7 min) but also spent time at shallow depths. Baird et al. (2006) reported that for a single Cuvier's beaked whale the maximum dive depth was 793 fathoms and the maximum dive duration was 68.7 min. Gouge marks were observed on mud volcanoes on the sea floor at 930–1,094 fathoms, and Woodside et al. (2006) speculated that they were caused by Cuvier's beaked whales foraging on benthic prey.

Acoustics. MacLeod (1999) suggested that beaked whales use frequencies of between 300 Hz and 129 kHz for pulse sounds, and between 2 and 10 kHz, and possibly up to 16 kHz, for social communication. Blaineville's beaked whales echolocation clicks were recorded at frequencies from 20 to 40 kHz (Johnson et al., 2004) and Cuvier's beaked whales at frequencies from 20 to 70 kHz (Zimmer et al., 2005). Cook et al. (2006) reported that the Gervais beaked whale (*Mesoplodon europeus*) could hear in the range of 5 to 80 kHz although no measurements were attempted above 80 kHz).

Blainville's Beaked Whale (*Mesoplodon densirostris*)

Stock. Hawaiian

Status. The Blainville's beaked whale is not listed as endangered under the ESA and is not a depleted or strategic stock under the MMPA (Carretta et al., 2005).

Abundance and Distribution. The best available estimate of abundance for the Hawaiian stock of the Blainville's beaked whale is 2,138 individuals (CV = 0.77) (Barlow, 2003; Carretta et al., 2005). There is no information on the population trend of Blainville's beaked whales.

The Blainville's beaked whale occurs in temperate and tropical waters of all oceans (Jefferson et al., 1993). The distribution of *Mesoplodon* species in the western North Atlantic may relate to water temperature (Mead, 1989; MacLeod, 2000), with Blainville's beaked whale generally occurring in warmer southern waters (MacLeod 2000). In the eastern Pacific, where there are about a half-dozen *Mesoplodon* species known, the Blainville's beaked whale is second only to the pygmy beaked whale (*Mesoplodon peruvianus*) in abundance in tropical waters (Wade and Gerrodette, 1993). Mobley et al. (2006a) reported the presence of a Blaineville's beaked whale in at the northern edge of the Kaulakahi Channel between the islands of Kauai and Niihau. Mobley et al. (2006) reported the presence of a Blainville's beaked whale in the Alenuihaha

Channel area between the islands or Maui and Hawaii during the RIMPAC 06 exercise. The same individuals had been observed multiple times off of the west coast of the Island of Hawaii during a 15 year period suggesting a island associated population (McSweeney et al., in press). Recent information shows that *Mesoplodon* beaked whales may not always inhabit deep ocean areas and may be found over the continental slope (Ferguson et al., 2006).

Diving Behavior. Analysis of stomach contents from captured and stranded individuals suggests that beaked whales are deep-diving animals, feeding by suction (Heyning and Mead 1996). Another species of beaked whales, the Baird's beaked whale, feed mainly on benthic fishes and cephalopods, but occasionally on pelagic fish such as mackerel, sardine, and saury (Kasuya, 2002; Walker et al., 2002; Ohizumi et al., 2003). Baird et al. (2006) reported on the diving behavior of four Blaineville's beaked whales off the west coast of Hawaii. The four beaked whales foraged in deep ocean areas (692-3,004 m) with a maximum dive to 1,408 m. Dives ranged from at least 13 min (lost dive recorder during the dive) to a maximum of 68 min (Baird et al., 2006).

Acoustics. MacLeod (1999) suggested that beaked whales use frequencies of between 300 Hz and 129 kHz for echolocation, and between 2 and 10 kHz, and possibly up to 16 kHz, for social communication. Blaineville's beaked whales echolocation clicks were recorded at frequencies from 20 to 40 kHz (Johnson et al., 2004) and Cuvier's beaked whales at frequencies from 20 to 70 kHz (Zimmer et al., 2005).

Recent information on the hearing abilities of beaked whales (Blaineville's, Cuvier's and Gervais' beaked whales) show that they are most sensitive from 40 to 80 kHz with an overall range of 5 to 80 kHz although no measurements were attempted above 80 kHz (Johnson et al., 2004; Zimmer et al., 2005; Cook et al., 2006).

Longman's Beaked Whale (*Indopacetus pacificus*)

Status. The Longman's beaked whale is not listed as endangered under the ESA and is not a depleted or strategic stock under the MMPA (Carretta et al., 2005). There is no information on the population trend of Longman's beaked whale.

Abundance and Distribution. Beaked whales may be expected to occur in the area including around seaward of the shelf break. There is a low or unknown occurrence of beaked whales on the shelf between the 27-fathom isobath and the shelf break, which takes into account that deep waters come very close to the shore in this area. In some locales, beaked whales can be found in waters over the shelf, so it is possible that beaked whales have similar habitat preferences here. Occurrence patterns are expected to be the same throughout the year (U.S. Department of the Navy 2005).

Longman's beaked whale is not as rare as previously thought. However, the frequency with which it has been sighted in the eastern and western tropical Pacific oceans (MacLeod et al., 2004) suggests that it is probably not as common as the Cuvier's and *Mesoplodon* beaked whales (Ferguson and Barlow, 2001). Recent information shows that Cuvier's and mesoplodon beaked whales may not always inhabit deep ocean areas and may be found over the continental slope (Ferguson et al., 2006).

Diving Behavior. Analysis of stomach contents from captured and stranded individuals suggests that beaked whales are deep-diving animals, feeding by suction (Heyning and Mead 1996). Another species of beaked whales, the Baird's beaked whale, feed mainly on benthic fishes and cephalopods, but occasionally on pelagic fish such as mackerel, sardine, and saury (Kasuya, 2002; Walker et al., 2002; Ohizumi et al., 2003). Prolonged dives by the Baird's beaked whales for periods of up to 67 min have been reported (Kasuya, 2002), though dives of about 14 to 19 fathoms are typical, and dives of 45 min are not unusual (Balcomb, 1989; Von Saunder and Barlow, 1999).

Acoustics. MacLeod (1999) suggested that beaked whales use frequencies of between 300 Hz and 129 kHz for echolocation, and between 2 and 10 kHz, and possibly up to 16 kHz, for social communication. Blaineville's beaked whales echolocation clicks were recorded at frequencies from 20 to 40 kHz (Johnson et al., 2004) and Cuvier's beaked whales at frequencies from 20 to 70 kHz (Zimmer et al., 2005).

There is no direct information available on the exact hearing abilities of Longman's beaked whales (MacLeod, 1999) but some information is available for other beaked whales. Recent information on the hearing abilities of beaked whales (Blaineville's, Cuvier's and Gervais' beaked whales) show that they are most sensitive from 40 to 80 kHz with a overall range of 5 to 80 kHz (Johnson et al., 2004; Zimmer et al., 2005; Cook et al., 2006). Cook et al. (2006) reported that the Gervais beaked whale (*Mesoplodon europeus*) could hear in the range of 5 to 80 kHz although no measurements above 80 kHz were attempted.

Rough-Toothed Dolphin (*Steno bredanensis*)

Status. The rough-toothed dolphin is not listed as endangered under the ESA and is not a depleted or strategic stock under the MMPA (Carretta et al., 2005). There is no information on the population trend of rough-toothed dolphins. Nothing is known about stock structure for the rough-toothed dolphin in the North Pacific (Carretta et al., 2005).

Abundance and Distribution. The best available estimate of abundance for the Hawaiian stock of the rough-toothed dolphin is 19,904 (CV = 0.52) individuals (Carretta et al., 2005).

Rough-toothed dolphins are found in tropical to warm-temperate waters globally, rarely ranging north of 40°N or south of 35 degrees (Miyazaki and Perrin, 1994). In the Main Hawaiian Islands, this species appears to demonstrate site fidelity to specific islands (Baird, personal communication, 2005 cited in U.S. Department of Navy 2005).

Primary occurrence for the rough-toothed dolphin is from the shelf break to seaward of the HRC boundaries. There is also an area of rare occurrence of rough-toothed dolphins from the shore to the shelf break. Baird et al. (2003) noted that rough-toothed dolphins are rarely seen in offshore waters of the Main Hawaiian Islands. Occurrence patterns are expected to be the same throughout the year.

Diving Behavior. They are deep divers, and can dive for up to 15 min (Reeves et al., 2002). They usually inhabit deep waters (Davis et al., 1998), where they prey on fish and cephalopods (Reeves et al., 2002).Rough-toothed dolphins may stay submerged for up to 15 min and are known to dive as deep as 70 m, but can probably dive much deeper (Miyazaki and Perrin, 1994).

Acoustics. The vocal repertoire of the rough-toothed dolphin includes broad-band clicks, barks, and whistles (Yu et al., 2003). Echolocation clicks of rough-toothed dolphins are in the frequency range of 0.1 to 200 kHz, with a peak of about 25 kHz (Miyazaki and Perrin, 1994; Yu et al., 2003). Whistles show a wide frequency range: 0.3 to >24 kHz (Yu et al., 2003). There is no published information on hearing ability of this species.

Bottlenose Dolphin (*Tursiops truncatus*)

Stock. Hawaiian

Status. The bottlenose dolphin is not listed as endangered under the ESA and is not a depleted or strategic stock under the MMPA (Carretta et al., 2005). There is no information on the population trend of bottlenose dolphins.

Genetic analyses of biopsied bottlenose dolphins in the Main Hawaiian Islands suggested the possibility of two species of bottlenose dolphins in Hawaiian waters (U.S. Department of Defense, 2005). In the meantime, however, information is presented on the one confirmed *Tursiops* species for this HRC.

Abundance and Distribution. The best available estimate of abundance for the Hawaiian stock of the bottlenose dolphin is 3,263 (CV = 0.60) individuals (Barlow, 2003; Carretta et al., 2005).

The overall range of *Tursiops* is worldwide in tropical to temperate waters. *Tursiops* generally do not range poleward of 45°, except around the United Kingdom and northern Europe (Jefferson et al., 1993).

Bottlenose dolphins found in offshore waters around the Main Hawaiian Islands are island-associated, with all sightings occurring in relatively offshore and shallow waters (<109 fathoms), and no apparent movement between the islands (Baird et al., 2002, 2003). Baird et al. (2003) noted the possibility of a second population of bottlenose dolphins in the Hawaiian Islands, based on sighting data, with a preference for deeper (bottom depth of 400 to 900 m) waters.

Bottlenose dolphins are regularly found around the Main Hawaiian Islands in both offshore and offshore waters (Rice, 1960; Shallenberger, 1981; Mobley et al., 2000; Baird et al., 2003). Based on photo-identification studies and sighting data, there is a possibility of separate island populations with different preferences for shallow (<109 fathoms) and deep (about 219 to 492 fathoms) waters (Baird et al., 2003; Baird et al., 2006). Therefore, an area of primary occurrence is expected from the shore to the 547-fathom isobath in the HRC, excluding Nihoa due to no survey effort. This area is continuous between Niihau and Kauai and between Oahu, Molokai, Lanai, Maui, and Kahoolawe to account for possible movements between islands. There is a secondary occurrence seaward of the 547-fathom isobath and seaward from the shoreline of Nihoa. Occurrence patterns are expected to be the same throughout the year.

Diving Behavior. Pacific coast bottlenose dolphins feed primarily on surf perches (Family Embiotocidae) and croakers (Family Sciaendae) (Norris and Prescott, 1961; Walker, 1981;

Schwartz et al., 1992; Hanson and Defran, 1993), and also consume squid (*Loligo opalescens*) (Schwartz et al., 1992). Navy bottlenose dolphins have been trained to reach maximum diving depths of about 164 fathoms (Ridgway et al., 1969). Reeves et al. (2002) noted that the presence of deep-sea fish in the stomachs of some offshore individual bottlenose dolphins suggests that they dive to depths of more than 273 fathoms. Dive durations up to 15 min have been recorded for trained individuals (Ridgway et al., 1969). Typical dives, however, are more shallow and of a much shorter duration.

<u>Acoustics</u>. Sounds emitted by bottlenose dolphins have been classified into two broad categories: pulsed sounds (including clicks and burst-pulses) and narrow-band continuous sounds (whistles), which usually are FM. Clicks and whistles have a dominant frequency range of 110 to 130 kHz and a source level of 218 to 228 dB re 1 µPa-m (Au, 1993) and 3.5 to 14.5 kHz and 125 to 173 dB re 1 µPa-m, respectively (Ketten, 1998). Generally, whistles range in frequency from 0.8 to 24 kHz (Richardson et al., 1995).

The bottlenose dolphin has a functional high-frequency hearing limit of 160 kHz (Au, 1993) and can hear sounds at frequencies as low as 40 to 125 Hz (Turl, 1993). Inner ear anatomy of this species has been described (Ketten, 1992). Electrophysiological experiments suggest that the bottlenose dolphin brain has a dual analysis system: one specialized for ultrasonic clicks and the other for lower-frequency sounds, such as whistles (Ridgway, 2000). The audiogram of the bottlenose dolphin shows that the lowest thresholds occurred near 50 kHz at a level around 45 dB re 1 µPa-m (Nachtigall et al., 2000). Below the maximum sensitivity, thresholds increased continuously up to a level of 137 dB at 75 Hz. Above 50 kHz, thresholds increased slowly up to a level of 55 dB at 100 kHz, then increased rapidly above this to about 135 dB at 150 kHz. Scientists have reported a range of best sensitivity between 25 and 70 kHz, with peaks in sensitivity occurring at 25 and 50 kHz at levels of 47 and 46 dB re 1 µPa-m (Nachtigall et al., 2000).

Temporary threshold shifts (TTS) in hearing have been experimentally induced in captive bottlenose dolphins (Ridgway et al., 1997; Finneran et al., 2000; 2005; Schlundt et al., 2000; Nachtigall et al., 2003). Ridgway et al. (1997) observed changes in behavior at the following minimum levels for 1-sec tones: 186 dB at 3 kHz, 181 dB at 20 kHz, and 178 dB at 75 kHz (all re 1 µPa-m). TTS levels were 194 to 201 dB at 3 kHz, 193 to 196 dB at 20 kHz, and 192 to 194 dB at 75 kHz (all re 1 µPa-m). Schlundt et al. (2000) exposed bottlenose dolphins to intense tones (0.4, 3, 10, 20, and 75 kHz); the animals demonstrated altered behavior at source levels of 178 to 193 dB re 1 µPa-m, with TTS after exposures generally between 192 and 201 dB re 1 µPa-m (though one dolphin exhibited TTS after exposure at 182 dB re 1 µPa-m). Nachtigall et al. (2003) determined threshold for a 7.5 kHz pure tone stimulus. No shifts were observed at 165 or 171 dB re 1 µPa-m, but when the noise level reached 179 dB re 1 µPa-m, the animal showed the first sign of TTS. Recovery apparently occurred rapidly, with full recovery apparently within 45 min following noise exposure. TTS measured between 8 and 16 kHz (negligible or absent at higher frequencies) after 30 min of noise exposure (4 to 11 kHz) at 160 dB re 1 µPa-m (Nachtigall et al., 2004). Finneran et al. (2005) reported the onset of TTS in bottlenose dolphins at 197 dB re 1 µPa^2-s for 1-sec pulse sounds at 3.0 and 4.5 kHz. For further discussion of TTS in marine mammals, see Section 4.1.2.

Pantropical Spotted Dolphin (*Stenella attenuata*)

Status. The pantropical spotted dolphin is not listed as endangered under the ESA and is not a depleted or strategic stock under the MMPA (Carretta et al., 2005). There is no information on the population trend of pantropical spotted dolphins.

Abundance and Distribution: The best available estimate of abundance for the pantropical spotted dolphin within the Hawaiian Islands EEZ is 10,260 (CV = 0.41) individuals (Barlow, 2003; Carretta et al., 2005).

The pantropical spotted dolphin is distributed in tropical and subtropical waters worldwide (Perrin and Hohn, 1994). Range in the central Pacific is from the Hawaiian Islands in the north to at least the Marquesas in the south (Perrin and Hohn, 1994).

Based on known habitat preferences and sighting data, the primary occurrence for the pantropical spotted dolphin is between the 330 ft and 13,122 ft isobaths throughout the HRC. This area of primary occurrence also includes a continuous band connecting all the Main Hawaiian Islands, Nihoa, and Kaula Rock, taking into account possible inter-island movements. Secondary occurrence is expected from the shore to 330 ft, as well as seaward of 13,122 ft. Pantropical spotted dolphins are expected to be rare in Pearl Harbor. Occurrence patterns are the same throughout the year.

Diving Behavior: Results from various tracking and food habit studies suggest that pantropical spotted dolphins in the Eastern Tropical Pacific and off Hawaii feed primarily at night on epipelagic species and on mesopelagic species which rise towards the water's surface after dark (Robertson and Chivers, 1997; Scott and Cattanach, 1998; Baird et al., 2001). Dives during the day generally are shorter and more shallow than dives at night; rates of descent and ascent are higher at night than during the day (Baird et al., 2001). Similar mean dive durations and depths have been obtained for tagged pantropical spotted dolphins in the Eastern Tropical Pacific and off Hawaii (Baird et al., 2001).

Acoustics. Pantropical spotted dolphin whistles have a dominant frequency range of 6.7 to 17.8 kHz (Ketten, 1998). Click source levels between 197 and 220 dB re 1 μPa-m have been recorded for pantropical spotted dolphins (Schotten et al., 2004). Echolocation clicks measure in wild Atlantic spotted dolphins showed bimodal ranges of 40 and 50 kHz and a high-frequency peak between 110 and 130 kHz with a source level of 210 dB re 1 μPa (Au and Herzing 2003).

Spinner Dolphin (*Stenella longirostris*)

Status. The spinner dolphin is not listed as endangered under the ESA and is not a depleted or strategic stock under the MMPA (Carretta et al., 2005). There is no information on the population trend of spinner dolphins.

Abundance and Distribution. The best available estimate of abundance for the Hawaiian stock of the spinner dolphin is 2,805 (CV = 0.66) individuals (Barlow, 2003; Carretta et al., 2005).

The spinner dolphin is found in tropical and subtropical waters worldwide. Limits are near 40°N and 40°S (Jefferson et al., 1993). These dolphins occur near islands such as the Hawaiian Islands, the Mariana Islands, the South Pacific, the Caribbean, and Fernando de Noronha

Island off Brazil. Spinner dolphins have been documented to travel distances of about 25 mi between the Main Hawaiian Islands (Maldini, 2003). In the Hawaiian Islands, spinner dolphins occur along the leeward coasts of all the major islands and around several of the atolls northwest of the main island chain. Long-term site fidelity has been noted for spinner dolphins along the Kona coast of Hawaii, along Oahu, and off the island of Moorea in the Society Islands (Norris et al., 1994; Östman 1994; Poole, 1995; Marten and Psarakos, 1999), with some individuals being sighted for up to 12 years at Moorea (Poole, 1995). Recent data suggests that spinner dolphins to do not readily move between islands as determined by genetic analysis (Andrews et al., 2006). Monitoring for RIMPAC 2006 showed that spinner dolphins are seen daily in the offshore area of Kekaha Beach, Kauai (near PMRF, Barking Sands) and this despite being regularly accompanied by tour boats (U.S. Department of the Navy, 2006).

Spinner dolphins occur year-round throughout the HRC, with primary occurrence from the shore to the 13,122 ft isobath. This takes into account offshore resting habitat and offshore feeding areas. Spinner dolphins are expected to occur in shallow water (about 162 ft or less) resting areas throughout the middle of the day, moving into deep waters offshore during the night to feed. Primary resting areas are along the west side of Hawaii, including Makako Bay, Honokohau Bay, Kailua Bay, Kealakekua Bay, Honaunau Bay, Kauhako Bay, and off Kahena on the southeast side of the island (Östman-Lind et al., 2004). Along the Waianae coast of Oahu, spinner dolphins rest along Makua Beach, Kahe Point, and Pokai Bay during the day (Lammers, 2004). Kilauea Bay in Kauai is also a popular resting bay for Hawaiian spinner dolphins (US Department of Defense, 2005). There is an area of secondary occurrence seaward of 2,187-fathoms. Although sightings have been recorded around the mouth of Pearl Harbor (Lammers, 2004), spinner dolphin occurrence is expected to be rare. Occurrence patterns are assumed to be the same throughout the year. It is currently not known whether individuals move between islands or island groups (Carretta et al., 2005) but recent data on the genetic comparison of animals from each suggest there is little movement between the islands (Andrews et al., 2006).

<u>Diving Behavior</u>. Spinner dolphins feed primarily on small mesopelagic fishes, squids, and sergestid shrimp, and they dive to at least 109 to 164 fathoms (Perrin and Gilpatrick, 1994). Foraging can be begin in the late afternoon (Lammers 2004) and takes place primarily at night when the mesopelagic prey migrates vertically towards the surface and also horizontally towards the shore (Benoit-Bird et al., 2001; Benoit-Bird and Au, 2004; Dollar et al., 2003)

<u>Acoustics</u>. There is little information on the acoustic abilities of the spinner dolphin. They produce whistles in the range of 1 to 22.5 kHz with the dominant frequency being 6.8 to 17.9 kHz, above that of the active sonar frequencies, although their full range of hearing may extend down to 1 kHz or below as reported for other small odontocetes (Richardson et al., 1995, Nedwell et al., 2004; Bazúa-Durán, C. and W.W.L. Au. 2002). They also display pulse burst sounds in the range of 5 to 60 kHz. Their echolocation clicks range up to at least 65 kHz (Richardson et al., 1995).

Spinner dolphins in Tahiti showed a pattern of being present a higher percentage of time on the weekend compared to weekdays despite the higher tourist traffic and encounter rate (Gannier and Petiau 2007).

<u>Striped Dolphin (*Stenella coeruleoalba*)</u>

<u>Status</u>. The striped dolphin is not listed as endangered under the ESA and is not a depleted or strategic stock under the MMPA (Carretta et al., 2005). There is no information on the population trend of striped dolphins.

<u>Abundance and Distribution</u>. The best available estimate of abundance for the Hawaiian stock of the striped dolphin is 10,385 individuals (Barlow, 2003; Carretta et al., 2005). The striped dolphin has a worldwide distribution in cool-temperate to tropical waters. This species is well documented in both the western and eastern Pacific off the coasts of Japan and North America (Perrin et al., 1994a); the northern limits are the Sea of Japan, Hokkaido, Washington State, and along roughly 40°N across the western and central Pacific (Reeves et al., 2002). Scattered records exist from the South Pacific as well (Perrin et al., 1994a).

The striped dolphin regularly occurs throughout the HRC. There is a primary occurrence for the striped dolphin seaward of 547-fathoms based on sighting records and the species' known preference for deep waters. Striped dolphins are occasionally sighted closer to shore (Mobley et al., 2000); therefore, an area of secondary occurrence is expected from 55-fathoms to 547-fathoms. Occurrence patterns are assumed to be the same throughout the year.

<u>Diving Behavior</u>. Striped dolphins often feed in pelagic or benthopelagic zones along the continental slope or just beyond oceanic waters. A majority of the prey possess luminescent organs, suggesting that striped dolphins may be feeding at great depths, possibly diving to about 109 to 383 fathoms to reach potential prey (Archer and Perrin, 1999). Striped dolphins may feed at night, in order to take advantage of the deep scattering layer's diurnal vertical movements. Small, mid-water fishes (in particular, myctophids or lanternfish) and squids are the dominant prey (Perrin et al., 1994).

<u>Acoustics</u>. Striped dolphin whistles range from 6 to 24+ kHz, with dominant frequencies ranging from 8 to 12.5 kHz (Richardson et al., 1995). The striped dolphin's range of most sensitive hearing (defined as the frequency range with sensitivities within 10 dB of maximum sensitivity) was determined to be 29 to 123 kHz using standard psycho-acoustic techniques; maximum sensitivity occurred at 64 kHz (Kastelein et al., 2003). Hearing ability became less sensitive below 32 kHz and above 120 kHz (Kastelein et al., 2003).

<u>Risso's Dolphin (*Grampus griseus*)</u>

<u>Status</u>. The Risso's dolphin is not listed as endangered under the ESA and is not a depleted or strategic stock under the MMPA (Carretta et al., 2005). There is no information on the population trend of Risso's dolphins.

<u>Abundance and Distribution</u>. The best available estimate of abundance for the Hawaiian stock of the Risso's dolphin is 2,351 (CV = 0.65) individuals (Barlow, 2003; Carretta et al., 2005). The Risso's dolphin is distributed worldwide in tropical to warm-temperate waters, roughly between 60°N and 60°S, where surface water temperature is usually greater than 50°F (Kruse et al., 1999). Water temperature appears to be a factor that affects the distribution of Risso's dolphins in the Pacific (Kruse et al., 1999). Changes in local distribution and abundance along the California coast are probably in response to protracted or unseasonal warm-water events, such as El Niño events (Shane, 1994).

There is an area of secondary occurrence between the 330 ft and 16,400 ft isobaths based on the known habitat preferences of this species, as well as the paucity of sightings even though there is extensive aerial and boat-based survey coverage near the islands. There is a narrow band of rare occurrence from the shore to the 55-fathom isobath, including Pearl Harbor, that takes into consideration the possibility that this species, with a preference for waters with steep bottom topography, might swim into areas where deep water is close to shore. Risso's dolphins are expected to be rare seaward of the 16,400 ft isobath. Occurrence patterns are assumed to be the same throughout the year.

Diving Behavior. They may remain submerged on dives for up to 30 min (Kruse et al., 1999). Cephalopods are the primary prey (Clarke, 1996).

Acoustics. Risso's dolphin vocalizations include broadband clicks, barks, buzzes, grunts, chirps, whistles, and simultaneous whistle and burst-pulse sounds (Corkeron and Van Parijs, 2001). The combined whistle and burst pulse sound appears to be unique to Risso's dolphin (Corkeron and Van Parijs, 2001). Corkeron and Van Parijs (2001) recorded five different whistle types, ranging in frequency from 4 to 22 kHz. Broadband clicks had a frequency range of 6 to greater than 22 kHz. Low-frequency narrowband grunt vocalizations had a frequency range of 0.4 to 0.8 kHz. A recent study established empirically that Risso's dolphins echolocate; estimated source levels were up to 216 dB re 1 μPa-m (Philips et al., 2003).

The range of hearing in Risso's dolphins is 1.6-122.9 kHz with maximum sensitivity occurring between 8 and 64 kHz (Nachtigall et al., 1995).

Melon-headed Whale (*Peponocephala electra*)

Status. The melon headed whale is not listed as endangered under the ESA and is not a depleted or strategic stock under the MMPA (Carretta et al., 2005). There is no information on the population trend of melon headed whales.

Abundance and Distribution. The best available estimate of abundance for the Hawaiian stock of the melon-headed whale is 2,947 (CV = 1.11) individuals (Barlow, 2003; Carretta et al., 2005). Melon-headed whales are found worldwide in tropical and subtropical waters. They have occasionally been reported from higher latitudes, but these sightings are often associated with incursions of warm water currents (Perryman et al., 1994). Preliminary results from photo-identification work in the Main Hawaiian Islands suggest inter-island movements by some individuals (e.g., between the islands of Kauai and Hawaii) as well as some residency by other individuals (e.g., at the island of Hawaii (U.S. Department of the Navy 2005).

The melon-headed whale is an oceanic species. Melon-headed whales are primarily expected to occur from the shelf break to seaward of the HRC and vicinity. There is a rare sighting occurrence from the shore to the shelf break. Occurrence patterns are assumed to be the same throughout the year.

Diving Behavior. There is no information on the diving behavior of melon headed whales.

Acoustics. Melon headed whales produce whistles in the range of 8-12 kHz and clicks in the range of 20-40 kHz (Watkins et al., 1997).

<u>Fraser's Dolphin (*Lagenodelphis hosei*)</u>

<u>Status</u>. The Fraser's dolphin is not listed as endangered under the ESA and is not a depleted or strategic stock under the MMPA (Carretta et al., 2005). There is no information on the population trend of Fraser's dolphins.

<u>Abundance and Distribution</u>. The best available estimate of abundance for the Hawaiian stock of the Fraser's dolphin is 16,836 (CV = 1.11) individuals (Barlow, 2003; Carretta et al., 2005).

The Fraser's dolphin is found in tropical and subtropical waters around the world, typically between 30°N and 30°s (Jefferson et al., 1993). Strandings in temperate areas are usually associated with anomalously warm-water temperatures (Perrin et al., 1994b). As noted by Reeves et al. (1999), the documented distribution of this species is skewed towards the eastern Pacific, which may reflect the intensity of research associated with the tuna fishery rather than an actual higher density of occurrence there than in other tropical regions.

Fraser's dolphins have only recently been documented in Hawaiian waters (Carretta et al., 2005). Sightings have been recorded in the Northwest Hawaiian Islands but not within the Main Hawaiian Islands (Barlow, 2003). There is a rare occurrence of the Fraser's dolphin from the shore to seaward of the HRC that takes into account that this is an oceanic species that can be found closer to the coast, particularly in locations where the shelf is narrow and deep waters are nearby. Occurrence patterns are assumed to be the same throughout the year.

<u>Diving Behavior</u>. There is no information available on their diving behavior.

<u>Acoustics</u>. Little is known of the acoustic abilities of Fraser's dolphins. Their whistles have a range of 7.6-13.4 kHz (Leatherwood et al., 1993). There are no audiograms or other information on the hearing of Fraser's dolphins.

<u>Pygmy Killer Whale (*Feresa attenuata*)</u>

<u>Status</u>. The pygmy killer whale is not listed as endangered under the ESA and is not a depleted or strategic stock under the MMPA (Carretta et al., 2005). There is no information on the population trend of pygmy killer whales.

<u>Abundance and Distribution</u>. The best available estimate of abundance for the Hawaiian stock of the pygmy killer whale is 817 (CV = 1.12) individuals (Barlow, 2003; Carretta et al., 2005).This species has a worldwide distribution in deep tropical and subtropical oceans. Pygmy killer whales generally do not range north of 40°N or south of 35°S (Jefferson et al., 1993). Reported sightings suggest that this species primarily occurs in equatorial waters, at least in the eastern tropical Pacific (Perryman et al., 1994). Most of the records outside the tropics are associated with strong, warm western boundary currents that effectively extend tropical conditions into higher latitudes (Ross and Leatherwood, 1994).

Pygmy killer whales regularly occur in the HRC. Pygmy killer whales are easily confused with false killer whales and melon-headed whales, which are two species that also have expected occurrence in the HRC. The pygmy killer whale is primarily expected to occur from the shelf break to seaward of the HRC boundaries. There is a rare sighting occurrence from the shore to the shelf break. Occurrence patterns are assumed to be the same throughout the year. Pygmy killer whales off the island of Hawaii demonstrate tremendous site fidelity to the island (U.S. Department of the Navy, 2005).

Diving Behavior. There is no information on the diving behavior of pygmy killer whales.

Acoustics. The pygmy killer whale produces clicks in the range of 45-117 kHz with the main energy in the range of 70-85 kHz (Madsen et al., 2004). There is no information on the hearing of pygmy killer whales.

False Killer Whale (*Pseudorca crassidens*)

Status. This stock is listed as a strategic stock by NMFS because the estimated level of serious injury and mortality from the Hawaii-based tuna and swordfish longline fishery is greater than the potential biological removal (Carretta et al., 2005). Genetic evidence suggests that the Hawaiian stock might be a reproductively isolated population from false killer whales in the eastern tropical Pacific (Chivers et al., 2003). Baird et al. (2005) noted that more work was needed to determine whether false killer whales using coastal waters might even be a discrete population from those in offshore waters and waters off the Northwest Hawaiian Islands.

Abundance and Distribution. The best available estimate of abundance for the Hawaiian stock of the false killer whale is 268 (CV = 1.08) individuals (Barlow, 2003; Carretta et al., 2005).False killer whales are found in tropical and temperate waters, generally between 50°S and 50°N latitude with a few records north of 50°N in the Pacific and the Atlantic (Odell and McClune, 1999). Seasonal movements in the western North Pacific may be related to prey distribution (Odell and McClune, 1999). Baird et al. (2005) noted considerable inter-island movements of individuals in the Hawaiian Islands.

False killer whales are commonly sighted in offshore waters from small boats and aircraft, as well as offshore from longline fishing vessels (e.g., Mobley et al., 2000; Baird et al., 2003; Walsh and Kobayashi, 2004). Baird et al. (2005) reported that false killer whales in the Hawaiian Islands occur in waters from about 22 to 2,187 fathoms. There is an area of primary occurrence for the false killer whale from the shore to 1,094-fathoms, with the exception of Pearl Harbor, where there is a rare occurrence for this species. There is an additional area of primary occurrence seaward of 2,187-fathoms on the south side of the islands, which takes into account false killer whale sighting and incidental catch data in the southwestern portion of the HRC (Forney, 2004; Walsh and Kobayashi, 2004; Carretta et al., 2005). The area of secondary occurrence includes a narrow band between 1,094-fathoms and 2,187-fathoms south of the islands and the entire area north of the islands seaward of 1,094-fathoms. It has been suggested that false killer whales using coastal waters might be a discrete population from those in offshore waters and waters off the Northwest Hawaiian Islands (Baird et al., 2005; Carretta et al., 2005). The area of secondary occurrence takes into account the possibility of two different stocks, with a possible hiatus in their distribution (Department of Defense, 2005). Occurrence patterns are assumed to be the same throughout the year.

Diving Behavior. False killer whales primarily eat deep-sea cephalopods and fish (Odell and McClune, 1999), but they have been known to attack other cetaceans, including dolphins (Perryman and Foster, 1980; Stacey and Baird, 1991), sperm whales (Palacios and Mate, 1996), and baleen whales.

Acoustics. The dominant frequencies of false killer whale whistles are 4 to 9.5 kHz; those of their clicks are 25 to 30 kHz and 95 to 130 kHz (Thomas et al., 1990; Richardson et al., 1995). The source level is 220 to 228 dB re 1 µPa-m (Ketten, 1998). Best hearing sensitivity measured for a false killer whale was around 16 to 64 kHz (Thomas et al., 1988, 1990). Yuen et al. (2005) tested a stranded false killer whale using auditory evoke potentials to produce an audiogram in the range of 4-44 kHz and with best sensitivity at 16-24 kHz but may have age related hearing loss.

Killer Whale (*Orcinus orca*)

Status. The killer whale is not listed as endangered under the ESA and is not a depleted or strategic stock under the MMPA (Carretta et al., 2005). There is no information on the population trend of killer whales.

Abundance and Distribution. The best available estimate of abundance for the Hawaiian stock of the killer whale is 430 (CV = 0.72) individuals (Barlow, 2003; Carretta et al., 2005). Genetic analysis of a biopsy sample taken from a killer whale in Hawaii (during the NMFS Hawaiian Islands Cetacean and Ecosystem Assessment Survey) was most closely related to mammal-eating killer whales in Alaska (Baird et al., 2003).

The killer whale is a cosmopolitan species found throughout all oceans and contiguous seas, from equatorial regions to the polar pack-ice zones. This species has sporadic occurrence in most regions (Ford, 2002). Though found in tropical waters and the open ocean, killer whales as a species are most numerous in coastal waters and at higher latitudes (Mitchell, 1975; Miyazaki and Wada, 1978; Dahlheim et al., 1982). Sightings in most tropical waters, although not common, are widespread (Visser and Bonoccorso, 2003).

Killer whales in general are uncommon in most tropical areas (Department of Defense, 2005). The distinctiveness of this species would lead it to be reported more than any other member of the dolphin family, if it occurs in a certain locale. Killer whales are infrequently sighted and found stranded around the Hawaiian Islands (Shallenberger, 1981; Tomich, 1986; Mobley et al., 2001b; Baird et al., 2003), though with increasing numbers of boaters, sightings each year could be expected (Baird et al., 2006). Because the killer whale has a sporadic occurrence in tropical waters and can be found in both coastal areas and the open ocean, there is a rare occurrence of this species in the HRC from the shoreline to seaward of the HRC boundaries. Occurrence patterns are assumed to be the same throughout the year.

Diving Behavior. The maximum depth recorded for free-ranging killer whales diving off British Columbia is about 144 fathoms (Baird et al., 2005). On average, however, for seven tagged individuals, less than 1 percent of all dives examined were to depths greater than about 16 fathoms (Baird et al., 2003). The longest duration of a recorded dive from a radio-tagged killer whale was 17 min (Dahlheim and Heyning, 1999).

Acoustics. The killer whale produces a wide variety of clicks and whistles from 1.5-25 kHz, but most of its sounds are pulsed with dominant frequencies of 1 to 6 kHz (Richardson et al., 1995). Source levels of echolocation signals range between 195 and 224 dB re 1 µPa-m (Au et al., 2004). The source level of social vocalizations ranges between 137 to 157 dB re 1 µPa-m (Veirs, 2004). Acoustic studies of resident killer whales in British Columbia have found that there are dialects, in their highly stereotyped, repetitive discrete calls, which are group-specific and shared by all group members (Ford, 2002). These dialects likely are used to maintain group identity and cohesion, and may serve as indicators of relatedness that help in the avoidance of inbreeding between closely related whales (Ford, 2002). Dialects also have been documented in killer whales occurring in northern Norway, and likely occur in other locales as well (Ford, 2002). The killer whale has the lowest frequency of maximum sensitivity and one of the lowest high frequency hearing limits known among toothed whales (Szymanski et al., 1999). The upper limit of hearing is 100 kHz for this species. The most sensitive frequency, in both behavioral and in auditory brainstem response audiograms, has been determined to be 20 kHz (Szymanski et al., 1999).

Short-finned Pilot Whale (*Globicephala macrorhynchus*)

Status. Stock structure of short-finned pilot whales has not been well-studied in the North Pacific Ocean, except in Japanese waters (Carretta et al., 2005). Two stocks have been identified in Japan based on pigmentation patterns and differences in the head shape of adult males (Kasuya et al., 1988). Pilot whales in Hawaiian waters are similar morphologically to the Japanese southern form (Carretta et al., 2005). Genetic analyses of tissue samples collected near the Main Hawaiian Islands indicate that the Hawaiian population is reproductively isolated from short-finned pilot whales found in the eastern North Pacific Ocean (Carretta et al., 2005).

Abundance and Distribution. The best available estimate of abundance for the Hawaiian stock of the short-finned pilot whale is 8,846 (CV = 0.49) individuals (Barlow, 2003; Carretta et al., 2005). The short-finned pilot whale is found worldwide in tropical to warm-temperate seas, generally in deep offshore areas. The short-finned pilot whale usually does not range north of 50°N or south of 40°S (Jefferson et al., 1993). The long-finned pilot whale is not known to presently occur in the North Pacific (Kasuya, 1975); the range of the short-finned pilot whale appears to be expanding to fill the former range of the long-finned pilot whale (Bernard and Reilly, 1999). Pilot whales are sighted throughout the Hawaiian Islands (Shallenberger, 1981).

Short-finned pilot whales are expected to occur year-round throughout the HRC. They are commonly found in deep waters with steep bottom topography, including deepwater channels between the Main Hawaiian Islands, such as the Alenuihaha Channel between Maui and Hawaii (Balcomb, 1987). The area of primary occurrence for this species is between 109-fathoms and 2,187-fathoms. Considering the narrow insular shelf and deep waters in proximity to the shore, secondary occurrence is between 27 fathoms and 109 fathoms. Another area of secondary occurrence extends from 2,187-fathoms to seaward of the HRC boundaries. Short-finned pilot whales are expected to be rare between the shore and 27 fathoms. Occurrence patterns are assumed to be the same throughout the year. Photo-identification work suggests a high degree of site fidelity around the island of Hawaii (Shane and McSweeney, 1990).

Diving Behavior. Pilot whales are deep divers; the maximum dive depth measured is about 531 fathoms (Baird et al., 2002). Pilot whales feed primarily on squid, but also take fish (Bernard and Reilly, 1999). Pilot whales are not generally known to prey on other marine mammals; however, records from the Eastern Tropical Pacific suggest that the short-finned pilot whale does occasionally chase, attack, and may eat dolphins during fishery operations (Perryman and Foster, 1980), and they have been observed harassing sperm whales in the Gulf of Mexico (Weller et al., 1996).

Acoustics. Short-finned pilot whale whistles and clicks have a dominant frequency range of 2 to 14 kHz and a source level of 180 dB re 1 μPa-m (Fish and Turl, 1976; Ketten, 1998). There are no published hearing data available for this species.

Pinnipeds

Hawaiian Monk Seal (*Monachus schauinslandi*)

Stock. Hawaiian

Status. The Hawaiian monk seal is listed as endangered under the ESA and as a depleted and strategic stock under the MMPA (Ragen and Lavigne, 1999; Carretta et al., 2005). Hawaiian monk seals are managed as a single stock, although there are six main reproductive subpopulations at French Frigate Shoals, Laysan Island, Lisianski Island, Pearl and Hermes Reef, Midway Island, and Kure Atoll (Ragen and Lavigne, 1999; Carretta et al., 2005). Genetic comparisons between the Northwestern and Main Hawaiian Islands seals have not yet been conducted, but observed interchange of individuals among the regions is extremely rare, suggesting that these may be more appropriately designated as separate stocks; further research is needed (Carretta et al., 2005).

Critical habitat for the Hawaiian monk seal is designated from the shore out to 20 fathoms in 10 areas of the Northwestern Hawaiian Islands (National Marine Fisheries Service, 1988). The eastern-most island is located on the northwestern edge of the HRC. A revised recovery plan, which included species status, threats to the population and recommendations to prevent extinction, was issued in 2006 (National Marine Fisheries Service, 2006).

Abundance and Distribution. The best estimate of the total population size is 1,224 individuals (Carretta et al., 2005). There are an estimated 55 seals in the Main Hawaiian Islands (Baker and Johanos, 2004; U.S. Department of the Navy, 2005; Carretta et al., 2005). The vast majority of the population is present in the Northwestern Hawaiian Islands. The trend in abundance for the population over the past 20 years has mostly been negative (Baker and Johanos, 2004; Carretta et al., 2005). A self-sustaining subpopulation in the Main Hawaiian Islands may improve the monk seal's long-term prospects for recovery (Marine Mammal Commission, 2003; Baker and Johanos, 2004; Carretta et al., 2005).

The Hawaiian monk seal occurs only in the central North Pacific. Until recently, this species occurred almost exclusively at remote atolls in the Northwestern Hawaiian Islands where six major breeding colonies are located: French Frigate Shoals, Laysan and Lisianski Islands, Pearl and Hermes Reef, Midway Island, and Kure Atoll. In the last decade, however, sightings of Hawaiian monk seals in the Main Hawaiian Islands have increased considerably (Baker and Johanos, 2004; Carretta et al., 2005). Most monk seal haulout events in the Main Hawaiian Islands have been on the western islands of Niihau and Kauai (Baker and Johanos, 2004; Carretta et al., 2005), although sightings or births have now been reported for all of the Main Hawaiian Islands, including Lehua Rock and Kaula Rock (Marine Mammal Commission, 2003; Baker and Johanos, 2004). Births of Hawaiian monk seal pups have been recorded in the Main Hawaiian Islands including Kauai and Niihau (Baker and Johanos, 2004). Hawaiian monk seals wander to Maro Reef and Gardner Pinnacles and have occasionally been sighted on nearby island groups such as Johnston Atoll, Wake Island, and Palmyra Atoll (Rice, 1998).

Hawaiian monk seals show very high site fidelity to natal (birthing) islands, with only about 10 percent of individuals moving to another island in their lifetime (Gilmartin and Forcada, 2002). While monk seals do move between islands, long-distance movements are not common. Seals move distances of up to 135 nm on a regular basis, but distances of more than 540 nm have not been documented (DeLong et al., 1984; Ragen and Lavigne, 1999).

The highly endangered status of this species necessitates a conservative estimate of expected occurrence in the HRC. Primary occurrence of monk seals is expected in a continuous band between Nihoa, Kaula Rock, Niihau, and Kauai. This band extends from the shore to around 273 fathoms and is based on the large number of sightings and births recorded in this area (Westlake and Gilmartin, 1990; Ragen and Finn, 1996; Marine Mammal Commission, 2003; Baker and Johanos, 2004). An area of secondary occurrence is expected from 273 fathoms to 547 fathoms around Nihoa, Kaula Rock, Niihau, and Kauai. A continuous area of secondary occurrence is also expected from the shore to 547-fathoms around the other Main Hawaiian Islands, taking into account sighting records, the location of deep sea corals, and the ability of monk seals to forage in water deeper than about 273 fathoms (Parrish et al., 2002; Severns and Fiene Severns, 2002; Kona Blue Water Farms, 2003; Kubota, 2004; Anonymous 2005 [from Honolulu Star Bulletin]; Fujimori, 2005). The Pearl Harbor entrance is included in the area of secondary occurrence based on sightings of this species near the entrance of the harbor (U.S. Department of the Navy, 2001a). There is a rare occurrence of the monk seal seaward of the 3,281-ft isobath. Occurrence patterns are expected to be the same throughout the year.

<u>Diving Behavior</u>. Monk seals feed on a variety of benthic and mid water fish and invertebrates (Goodman-Lowe, 1998; Parrish et al., 2000). Adult seals at French Frigate Shoals forage at depths of 164–273 fathoms in coral beds; and juveniles forage at depths of about 5.5 to 16 fathoms and to 27 to 55 fathoms at underwater sand fields (Parrish et al., 2002; 2005).

The range of underwater hearing in monk seals is 12 to 70 kHz with best hearing from 12 to 28 kHz and 60-70 kHz (Thomas et al., 1990). This audiogram was from only one animal and the high upper frequency range, which is high for a phocid, may not be indicative of the species. Mid frequency active sonar uses frequencies below those reported for the Hawaiian monk seals lower limit of its audiogram, suggests that they will not respond to Navy mid-frequency active sonar.

There is no information on underwater sounds. In air sounds are low frequency sounds (below 1000 Hz) such as “soft liquid bubble”, short duration guttural expiration, a roar and belching/coughing sound (Miller and Job, 1992). A pup produces a higher frequency call (1.4 kHz) that presumably is used to call its mother.

<u>Northern Elephant Seal (*Mirounga angustirostris*)</u>

<u>Status</u>. The northern elephant seal is not listed as endangered under the ESA and is not a depleted or strategic stock under the MMPA (Carretta et al., 2005).

<u>Abundance and Distribution</u>. The northern elephant seal population has recovered dramatically after being reduced to several dozen to perhaps no more than a few animals in the 1890s (Bartholomew and Hubbs, 1960; Stewart et al., 1994). Although movement and genetic exchange continues between rookeries, most elephant seals return to their natal rookeries when they start breeding (Huber et al., 1991). The population size has to be estimated since all

age classes are not ashore at any one time of the year (Carretta et al., 2005). There is a conservative minimum population estimate of 60,547 elephant seals in the California stock (Carretta et al., 2005). Based on trends in pup counts, abundance in California is increasing by around 6 percent annually, but the Mexican stock is evidently decreasing slowly (Stewart et al., 1994; Carretta et al., 2005).

Breeding and molting habitat for northern elephant seals is characterized by sandy beaches, mostly on offshore islands, but also in some mainland locations along the coast (Stewart et al., 1994). When on shore, seals will also use small coves and sand dunes behind and adjacent to breeding beaches. They rarely enter the water during the breeding season, but some seals will spend short periods in tide pools and alongshore; these are most commonly weaned pups that are learning to swim (Le Boeuf et al., 1972).

The northern elephant seal is endemic to the North Pacific Ocean, occurring almost exclusively in the eastern and central North Pacific. However, vagrant individuals do sometimes range to the western North Pacific. Northern elephant seals occur in Hawaiian waters only rarely as extralimital vagrants. The most far-ranging individual appeared on Nijima Island off the Pacific coast of Japan in 1989 (Kiyota et al., 1992). This demonstrates the great distances that these animals are capable of covering.

There is a rare occurrence of northern elephant seals throughout the HRC year-round. There are several unconfirmed reports of elephant seals at Midway Atoll, Pearl and Hermes Reef, and Kure Atoll (U.S. Department of the Navy, 2005). The first confirmed sighting of a northern elephant seal in the Hawaiian Islands was a female found on Midway Island in 1978 that had been tagged earlier at San Miguel Island (off the coast of southern California) (Northwest and Alaska Fisheries Center, 1978). The first sighting of an elephant seal in the Main Hawaiian Islands occurred on the Kona coast of Hawaii in January 2002; a juvenile male was sighted hauled out at Kawaihae Beach and later at the Kona Village Resort (Fujimori, 2002;). Based on these sightings and documented long-distance movements as far west as Japan (Northwest and Alaska Fisheries Center, 1978; Antonelis and Fiscus, 1980; Tomich, 1986; Kiyota et al., 1992; Fujimori, 2002), rare encounters with northern elephant seals in the HRC are possible.

<u>Diving Behavior</u>. Feeding habitat is mostly in deep, offshore waters of warm temperate to subpolar zones (Stewart and DeLong, 1995; Stewart, 1997; Le Boeuf et al., 2000). Some seals will move into subtropical or tropical waters while foraging (Stewart and DeLong, 1995).

Both sexes routinely dive deep (82 to 437.5 fathoms) (Le Boeuf et al., 2000); dives average 15–25 min, depending on time of year, and surface intervals between dives are 2–3 min. The deepest dives recorded for both sexes are over 833 fathoms (e.g., Le Boeuf et al., 2000; Schreer et al., 2001). Females remain submerged about 86–92 percent of the time and males about 88–90 percent (Le Boeuf et al., 1989; Stewart and Delong, 1995). Feeding juvenile northern elephant seals dive for slightly shorter periods (13–18 min), but they dive to similar depths (163 to 250 fathoms) and spend a similar proportion (86–92 percent) of their time submerged (Le Boeuf et al., 1996).

<u>Acoustics</u>. The northern elephant seal produces loud, low-frequency in-air vocalizations (Bartholomew and Collias, 1962). The mean fundamental frequencies are in the range of 147 to 334 Hz for adult males (Le Bouef and Petrinovich, 1974). The mean source level of the male-

produced vocalizations during the breeding season is 110 dB re 20 µPa 1 m (Sanvito and Galimberti, 2003). In-air calls made by aggressive males include: (1) snoring, which is a low intensity threat; (2) a snort (0.2 to 0.6 kHz) made by a dominant male when approached by a subdominant male; and (3) a clap threat (<2.5 kHz) which may contain signature information at the individual level (Richardson et al., 1995). These sounds appear to be important social cues (Shipley et al., 1992). The mean fundamental frequency of airborne calls for adult females is 500 to 1,000 Hz (Bartholomew and Collias, 1962). In-air sounds produced by females include a <0.7 kHz belch roar used in aggressive situations and a 0.5 to 1 kHz bark used to attract the pup (Bartholomew and Collias, 1962). As noted by Kastak and Schusterman (1999), evidence for underwater sound production by this species is scant. Except for one unsubstantiated report), none have been definitively identified (Fletcher et al., 1993; Burgess et al., 1998). Burgess et al. (1998) detected possible vocalizations in the form of click trains that resembled those used by males for communication in air.

The audiogram of the northern elephant seal indicates that this species is well-adapted for underwater hearing; sensitivity is best between 3.2 and 45 kHz, with greatest sensitivity at 6.4 kHz and an upper frequency cutoff of approximately 55 kHz (Kastak and Schusterman, 1999).

3.1.3 CULTURAL RESOURCES—OPEN OCEAN AREA

Cultural resources include prehistoric and historic sites, structures, objects, districts, artifacts or any other physical evidence of human activity considered important to a culture, subculture or community for scientific, traditional, religious or any other reasons. For ease of discussion, cultural resources have been divided into archaeological resources (prehistoric and historic), historic buildings and structures, and traditional resources. Traditional resources include, but are not limited to, topographical areas, natural features, plants, animals, minerals, water sources, or archaeological sites that contemporary cultures value presently (or did so in the past) and consider essential for the persistence of their traditional culture. Appendix C includes a description of cultural resources and the laws and regulations pertaining to them.

Region of Influence

For all locations analyzed in this EIS/OEIS, the region of influence for cultural resources (both terrestrial and underwater) is synonymous with the Area of Potential Effect as defined under the National Historic Preservation Act. In general, the region of influence includes any area where ground disturbance from the proposed activities described in Chapter 2.0 could occur. The region of influence also encompasses any identified historic buildings or structures that could be affected by demolition, renovation, or other major alteration.

The region of influence for cultural resources within the Open Ocean Area and offshore areas includes any locations where underwater demolition; trenching; or placement of new systems, infrastructure, or equipment might affect submerged sites, features, wrecks, or ruins.

Affected Environment

Open Ocean Area Archaeological Resources

In the waters surrounding the Hawaiian Islands, there are thousands of submerged cultural resources. Among the typical deep water resources are wrecks of World War II submarines and ships, commercial fishing vessels and tankers, and aircraft. There is no definitive count of the number of shipwrecks surrounding the Hawaiian Islands, as Pacific Ocean currents are quick to destroy wrecks. In addition, identifying older wrecks can be problematic, as islands are periodically subjected to large storms, powerful seas, and occasional tsunamis. The types of shipwrecks most likely to occur around the Hawaiian Islands are 19th century cargo ships, submarines, old whaling and merchant ships, fishing boats, or 20th century U.S. Warships, recreational craft and land vehicles.

The National Oceanic and Atmospheric Administration's Automated Wreck and Obstruction Information System (2004) was queried to determine the potential for shipwrecks to exist within the waters surrounding the Hawaiian Islands, as well as the specific proposed regions of influence. Figures 3.1.3-1 through 3.1.3-3 show the distribution of shipwrecks in this database.

3.1.4 HAZARDOUS MATERIALS AND WASTE—OPEN OCEAN AREA

Appendix C includes a discussion of hazardous materials and waste resource regulations.

Region of Influence

The hazardous materials and wastes region of influence for the Open Ocean Area includes the Navy's sea ranges, and immediately adjacent waters.

Affected Environment

Hazardous Materials and Hazardous Constituents

Hazardous materials can be broadly defined as those materials with clearly hazardous properties that are in general use in commercial and industrial applications. Hazardous materials include, but are not limited to, petroleum products, coolants, paints, adhesives, solvents, corrosion inhibitors, cleaning compounds, photographic materials and chemicals, and batteries. Hazardous materials are required for maintenance and operation of vessels, machinery, and equipment used by the Navy in training activities.

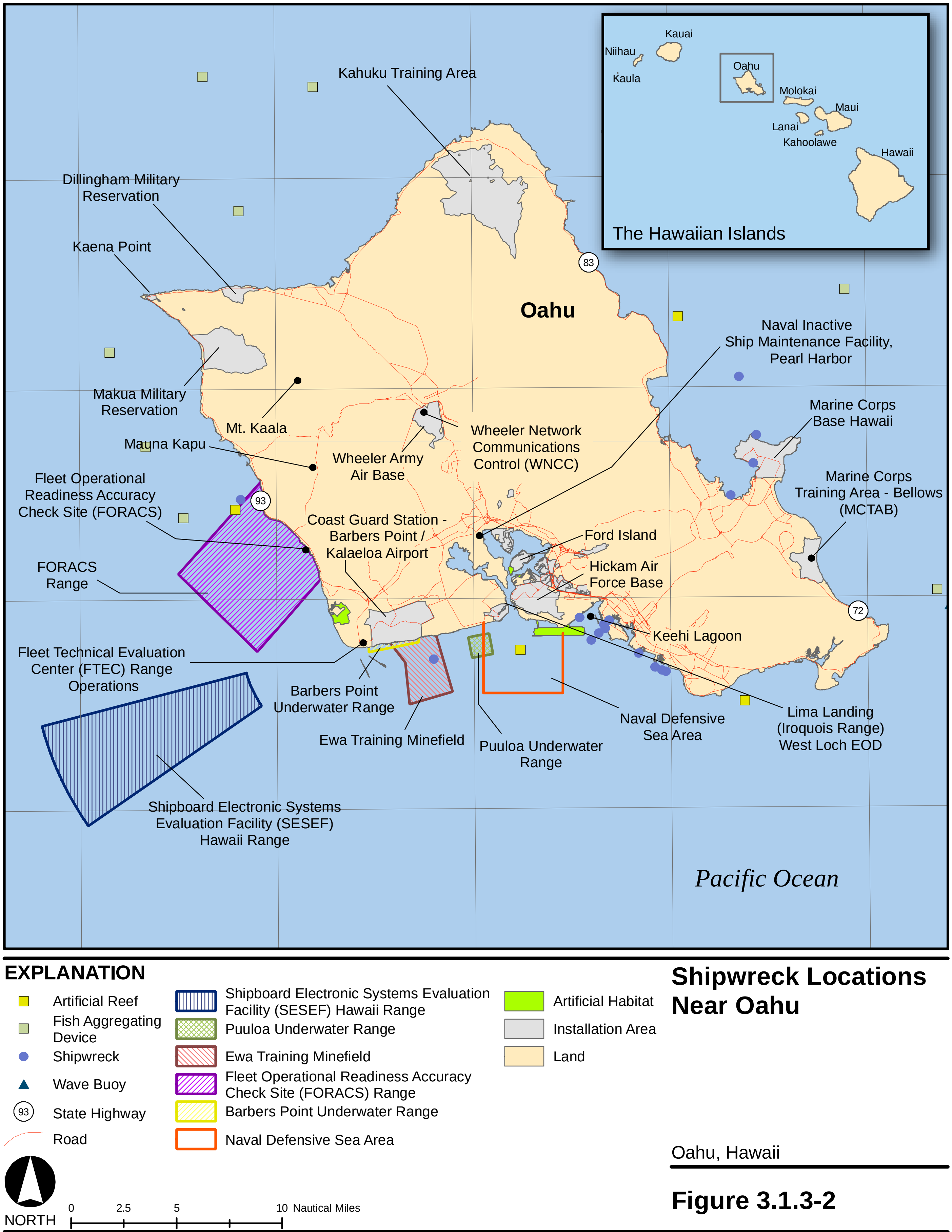
Hazardous constituents can generally be defined as hazardous materials present at low concentrations in a generally non-hazardous matrix, such that their hazardous properties do not produce acute effects. Navy vessels conducting training do not intentionally release hazardous constituents into the water. The U.S. Environmental Protection Agency (USEPA) and Department of Defense (DoD), however, have identified numerous waste streams from Navy vessels that do or may contain hazardous constituents. Waste streams from Navy vessels that may contain hazardous constituents include hull coating leachate and:

- Bilgewater / oil water separator discharges,
- Gray water,

Shipwreck Locations Near Kauai and Niihau

Kauai and Niihau, Hawaii

Figure 3.1.3-1



Shipwreck Locations Near Oahu

Oahu, Hawaii

Figure 3.1.3-2

Shipwreck Locations Near Maui, Molokai, Lanai, and Kahoolawe

Maui, Molokai, Lanai, and Kahoolawe, Hawaii

Figure 3.1.3-3

- Cooling water,
- Weather deck runoff
- Chain locker effluent,
- Elevator pit effluent, and
- Photographic laboratory drains.

In addition, small boat engines discharge petroleum products in their wet exhaust (U.S. Environmental Protection Agency, 1999).

Table 3.1.4-1 lists quantities of training activity hazardous materials for the Open Ocean Area, by Navy training activity, based on the number of baseline training operations. Hazardous materials associated with training are described in subsequent paragraphs.

Hazardous Constituents of Concern

Missiles

The single largest hazardous constituent of missiles is solid propellant, but numerous hazardous constituents are used in igniters, explosive bolts, batteries, and warheads. Most of the missiles fired carry inert warheads that contain no hazardous constituents. Exterior surfaces may be coated, however, with anti-corrosion compounds containing chromium or cadmium.

Aerial Targets

Aerial targets are used for testing and training purposes. Most air targets contain jet fuels, oils, hydraulic fluid, batteries, and explosive cartridges as part of their operating systems. Fuel is shut off by an electronic signal, the engine stops, and the target begins to descend. A parachute is activated and the target descends to the ocean surface where range personnel retrieve it. Some targets are actually hit by missiles, however, and those targets fall into the Range.

Surface Targets

Surface targets are used during missile and bombing exercises. Surface targets are stripped of unnecessary hazardous constituents and other augmentation, and made environmentally clean; therefore, only minimal amounts of hazardous constituents are onboard.

Each Sinking Exercise (SINKEX) uses as a target an excess vessel hulk that is eventually sunk during the course of the exercise. The target is an empty, cleaned, and environmentally remediated ship hull that is towed to a designated location where various platforms use multiple types of weapons to fire shots at the hulk. The vessels used as targets are selected from a list of USEPA-approved destroyers, tenders, cutters, frigates, cruisers, tugs, and transports (U.S. Department of the Navy and U.S. Environmental Protection Agency, 1996). Platforms can consist of air, surface, and subsurface elements. Weapons can include missiles, precision and non-precision bombs, gunfire, and torpedoes. If none of the shots sinks the hulk, either a submarine shot or placed explosive charges are used to sink the ship. If sunk by explosives, charges ranging from 100 to 200 lb, depending on the size of the ship, are placed on or in the hulk.

The USEPA granted the U.S. Department of the Navy a general permit through the Marine Protection, Research, and Sanctuaries Act to transport vessels “for the purpose of sinking such vessels in ocean waters…” (40 Code of Federal Regulations [CFR] Part 229.2). Subparagraph (a)(3) of this regulation states “All such vessel sinkings shall be conducted in water at least 1,000 fathoms (6,000 ft) deep and at least 50 nm from land.” In Hawaii, SINKEX events take place in Warning Area W-188 (see Figure 3.1.1-1).

Table 3.1.4-1. Baseline Navy Operations—Open Ocean Area

Training Activity	Hazardous Material		
	Training Item	No. Per Exercise	Total No. Deployed Annually
Visit, Board, Search, and Seizure	0.50-caliber gun ammunition	varies	varies
Surface-to-Surface Gunnery Exercise (S-S GUNEX)	5-inch or 76-millimeter ammunition	20	1,380
	Smoke canister	0.52	36
	7.62-mm or .50-caliber ammunition	150	10,400
Air-to-Surface Gunnery Exercise (A-S GUNEX)	0.50-caliber or 7.62-mm ammunition	400	51,200
	Smoke canister	1	128
Bombing Exercise (BOMBEX)	MK-76	9	315
	MK-82	3	105
	BDU-45	1.7	60
	CBU	1	35
	MK-83	0.5	18
	Smoke canister	1	35
Sink Exercise (SINKEX)	Varies depending upon weapons and platform		
ASUW TORPEX (Submarine-Surface)	MK-48 torpedo	3	105
Antisubmarine Warfare Tracking Exercise (ASW TRACKEX)	Sonobuoy	24-43	6,228
	Smoke canister	1-2	279
	MK-39	0-1	152
Antisubmarine Warfare Torpedo Exercise (ASW TORPEX)	REXTORP	1	397
	MK-39	1	397
Air Combat Maneuver (ACM)	Chaff	6	4,428
	Flare	3	2,214
Surface-to-Air Gunnery Exercise (S-A GUNEX)	5-in	3	258
	7.62-mm projectile	3	258
	20-mm projectile	1,900	162,000
Chaff Exercise (CHAFFEX)	MK-36 super rapid bloom offboard chaff	7.5	255

Note: Training activities not listed above are assumed to have no hazardous materials associated with them.

Other Ordnance

Other ordnance includes bombs and gunnery rounds. Most of this ordnance is inert (non-explosive) and consists of non-hazardous constituents. Inert ordnance includes steel shapes or replicas containing concrete, vermiculite (clay), or other non-hazardous constituents similar in appearance, size, and weight to explosive ordnance used in wartime.

Training Debris

Various types of small, expendable training items are shot, thrown, dropped, or placed within the training areas. These items include smoke grenades, flares, and sonobuoys of various types. They are used in relatively small quantities for selected training activities, and are scattered over a large area. Items that are expended on the water, and fragments that are not recognizable as training debris (e.g., flare residue, or candle mix), are not collected.

Sonobuoys and debris from flares, smoke grenades, and other pyrotechnic devices that fall in the water may release small amounts of toxic substances as they degrade and decompose. The items degrade very slowly, so the volume of decomposing training debris within the training areas—and the amounts of toxic substances being released to the environment—gradually increases over the period of military use. Concentrations of some substances in sediments surrounding the disposed items would increase over time. Sediment movements in response to tidal surge and longshore currents, and sediment disturbance from ship traffic and other sources, would eventually disperse contaminants outside of the training areas.

Sonobuoys. Approximately 6,300 sonobuoys are deployed annually as part of the training events. Sonobuoys are electro-mechanical devices used for a variety of ocean sensing and monitoring tasks. Sonobuoys contain lead solder, lead weights, and copper anodes. Sonobuoys also may contain lithium sulfur dioxide, lithium, or thermal batteries.

During operation, a sonobuoy's seawater batteries may release copper, silver, lithium, or other metals to the surrounding marine environment, depending upon the type of battery used. Marine organisms are exposed to battery effluents for up to 8 hours, which is about the maximum life of seawater batteries. The batteries cease operating when their chemical constituents have been consumed. Once expended and scuttled, the sonobuoys sink to the ocean floor.

Various types of sonobuoys are used, so the exact amounts of waste materials that are generated are not known. Table 3.1.4-2 provides estimates of sonobuoy wastes, based on the types of sonobuoys in use on San Clemente Island.

Pyrotechnic Residues. About 480 smoke grenades and over 2,200 flares are used under baseline conditions. Solid flare and pyrotechnic residues may contain, depending on their purpose and color, aluminum, magnesium, zinc, strontium, barium, cadmium, and nickel, as well as perchlorates. At an average weight of about 0.85 lb per item, about 1.1 tons per year of these wastes would be generated. Although pyrotechnic residues typically include hazardous constituents, most of them are present in small amounts or low concentrations, and are bound up in relatively insoluble compounds. As inert, incombustible solids with low concentrations of leachable metals, these materials typically do not meet the criteria for characteristic hazardous wastes. The perchlorate compounds present in the residues are relatively soluble, and probably disperse quickly.

Table 3.1.4-2. Sonobuoy Hazardous Wastes Based on Average Amounts of Constituents

Sonobuoy Constituent	Annual Amount	
	Pounds	Kilograms
Fluorocarbons	121	55
Copper	7,000	3,180
Lead	5,760	2,620
TOTAL	12,900	5,860

Note: values rounded to three significant digits.
Source: U.S. Department of the Navy, San Clemente Island Ordnance Database

<ins>Chaff</ins>. Chaff is a thin polymer with a metallic (aluminum) coating used to decoy enemy radars. At present, about 34 Chaff Exercises are held per year, releasing about 255 packages of chaff over the Open Ocean Area. In addition, Air Combat Maneuvers release more than 4,400 packages of chaff per year. The chaff disperses quickly, and the widely spaced exercises have no discernable effect on the marine environment.

<ins>Baseline Conditions</ins>

Open ocean areas are typically considered to be relatively pristine with regard to hazardous materials and hazardous wastes. Hazardous materials are present on the ocean, however, as cargoes and as fuel, lubricants, and cleaning and maintenance materials for marine vessels and aircraft. Infrequently, large hazardous materials leaks and spills—especially of petroleum products—have fouled the marine environment and adversely affected marine life. No quantitative information is available on the overall types and quantities of hazardous materials present on the sea ranges at a given time, nor on their distribution among the various categories of vessels.

Navy vessels present on the Hawaii sea ranges represent a small fraction of the overall commercial and recreational boat traffic and, correspondingly, account for only a small fraction of the hazardous materials present in the Open Ocean Area around Hawaii. As described earlier, Navy training activities in open ocean areas involve the use of fuel, lubricants, explosives, propellants, batteries, oxidizers, and other hazardous substances. The Navy makes every effort to minimize its use of hazardous materials during training, and recovers and reuses unexpended training materials to the extent practicable.

Hazardous Wastes

<ins>Management</ins>

Environmental compliance policies and procedures applicable to operations on shore are defined in Naval Operations Instruction (OPNAVINST) 5090.1B (2003), Chapter 12, while environmental compliance policies and procedures applicable to shipboard operations afloat are defined in OPNAVINST 5090.1B (2002), Chapter 19. The Consolidated Hazardous Materials Reutilization and Inventory Management Program (CHRIMP) also provides information on management of hazardous materials for both afloat and ashore. These documents provide a comprehensive compilation of procedures and requirements that are mandated by law, directive, or regulation. These documents have a compliance orientation to ensure safe and efficient control, use, transport, and disposal of hazardous waste. Hazardous wastes generated afloat are stored in approved containers. The waste is offloaded for proper disposal within 5 working days of arrival at a Navy port.

Generation

Environmental compliance policies and procedures applicable to shipboard operations afloat are defined in OPNAVINST 5090.1B (2002), Chapter 19. Munitions containing or comprising hazardous materials expended during training exercises that are irretrievable from the ocean are not considered a hazardous waste in accordance with the Military Munitions Rule.

Storage

Navy ships may not discharge overboard untreated used or excess hazardous materials generated onboard the ship within 200 nm of shore. Ships retain used and excess hazardous material on board for shore disposal. Ships offload used hazardous materials within 5 working days of arrival at a Navy port.

Disposal

Hawaii lacks permitted hazardous waste disposal facilities; therefore, hazardous waste generated by the Navy is shipped to the mainland for disposal. Limited facilities for treatment and processing of recycled materials exist on Oahu.

Baseline Conditions

Hazardous wastes are present in open ocean areas, both on surface vessels and in bottom sediments. Commercial, scientific, and military vessels generate small quantities of hazardous wastes during their operations. These materials typically are accumulated while at sea, and then offloaded and transported to land disposal facilities when in port. No quantitative information is available on the overall types and quantities of hazardous wastes present on the sea ranges at a given time, nor on their distribution among the various categories of vessels.

As a result of the past practice of ocean disposal of hazardous wastes off Hawaii, isolated deposits of various types of hazardous wastes may be found on the ocean floor. Although no such sites have been identified within the Navy's sea ranges, the potential for one or more hazardous waste deposits to be present cannot be discounted.

3.1.5 HEALTH AND SAFETY—OPEN OCEAN AREA

Public health and safety issues include potential hazards inherent in flight operations, weapons firings, vessel operations, and target operations. This section also addresses public proximity and access, effects of electromagnetic radiation (EMR), potential ordnance hazards, and potential fuel hazards. The safety policy of the Navy is to observe every reasonable precaution in planning and executing its range operations to prevent injuries to or adverse health effects on its personnel or the public. Appendix C includes a discussion of health and safety resource regulations.

Region of Influence

The region of influence for public health and safety includes the sea ranges themselves, and ocean areas adjacent to the sea ranges.

Affected Environment

The ocean in the vicinity of the main Hawaiian Islands is used for a variety of recreational, commercial, scientific, transportation, cultural, and institutional purposes. The intensity of use generally declines with increasing distance from the shoreline, although specific resources in the Open Ocean Area may result in a concentration of use (e.g., sea mounts are preferred fishing locations). Areas that are shielded by land masses from the full force of wind and waves, such as the channels between Maui and adjacent islands, are preferred recreational areas. The Division of Land and Natural Resources Division of Aquatic Resources is conducting a Hawaii Marine Recreational Fishing Survey Project to determine the quantity of recreational fishing in Hawaii.

Activities in the Open Ocean Area have no influence on public health. Because these areas are widely used for recreation, commerce, and scientific, educational, and cultural activities, however, surface vessel transits, aircraft operations, and weapons firing have the potential to affect public safety. The Navy has developed extensive protocols and procedures for the safe operation of its vessels and the safe execution of its training events.

3.1.6 NOISE—OPEN OCEAN AREA

Appendix C includes a definition of noise and the main regulations and laws that govern them. Wildlife receptors and their acoustic characteristic and sensitivities are described in Section 3.1.2, Biological Resources (Marine).

Region of Influence

Noise sources in the HRC are transitory and widely dispersed. The region of influence for noise includes all areas of the HRC where aircraft operations or live weapons firings take place.

Affected Environment

Table 3.1.6-1 lists typical noise sources and their effects on the corresponding noise environments. Note that each of the sound levels indicated is for a single event. Such events are discrete, and the resulting noise is not additive.

Airborne Noise Sources

Airborne noise sources include civilian and military aircraft (both types of which fly at altitudes ranging from hundreds of feet to tens of thousands of feet above the surface), bombs, naval gunfire, missiles, rockets, and small arms. Noise levels may be significant in the vicinity of these operations, but these operations take place miles at sea. Open Ocean Area noise sources are widely dispersed in the air.

Table 3.1.6-1. Sound Levels of Typical Airborne Noise Sources and Environments

Noise Source (at a Given Distance)	A-Weighted Sound Level in Decibels (dBA)	Typical Noise Environment	Human Perception of Noise Loudness (Relative to 70 dBA)
	140		
Military Jet Take-off w/afterburner at 50 feet	130	Carrier Flight Deck, Runway Boundary	
Civil Defense Siren			
Commercial Jet Take-Off @ 200 ft	120		Threshold of Pain
			32 times as loud
Pile Driver @ 50 ft	110	Rock Music Concert Fighter Jet Depature	16 times as loud
Ambulance Siren @ 100 ft	100		Very Loud
Newspaper Press @ 5 ft		Printing Press Plant	8 times as loud
Power Lawn Mower @ 3 ft			
Motorcycle @ 25 ft	90	Boiler Room	4 times as loud
Propeller Aircraft @ 1,000 ft			
Diesel Truck, 40 mph @ 50 ft			
Home Garbage Disposal @ 3 ft	80	High Urban Ambient Sound	2 times as loud
Passenger Car, 65 mph @ 25 ft			
Living Room Stereo @ 15 ft			
Vacuum Cleaner @ 3 ft	**70**		Moderately Loud
Electronic Typewriter @ 10 ft			
Normal Conversation @ 5 ft	60	Data Processing Center	1/2 as loud
Air Conditioning Unit @ 100 ft		Department Store	
Light Automobile Traffic @ 100 ft	50	Private Business Office	1/4 as loud
Distant Bird Calls			
	40	Lower Limit of Urban Ambient Sound	Quiet
			1/8 as loud
Soft Whisper @ 5 ft	30	Quiet Bedroom	1/16 as loud
	20	Recording Studio	Barely Audible
	10	Anechoic Chamber	1/32 as loud
	0		Threshold of Hearing

Source: ISE 1997

Underwater Noise

Underwater sources on the HRC may be categorized in terms of their time-related characteristics. The categories are continuous or slowly varying, pulse (tonal), impulse (broadband), and explosive sources. The continuous or slowly varying source category includes submarine simulators, and torpedoes. Noise radiated into water from slower, low-flying fixed-wing aircraft and helicopters is also included in this category. The pulse category includes active sonar, beacons, transponders, fathometers, underwater telephones, and various pingers. The broadband impulse category includes noise made by fast, low-flying aircraft, naval surface gunfire, and objects impacting the water (e.g., sonobuoys, intact missiles, bombs, aerial targets, mine shapes, and various projectiles). (See Appendix H.)

Underwater noise sources include bombs and other projectiles that explode underwater and demolition activities. These sources are distinguished from the broadband impulse category by shock wave propagation near the source with high peak pressures and short durations.

3.1.7 SOCIOECONOMICS—OPEN OCEAN AREA

Appendix C includes a general definition of socioeconomics.

Region of Influence

The socioeconomic region of influence in this section includes the ocean area within the HRC. The major emphasis of this section is on the Hawaiian Islands fisheries and the areas impacted by the Hawaiian Islands fisheries.

Affected Environment

There are many activities that occur in the ocean areas of the HRC that contribute to the economy of Hawaii. These can be categorized into shipping related, tourism related, and fishing related.

Shipping

Hawaii's remote location in the mid-Pacific makes it economically dependent upon the local waterways and its inter-modal maritime transportation system. Hawaii's harbors and local waterways use vessel traffic separation schemes that are closely monitored and supervised by the U.S. Coast Guard to promote safe navigation and provide a secure system for shipping. Barges and ships navigate these waterways daily to transport goods and personnel not just within the Hawaiian Islands and to and from the mainland of North America, but across the Pacific Ocean to all the major ports of Asia, Oceania, Central and South America, and the South Pacific.

National Oceanic and Atmospheric Administration provides frequently updated electronic and paper navigation charts for all mariners depicting the current vessel traffic separation schemes for all of Hawaii's major harbors and inland waterways. While traffic separation schemes are demarcated on National Oceanic and Atmospheric Administration charts to maintain safe traffic flow, inter-modal shipping lanes are not. Outside of the traffic schemes and regulated waterways of the Hawaiian Islands, mariners are free to plot their own course; however, it is common practice for many shipping companies to use great circle routes with track adjustments made for navigational risks such as restricted waters, obstructions, depth of water, currents, weather, traffic, and environmental factors. Great circle routes are commonly used because they are the shortest distance between two points on the globe; therefore, it is more economical for companies to follow these routes.

Tourism

Tourism is the largest source of income for the State of Hawaii. Many island visitors enjoy partaking in activities in the ocean areas within the HRC such as scuba diving, kayaking, sailing, and dinner cruises. There are many businesses that rent equipment, offer guided tours, operate charter boats, and supply other services to the tourists within the region of influence.

Fishing

Although there is not always a clear distinction, there have traditionally been three classes of fishermen defined in Hawaii; subsistence fishermen, recreational fishermen, and commercial fishermen. Subsistence fishermen are typically men that fish as part of their culture and fish to supply food for their families. The term recreational fisherman implies that the fisherman is fishing for enjoyment; however, recreational fishermen sometimes sell their catch also. Commercial fishermen fish as a job.

Recreational Fishing

Anglers contribute about $138 million a year to the Hawaiian economy. Fishing occurs generally year round but is noticeably reduced during the fall-winter season on the windward side of the islands (north and east). Charter fishing trips cost from $700 to $5,000 depending on location. In a survey of over 500 small boat operators (small being less than 30 to 40 ft), about one third considered themselves recreational anglers and another third as expense fishers with the remaining third being commercially oriented. Since the 1990s the Hawaiian Islands have experienced an upward trend of personal recreational boat owners, reaching for example about 14,000 in 1999.

The most common fish caught by recreational anglers using private or rental boats in 2002 was skipjack tuna, followed by yellowfin tuna, dolphinfish, and wahoo. Marine recreational survey records show that in 2003 about 440,000 individuals took about 2.4 million trips catching a total of 12.5 million fish. The number of fishing trips remained above 50,000 per 2-month survey period in 2001, peaking during the July-August period at 150,000 trips. The average number of private boat trips in 2003 increased to about 60,000. The greatest number of trips was slightly less than 140,000 in the November-December survey period. The level of activity fishing from shore (no boats) is nearly an order of magnitude greater, averaging at about 200,000 fishing trips per 2-month period and peaking at over 500,000 during the July-August period in 2001. (Hawaiian Islands Operating Area Marine Resources Assessment, 2005.)

Commercial Fishing

Hawaii's commercial fisheries grossed $52.4 million in 2003 and averaged $60.1 million from 1994 to 2003 (2003 is the most recent year for which data is available) (Table 3.1.7-1). The actual economic value to the region is far greater than this, in terms of jobs, goods, and services associated with these fisheries. In the Hawaiian Islands, it is often difficult to distinguish recreational fishing from commercial fishing since many recreational anglers end up selling all or part of their daily catch to markets, restaurants, or at personal street side stands. These anglers do not register as “commercial” fishers, and their landings are not generally reported directly. Of the commercial fisheries in the Hawaiian archipelago, the pelagic fishery is the largest and most important (by effort and dollar value) that occurs in the waters of the HRC. This is followed in importance by the bottomfish fishery. The precious coral and crustacean fisheries are comparatively small and minimal in the waters of the HRC (Hawaiian Islands Operating Area Marine Resources Assessment, 2005).

Table 3.1.7-1. Landing and Dollar Value of Hawaii’s Fisheries from 1994 through 2003

Year	Metric Tons	Pounds	Dollars
1994	12,288	27,090,000	$62,451,000
1995	13,559	29,892,000	$59,847,000
1996	14,456	31,870,000	$64,288,000
1997	16,587	36,568,000	$68,693,000
1998	16,523	36,426,030	$62,064,800
1999	16,741	36,906,840	$64,556,518
2000	14,756	32,531,330	$68,447,404
2001	10,828	23,870,471	$54,561,446
2002	10,814	23,840,620	$52,113,310
2003	10,685	23,555,793	$52,433,417
Average:	***13,724***	***30,255,108***	***$60,945,590***
Total:	**137,236**	**302,551,084**	**$609,455,895**

Source: Hawaiian Islands Operating Area Marine Resources Assessment, 2005, Source Information: National Marine Fisheries Service, 2004a

Pelagic Fisheries

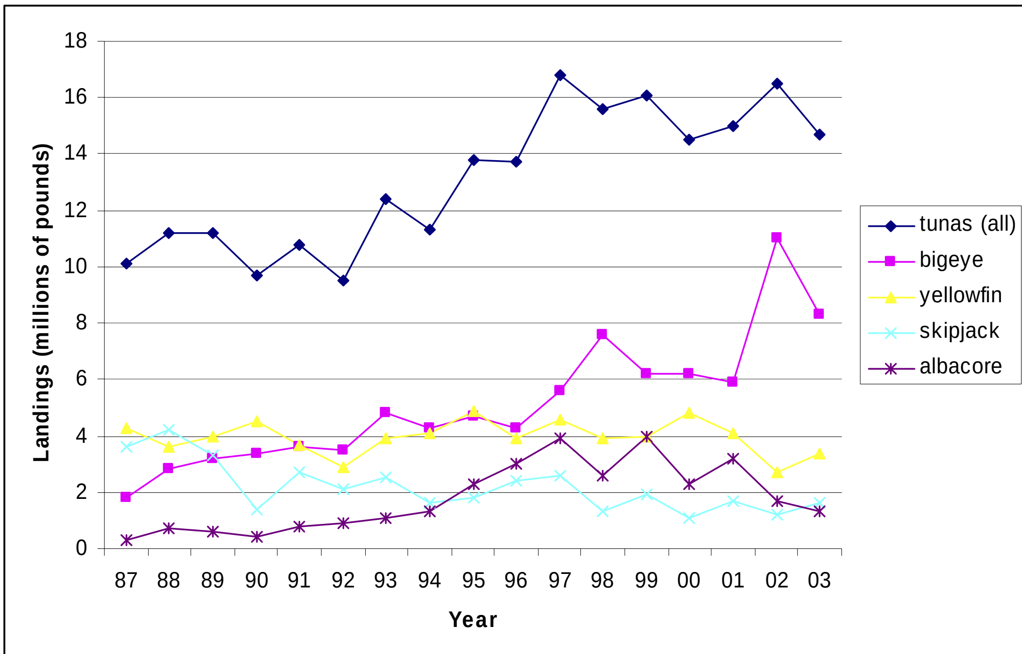
The pelagic fishery is dominant among the major fisheries of the HRC. Approximately 22 million lb were landed in 2002, comprising nearly 91 percent of all marine fishery landings in Hawaii for that year. Pelagic fishing is directed at open ocean fishes found primarily in the mid and upper water column using a variety of hook-and-line gears, most commonly longline (down to 164 fathoms). Target species include swordfish and tunas, primarily, but may include species such as other billfishes, pelagic sharks, and other small fishes such as dolphinfish, wahoo, moonfish, and pomfret (Figures 3.1.7-1 and 3.1.7-2) (Hawaiian Islands Operating Area Marine Resources Assessment, 2005).

Fishing occurs in numerous locations throughout the HRC. Figure 3.1.7-3 shows the location of the various fishing techniques that occur in the area as well as the placement of fish aggregating devices.

Bottomfish Fisheries

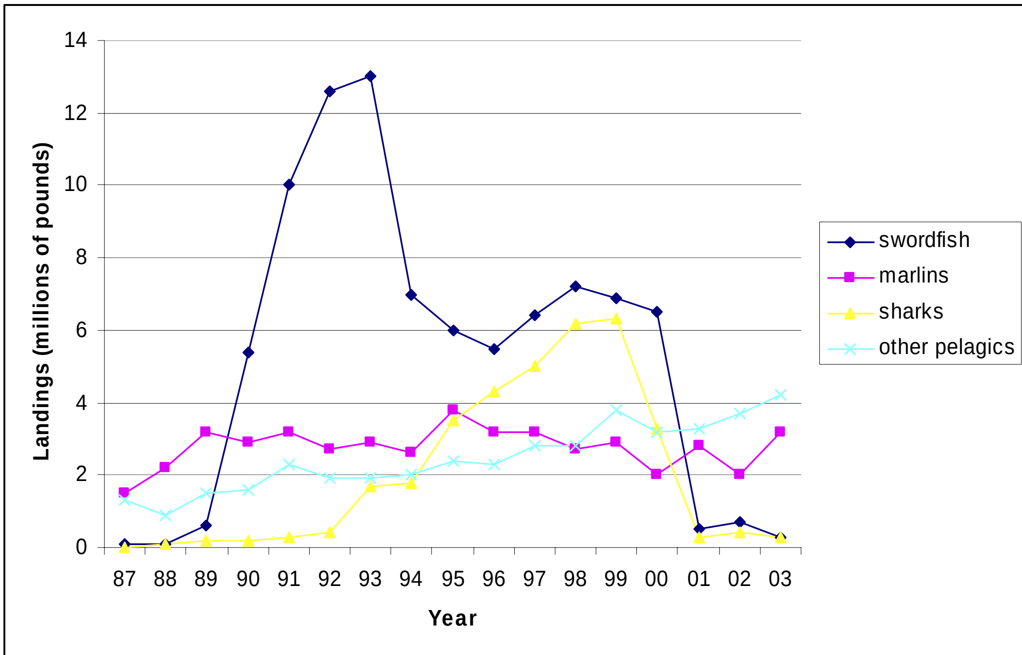
Bottomfish fisheries are the second most prevalent fishery type in the HRC. Landings have fluctuated since 1983, peaking at around 66,000 lb in 1996 and declining to about 42,000 lb in 2003 (Figure 3.1.7-4). Stocks of bottomfish around the main Hawaiian Islands are currently stressed. While seabass and pink snapper still represent the largest portion of bottomfish landings, they have experienced sudden declines since 2000. There has been an overall decline in landings of bottomfish species since 2000, though the longtail red snapper showed a slight increase (Hawaiian Islands Operating Area Marine Resources Assessment, 2005).

Fishing occurs in numerous locations throughout the HRC. Figure 3.1.7-5 shows the location of bottomfish fisheries in the HRC.



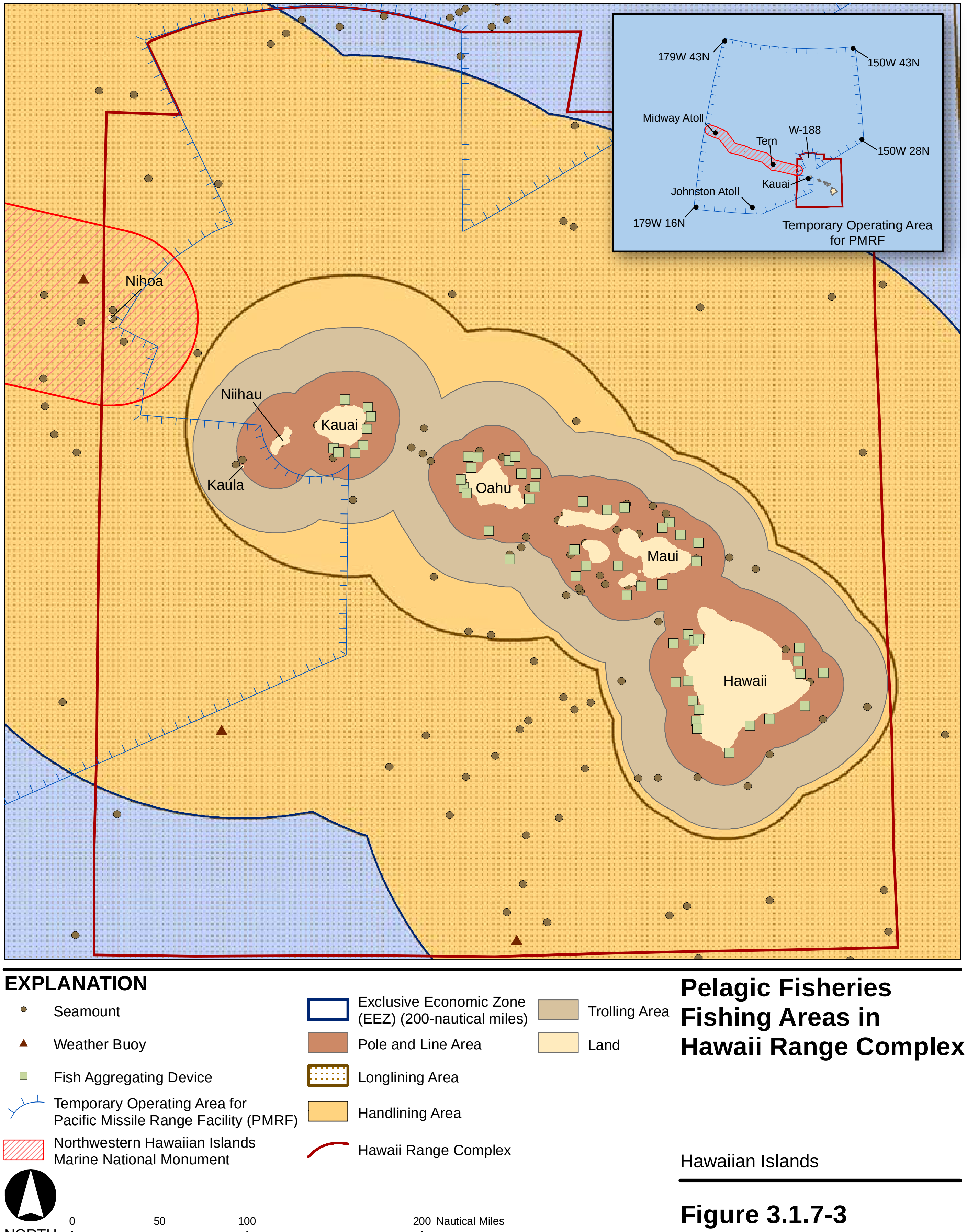
Source: Hawaiian Islands Operating Area Marine Resources Assessment, 2005, Source Information: Western Pacific Regional Fishery Management Council, 2004c.

Figure 3.1.7-1. Pelagic Fishery Landings in Millions of Pounds for Tunas Between the Years 1987 Through 2003



Source: Hawaiian Islands Operating Area Marine Resources Assessment, 2005, Source Information: Western Pacific Regional Fishery Management Council, 2004c.

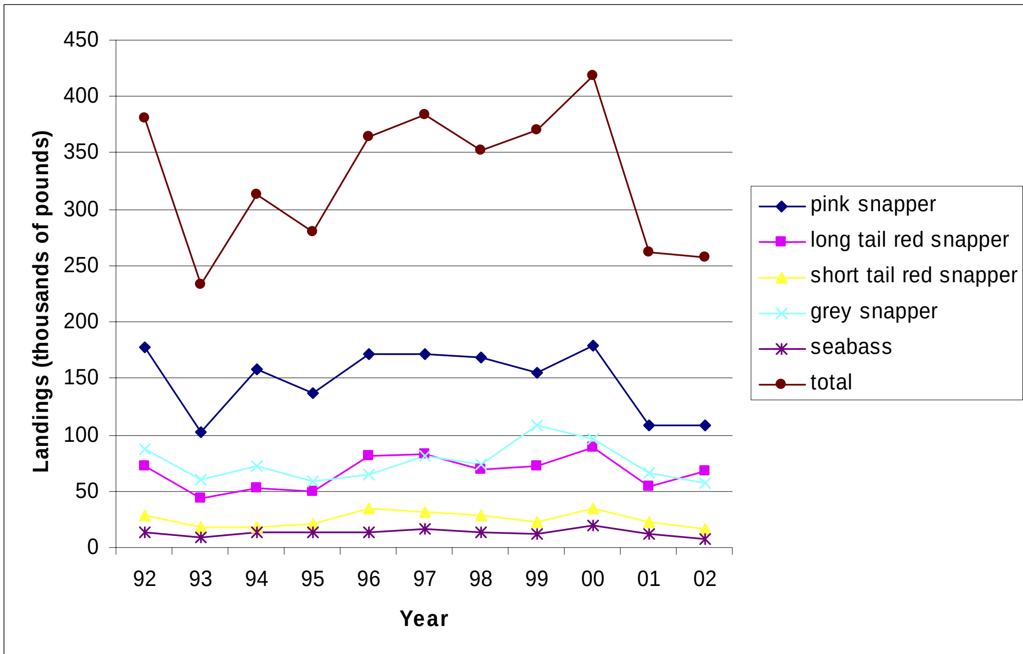
Figure 3.1.7-2. Pelagic Fishery Landings in Millions of Pounds for Swordfish, Marlins, Sharks, and other Pelagic Fishes (Dolphinfish, Wahoo, Moonfish, Pomfret, etc.) Between the Years 1987 Through 2003



Pelagic Fisheries Fishing Areas in Hawaii Range Complex

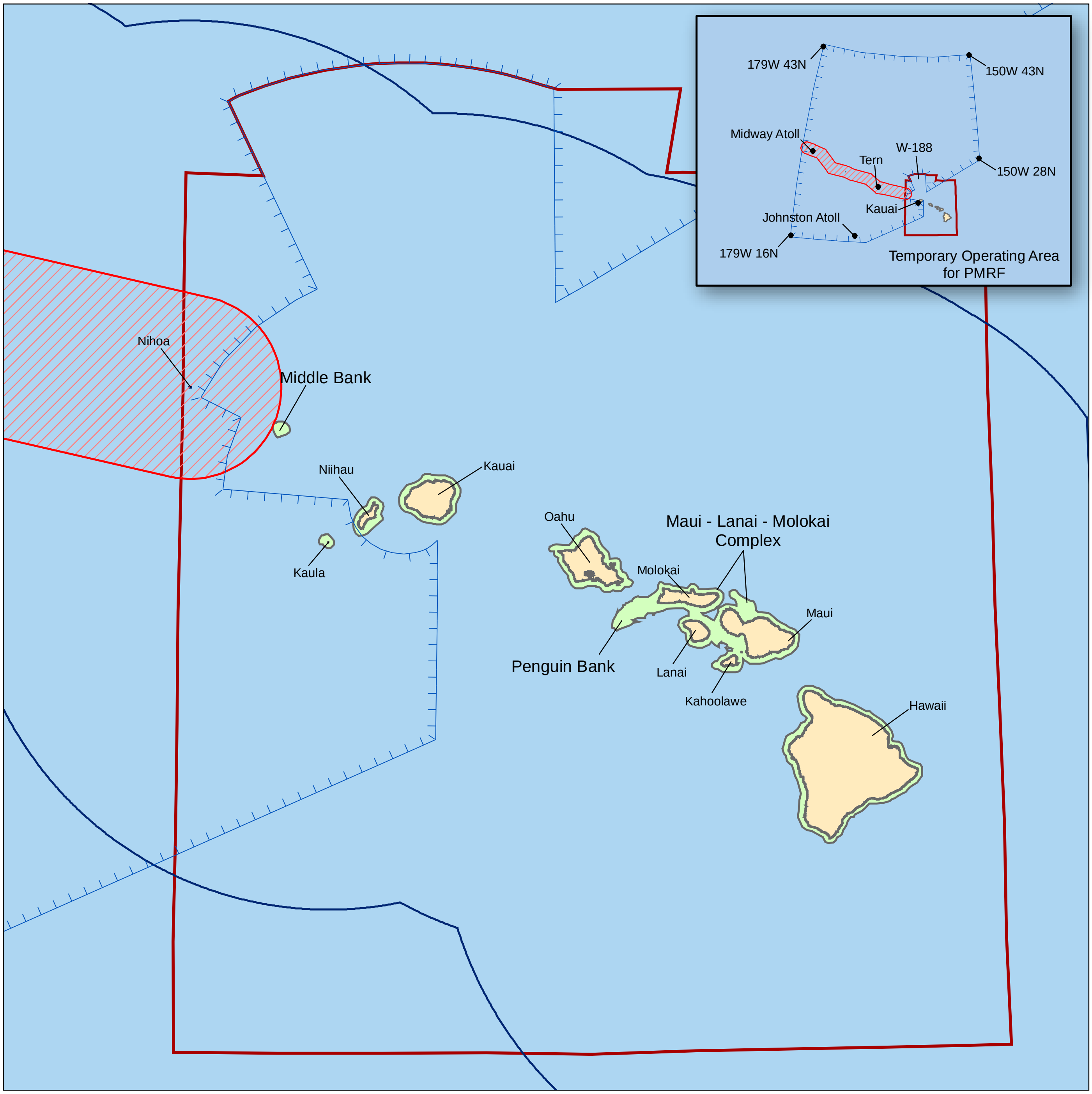
Hawaiian Islands

Figure 3.1.7-3



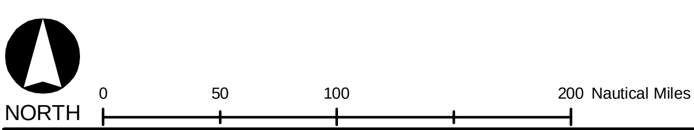
Source: Hawaiian Islands Operating Area Marine Resources Assessment, 2005, Source Information: Western Pacific Regional Fishery Management Council, 2004b.

Figure 3.1.7-4. Bottomfish Fishery Landings in Millions of Pounds for Select Species from 1987 Through 2003



EXPLANATION

- Temporary Operating Area for Pacific Missile Range Facility (PMRF)
- Hawaii Range Complex
- Exclusive Economic Zone (EEZ) (200-nautical miles)
- Main Hawaiian Islands Bottomfish Fishery
- Northwestern Hawaiian Islands Marine National Monument
- Land



Bottomfish Fisheries in Hawaii Range Complex

Hawaiian Islands

Figure 3.1.7-5

3.1.8 WATER RESOURCES—OPEN OCEAN AREA

Appendix C includes a description of the primary laws and regulations regarding water resources.

Region of Influence

The region of influence for water resources includes open ocean waters within the HRC.

Affected Environment

The Open Ocean Area off the Hawaiian Islands is a dynamic, tropical marine environment. Average water temperatures vary from 71° F in March to 81°F in September. Wave height varies from occasional flat seas to over 40 ft during high winter winds. Average swells commonly range from 3.3 to 9.8 ft in height. Water quality in the Open Ocean Area is excellent, with high clarity, low concentrations of suspended particles, high levels of dissolved oxygen, and low levels of contamination from trace metals or hydrocarbons (components of petroleum-based fuels) (U.S. Department of the Navy, 2000).

Physical and Chemical Properties

The general composition of the ocean includes water, salts, dissolved gases, minerals, and nutrients. The characteristics of seawater determine, in part, the interactions between the ocean and its inhabitants. The most important physical and chemical properties of seawater are temperature, salinity, density, alkalinity (pH), and dissolved gases.

Salinity

Salinity refers to the salt (sodium chloride) content of seawater. For oceanic waters, the salinity is approximately 35 parts of salt per 1,000 parts of seawater. Variations in the salinity of ocean water are linked primarily to climatic conditions. Salinity variations are at their highest at the surface of the water. The salinity of surface water is increased by the removal of water through evaporation. Alternately, it decreases through dilution from the addition of fresh water (e.g., rain, runoff from fresh water sources such as streams).

Seawater salinity has a profound effect on the concentration of salts in the tissues and body fluids of organisms. Slight shifts of salt concentrations in the bodies of animals can have stressful or even fatal consequences. Therefore, animals have either evolved mechanisms to control body salt levels, or they let them rise and fall with the levels of the seawater around them. (Waller, 1996)

In addition to the direct effects on marine biota, salinity also has an effect on the ocean's physical properties. For example, salinity helps maintain a constant temperature throughout the ocean depths. A high salt content in water slightly increases its density, which makes it resistant to drastic temperature fluctuations.

Density

Density (mass per unit volume) of seawater is dependent upon its composition, and is affected by temperature. The dissolved salt and other dissolved substances contribute to the higher density of seawater versus fresh water. As temperatures increase, density decreases.

Accordingly, water that is denser will sink, while water which is less dense will rise. Therefore, oceans can be thought of as having a three-layered system of water masses. The three layers of the ocean include: the surface layer, from 0 to 92 fathoms; an intermediate layer, from 92 to 250 fathoms; and a deepwater layer, from 250 fathoms to the sea floor. (Waller, 1996)

Temperature

Water temperature is one of the most important physical factors of the marine environment. Temperature controls the rate at which chemical reactions and biological processes occur (Waller, 1996). In addition, most organisms have a distinct range of temperatures in which they may thrive. A greater number of species live within the moderate temperature zones with fewer species tolerant to extremes in temperature. Typically, the vast majority of organisms cannot survive dramatic temperature fluctuations.

Temperature gradients are created when warmer, lighter water floats above the cold, denser water. The warm and cold layers of water are separated by a thin, narrow band of stable water called a thermocline. In tropical latitudes, the thermocline is present as a permanent feature and is located approximately 33 to 167 fathoms below the surface. The temperature below the thermocline remains relatively constant, with most areas of the Pacific Ocean maintaining a temperature of 39.2ºF. The thermocline acts as a depth barrier to many plants and animals and often represents the boundary between hospitable and inhospitable water masses for many species of organisms. (Waller, 1996)

pH

The measure of the acidity or alkalinity of a substance, known as the pH, is based on a scale ranging from 1 (highly acidic) to 14 (highly basic). A pH of 7 is considered neutral. Surface seawater often has a pH between 8.1 and 8.3 (slightly basic), but generally the acidity of ocean water is very stable with a neutral pH. In shallow seas and coastal areas, the pH can be altered by plant and animal activities, by pollution, and interaction with fresh water. (Waller, 1996)

Dissolved Gases

Oxygen is not readily soluble in seawater. The amount of oxygen present in seawater will vary with the rate of production by plants, consumption by animals and plants, bacterial decomposition, and by surface interactions with the atmosphere. Most organisms require oxygen for their life processes. When surface water sinks to deeper levels, it retains its store of oxygen. (Waller, 1996) Carbon dioxide is a gas required by plants for photosynthetic production of new organic matter. Carbon dioxide is 60 times more concentrated in seawater than it is in the atmosphere. Seawater in tropical regions has lower levels of dissolved gas in a given volume of water compared to seawater in high latitude areas (Waller, 1996).

3.2 NORTHWESTERN HAWAIIAN ISLANDS

The Northwestern Hawaiian Islands are a chain of small islands, atolls, submerged banks, and reefs stretching for more than 1,000 miles (mi) northwest of the main Hawaiian Islands. Missiles such as the Terminal High Altitude Area Defense (THAAD) missile when launched from the Pacific Missile Range Facility (PMRF) have the potential to overfly portions of the Northwestern Hawaiian Islands Marine National Monument (Papahanaumokuakea). Of particular concern is overflight of Nihoa and Necker, which are the islands closest to the Main Hawaiian Islands. Nihoa is located at the southeastern end of the Northwestern Hawaiian Islands and is 240 nautical miles (nm) northwest of Oahu. Of the 14 environmental resources considered for analysis, air quality, airspace, geology and soils, hazardous materials and waste, heath and safety, land use, noise, socioeconomics, transportation, utilities, visual and aesthetics, and water resources are not addressed. Any air space, air quality, hazardous materials and hazardous waste, health and safety, land use, and noise issues associated with the Northwestern Hawaiian Islands are addressed under PMRF/Main Base. There are no current or proposed Hawaii Range Complex (HRC) activities that affect the existing land forms, geology, and associated soils development of the islands. Socioeconomic characteristics (population size, employment, income generated and housing cost) do not apply since all the islands are uninhabited. No transportation (roadways, railways, etc) and utility systems (water, wastewater, electricity, and natural gas) exist. The visual and aesthetic vista is protected by its administrators (U.S. Fish and Wildlife Service and the State of Hawaii). HRC activities do not generate any waste streams that could impact local water quality.

3.2.1 BIOLOGICAL RESOURCES (OFFSHORE AND TERRESTRIAL)

Appendix C includes a definition of biological resources and the main regulations and laws that govern their protection.

Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve

Executive Order (EO) 13178, *Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve*, created the Reserve. EO 13196, *Final Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve,* amended EO 13178 by finalizing several of its provisions. The principal purpose of the Reserve is the long-term conservation and protection of the coral reef ecosystem and related marine resources and species of the Northwestern Hawaiian Islands in their natural character.

The Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve lies to the northwest of the main islands of the Hawaiian chain. The Reserve includes submerged lands and waters of the Northwestern Hawaiian Islands, extending approximately 1,200 nm long and 100 nm wide. The Reserve is adjacent to and seaward of the seaward boundaries of the State of Hawaii and the Midway Atoll National Wildlife Refuge, and overlies the Hawaiian Islands National Wildlife Refuge to the extent that it extends beyond the seaward boundaries of the State of Hawaii (Federal Register, 2000).

Hawaiian Islands National Wildlife Refuge

The Hawaiian Islands National Wildlife Refuge was designated by President Theodore Roosevelt in 1909. It consists of a chain of islands, atolls, and reefs extending approximately 800 mi northwest from the main Hawaiian Islands. The refuge consists of Nihoa, Necker, French Frigate Shoals, Gardner Pinnacles, Maro Reef, Laysan, Lisianski, and Pearl and Hermes Reef. Millions of seabirds, such as the sooty tern and albatross, live within the refuge, which also provides a rich habitat for marine life (U.S. Fish and Wildlife Service, Pacific Islands, 2002).

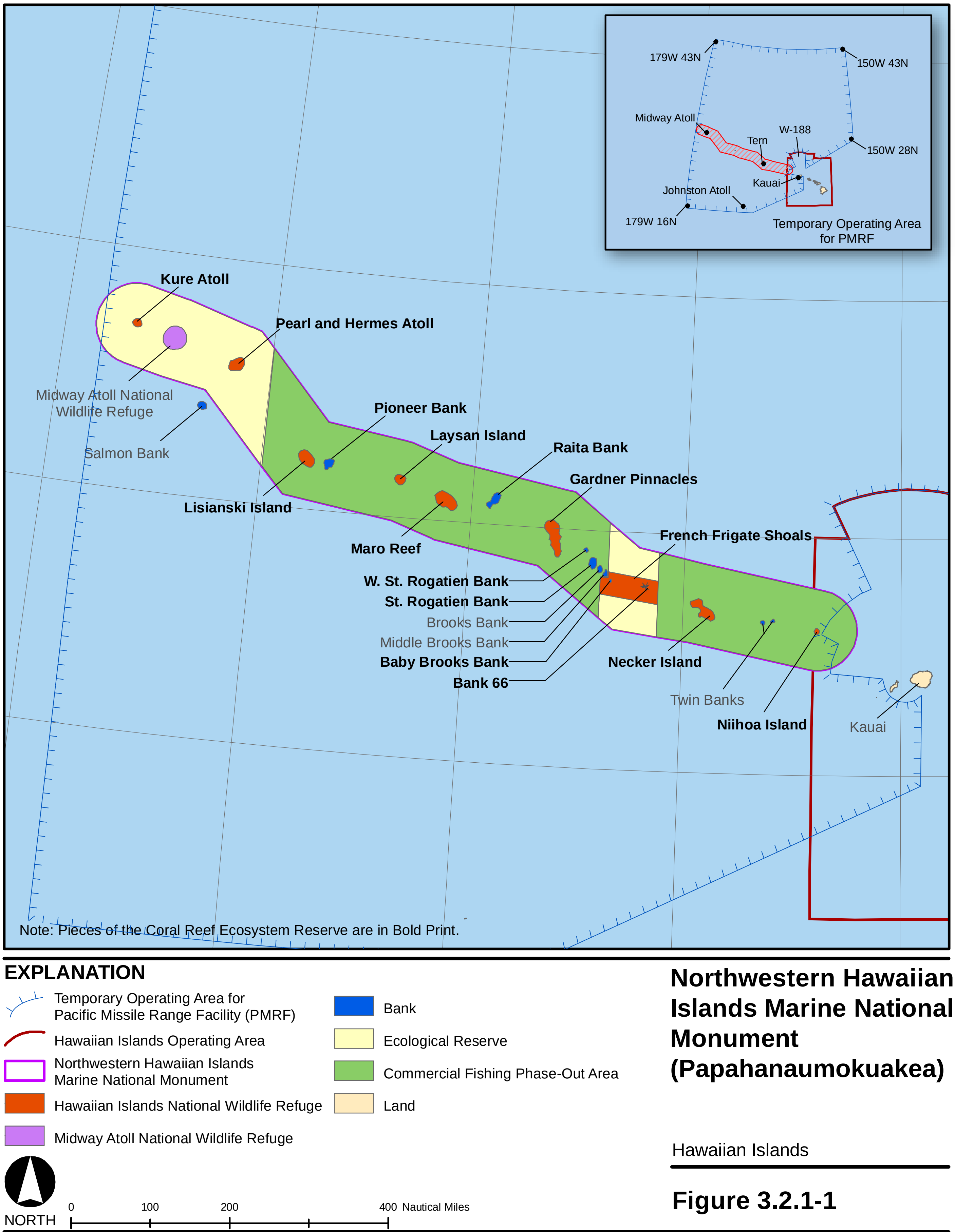
Northwestern Hawaiian Islands Marine National Monument (Papahanaumokuakea)

The Northwestern Hawaiian Islands Marine National Monument was established in June 2006 by Presidential Proclamation. The Monument is a nearly 140,000-square-mile (mi^2) area established to protect the unique marine resources in the area including coral reefs, the endangered Hawaiian monk seal, and the threatened Hawaiian green sea turtle. The Monument includes the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve, the Hawaiian Islands National Wildlife Refuge, the Midway National Wildlife Refuge, and the Battle of Midway National Memorial (National Oceanic and Atmospheric Administration, 2006). Only a fraction of the Monument is actually within the HRC on its western boundary near the northern border (Figure 3.2.1-1). However, the Temporary Operating Area encompasses the entire Monument.

The Monument is situated in the Pacific Ocean northwest of the Main Hawaiian Islands and is an approximately 1,200-nm stretch of coral islands, seamounts, banks, and shoals (Figure 3.2.1-1). The area is the largest protected marine resources area in the world. The Monument has been established for the protection of natural resources, including one of the last intact marine ecosystems in the world, home to sharks, whales, extensive coral reefs, and the endangered Hawaiian monk seal.

The closest island to the Main Hawaiian Islands is Nihoa, which lies 130 mi northwest of Niihau. It is the largest volcanic island in the northwestern chain, with approximately 170 acres of land. The submerged coral reef habitat associated with Nihoa is approximately 142,000 acres. The next closest island is Necker. This is a dry, volcanic island shaped like a fish hook that includes about 45 acres of land. More than 380,000 acres of coral reef habitat are associated with Necker (Hawaii Department of Land and Natural Resources, no date). Because Nihoa and Necker are most likely to be impacted by program activities, they are discussed in more detail at the end of this section.

French Frigate Shoals is an 18-mi wide, crescent-shaped atoll. Its lagoon contains two exposed volcanic rocks and 12 low, sandy islets. Ninety to 95 percent of green sea turtle nesting and breeding occurs at French Frigate Shoals. Tern Island is a part of French Frigate Shoals. Approximately 67 acres of land and 230,000 acres of coral reef habitat are associated with French Frigate Shoals. Gardner Pinnacles consists of two peaks of volcanic rock that total 5 acres. Gardner Pinnacles is an important roosting site and breeding habitat for 12 species of tropical seabirds and is surrounded by approximately 600,000 acres of coral reef habitat (Hawaii Department of Land and Natural Resources, no date).



Northwestern Hawaiian Islands Marine National Monument (Papahanaumokuakea)

Hawaiian Islands

Figure 3.2.1-1

070323_Marine Monument.eps

Maro Reef is a largely submerged atoll, with only approximately 1 acre of emergent land but about 475,000 acres of submerged coral reef habitat. Laysan is the largest island in the chain, with about 1,000 acres of land. It is well vegetated and contains a hypersaline lake that is one of only five natural lakes in the State of Hawaii. Approximately 145,000 acres of coral reef habitat are associated with this island (Hawaii Department of Land and Natural Resources, no date).

Lisianski Island is a low sand and coral island, with approximately 400 acres of land. It lies at the northern end of a large reef bank, spans about 65 mi^2, and totals about 310,000 acres. Pearl and Hermes Reef is a large atoll with several small islets forming about 80 acres of land with approximately 200,000 acres of coral reef habitat. The islets are periodically washed over during winter storms (Hawaii Department of Land and Natural Resources, no date).

Midway Atoll measures 5 mi across and includes three small islands located at the southeastern end of the lagoon totaling 1,550 acres. The protective reef around the lagoon is submerged in some places and 4 to 5 feet (ft) above sea level in others. Approximately 55,000 acres of reef habitat is associated with Midway Atoll (Hawaii Department of Land and Natural Resources, no date).

Kure is the northernmost coral atoll in the world. The island has a 6-mi diameter that encloses approximately 200 acres of emergent land. The outer reef almost completely encircles the lagoon except for passages to the southwest. The only permanent land in the atoll is Green Island, located near the fringing reef in the southeastern part of the lagoon. Almost 80,000 acres of coral reef habitat are associated with Kure Atoll (Hawaii Department of Land and Natural Resources, no date).

As earlier noted, Nihoa and Necker islands are most likely to be affected by program activities. Their biological resources are addressed in greater detail below.

Nihoa

Nihoa is the only home for 3 endemic endangered plants, 72 documented insect species, and 2 small, endangered land birds in the world's only remaining intact example of a Hawaiian coastal scrub community (U.S. Fish and Wildlife Service and Hawaii Department of Land and Natural Resources, Division of Aquatic Resources, 2002).

The three endemic endangered plants on Nihoa are the loulu (Nihoa fan palm) (*Pritchardia remota), Amaranthus brownii* (no common name, last observed in 1983)*,* and *Schiedea verticillata* (no common name). The endangered ‘ohai (*Sesbania tomentosa*) is also found on Nihoa. Critical habitat (the entire island other than manmade features) has been designated for these plants.

For many years the only regular inhabitants of Nihoa have been vast numbers of birds, including black-footed albatross, Bulwer's petrel and wedge-tailed shearwaters, red-tailed tropic birds, large frigate birds, three kinds of boobies, and five kinds of terns. Birds nest in a variety of places, from the ground to the crowns of the loulu palms. In addition to these seabirds, there are two species of native land birds: the Nihoa finch (*Telespyza ultima*) and the Nihoa miller bird (*Acrocephalus familiaris kingi*), both endemic species, found only on Nihoa, but related to species on Laysan (Resture, 2002). Nihoa supports a small colony of Hawaiian monk seals with limited reproduction, which is possibly maintained by immigration from other breeding colonies (National Oceanic and Atmospheric Administration, 2006).

The current estimate of 200 Nihoa Millerbirds, 1,000 Nihoa finches, and the Nihoa fan palm rely on the isolation and protection from invasive species and disturbance that the National Wildlife Refuge provides. (U.S. Fish and Wildlife Service and Hawaii Department of Land and Natural Resources, Division of Aquatic Resources, 2002) However, critical habitat has not been designated for either species on Nihoa. The area nevertheless contains important habitat for both birds, and protection afforded by the Endangered Species Act still applies.

The amount of shallow reef habitat immediately surrounding Nihoa is small, and fewer fish and other species have colonized there and been able to survive. Most of the 20 species of coral present only survive at depths greater than 30 ft, and coral cover is not greater than 25 percent. Reef fish sharks and jacks are common to the island (U.S. Fish and Wildlife Service and Hawaii Department of Land and Natural Resources, Division of Aquatic Resources, 2002; National Oceanic and Atmospheric Administration, 2006).

Necker

While Necker Island appears from a distance to be devoid of vegetation, its rounded crest and narrow terraces are actually sparsely covered with five species of plants: goosefoot shrub (aweoweo), also common throughout the main Hawaiian Islands; bunch grass (kakonakona); purslane (ihi); pickle weed; and a few ohai shrub (*Sesbania tomentosa)*. None of the plants reach more than 2 ft high (Resture, 2004).

A broad reef shelf surrounds the island, but is not shallow enough to protect the island from wave action. However, the number of coral species is comparable to that of Nihoa, fewer than 20. Reef growth is minimal (National Oceanic and Atmospheric Administration, 2006). The only wildlife other than land snails, spiders, and several endemic insects, are seabirds. Brown noddies are year-round residents; egg laying has been documented throughout the year (Megyesi, 1996). Great frigate birds, blue-gray noddies, and masked boobies are also present. Grey reef sharks, giant Trevally jacks, and gray snappers are numerous. Large manta rays have been observed along the island's rocky surf zone. Necker supports a small population of Hawaiian monk seals with limited reproduction that is possibly maintained by immigration from other breeding colonies. Green sea turtles occasionally bask along the coast (National Oceanic and Atmospheric Administration, 2006).

3.2.2 CULTURAL RESOURCES

Appendix C includes a definition of cultural resources and the main regulations and laws that govern their protection.

Region of Influence

As noted in Section 3.2, missiles (including THAAD) when launched from PMRF may overfly portions of the Northwestern Hawaiian Islands Marine National Monument. Because of this, there is the remote possibility that missile debris could fall within the Monument, particularly in the vicinity of Nihoa or Necker Islands (see Section 2.2.2.4.1 and Figure 3.2.1-1).

Affected Environment

Archaeological Resources (Prehistoric and Historic)

The Northwestern Hawaiian Islands were explored, colonized, and in some cases, semi-permanently settled by Native Hawaiians in pre-contact times. Nihoa and Necker (Mokumanamana) Islands, the islands that are closest to the main Hawaiian Islands (approximately 150 mi apart), are culturally and historically significant. They are listed on the National and Hawaii State Registers of Historic Places and are protected by the U.S. Fish and Wildlife Service.

Several archaeological surveys of Nihoa and Necker have been conducted beginning with a survey by the Bishop Museum (the Tanager Expedition in 1923) (Emory, 1928). On Nihoa, numerous features, including approximately 35 habitation sites, 15 religious sites (heiau), and 28 agricultural sites have been recorded across the island. Based on radiocarbon data, Nihoa (as well as Necker) could have been inhabited from 1000 A.D. to 1700 A.D. (Cleghorn, 1987; 1988); new methods of dating the sites (i.e., dating of the coral features) will likely refine these dates (TenBruggencate, 2005). There are no longer permanent inhabitants of Nihoa; however, research scientists and other educational expeditions occasionally visit the various islands of the island chain and camp for 1 to 12 weeks (Northwestern Hawaiian Islands Multi-Agency Education Project, 2006).

Historic Buildings and Structures

There are no modern historic buildings or structures on Nihoa or Necker; however, there are a number of pre-contact stone structures representing habitation, agricultural, and ceremonial features (Emory, 1928).

Traditional Resources (including Burials)

Among the recorded sites on Nihoa and Necker are religious and ceremonial features (cairns, terraces, stone platforms, upright stones [maraes]) and at least three burial sites (two on Nihoa, one on Necker). (Emory, 1928; TenBruggencate, 2005)

3.3 KAUAI

Kauai is the oldest and fourth largest of the Hawaiian Islands. It covers approximately 550 square miles (mi^2) and was formed by the volcano Waialeale located at its center. The town of Lihue is Kauai's county seat and is home to the State and County buildings. Current and proposed Hawaii Range Complex (HRC) operations on Kauai addressed in this Environmental Impact Statement (EIS)/Overseas EIS (OEIS) are located at Pacific Missile Range Facility (PMRF) (PMRF/Main Base) or facilities that support PMRF operations (Kauai Test Facility [KTF], Makaha Ridge, Kokee, Hawaii Air National Guard Kokee, Kamokala Magazines, Port Allen, Kikiaola Small Boat Harbor, and Mt. Kahili). Kikiaola Small Boat Harbor hosts Range Support Boats and small-boat launch facilities, and is used by PMRF to launch Seaborne Powered Targets. PMRF also conducts operations on the nearby islands of Niihau and Kaula. PMRF plans to continue using all sites. For organizational purposes in this document, discussions about Niihau and Kaula are included under the Kauai heading, although they are separate islands and are not part of the island of Kauai.

3.3.1 PACIFIC MISSILE RANGE FACILITY

Command and control (C2), aircraft operations support, missile exercises (MISSILEX), warfare exercises, mining exercises (MINEX), gunnery exercises (GUNEX), sink exercise (SINKEX), humanitarian assistance and non-combatant evacuation exercises (HAO/NEO), special warfare operations (SPECWAROPS), underwater demolition exercises, expeditionary assault, submarine operations, and missile launches are some of the typical operations at PMRF.

3.3.1.1 PMRF/MAIN BASE

Operation areas on PMRF/Main Base contain tracking and surveillance radars, data processing, and the communications network hut. Airfield facilities are located in the main area of Barking Sands. Ordnance and launch areas are also located on PMRF/Main Base, the KTF launch area, northern launch area, and southern launch facility. Sandia National Laboratories operates the KTF for the Department of Energy and provides PMRF with rocket launch services for target systems and upper atmosphere measurements. Of the 14 resources considered for analysis, visual and aesthetics is not addressed. HRC operations associated with PMRF/Main Base do not affect the scenic quality of the area.

3.3.1.1.1 Air Quality—PMRF/Main Base

Air quality in a given location is defined by the concentration of various pollutants in the atmosphere, generally expressed in parts per million or micrograms per cubic meter, or as a pollution standard index. Air quality is determined by the type and amount of pollutants emitted into the atmosphere, the size and topography of the air basin, and the prevailing meteorological conditions. The significance of a pollutant concentration is determined by comparing it to Federal and state ambient air quality standards (AAQS). Appendix C includes a definition of air quality and the main regulations and laws governing its protection.

Region of Influence

For inert pollutants (all pollutants other than ozone and its precursors), the region of influence is generally limited to an area extending several miles downwind from the source. The region of influence for ozone may extend much farther downwind than the region of influence for inert pollutants. As the project area has no heavy industry and very few automobiles, ozone and its precursors are not of concern. Consequently, for the air quality analysis, the region of influence for project operational activities is the existing airshed (the geographic area responsible for emitting 75 percent of the air pollution reaching a body of water) surrounding the various sites, which encompasses the Mana Plain, including the PMRF/Main Base.

Affected Environment

Climate

PMRF/Main Base is located just south of the Tropic of Cancer and has a mild and semi-tropical climate. Typical temperatures for the area are 80 to 84 degrees Fahrenheit (°F) during the day and 65 to 68°F during the night. The trade winds are typically light and from the northeast. Precipitation for the area averages 41 inches annually. Most of the rain falls during the October through April wet season. Relative humidity is approximately 60 percent during the daytime throughout the year.

Regional Air Quality

The only air quality monitoring station on Kauai is located in Lihue and monitors for PM-10. The entire State of Hawaii is in attainment of the NAAQS and AAQS established for all criteria pollutants.

Existing Emission Sources

Pollution sources at PMRF/Main Base include diesel-fuel powered generators, aircraft, ground vehicles, maintenance activities, and rocket launches. PMRF has been issued a Title V Covered Source Permit for five diesel generators. This permit was renewed in 2003 and covers all significant stationary emission sources on PMRF. While aircraft emissions and missile exhaust emissions are both considered mobile sources and are exempt from permitting requirements, these emissions are considered in the analysis.

Emissions sources at KTF include stationary sources (electrical generators) and mobile sources (rocket and missile launches, ground vehicles, and maintenance activities). The two electrical generators at KTF are permitted for operation by the State of Hawaii under a Non-covered Source Permit through April 2009. Rocket and missile launches are considered mobile sources and do not require permitting. (Sandia National Laboratory, 2006)

Fugitive dust produced during field preparation and smoke from sugar cane burning process in adjacent fields have short-term effects on airborne particulate levels. These agricultural activities do not result in long-term deterioration of the air quality of the region.

3.3.1.1.2 Airspace—PMRF/Main Base

Airspace, or that space which lies above a nation and comes under its jurisdiction, is generally viewed as being unlimited. However, it is a finite resource that can be defined vertically and horizontally, as well as temporally, when describing its use for aviation purposes. The time dimension is a very important factor in airspace management and air traffic control.

Under Public Law (PL) 85-725, *Federal Aviation Act of 1958*, the Federal Aviation Administration (FAA) is charged with the safe and efficient use of our nation's airspace and has established certain criteria and limits to its use. The method used to provide this service is the National Airspace System. This system is "…a common network of U.S. airspace; air navigation facilities, equipment and services, airports or landing areas; aeronautical charts, information and services; rules, regulations and procedures, technical information and manpower and material." Appendix C includes a detailed description of airspace.

Region of Influence

The region of influence for airspace includes the airspace over and surrounding PMRF/Main Base. Figure 3.3.1.1.2-1 shows a view of the airspace within the PMRF/Main Base region of influence, it includes the PMRF Operational Areas, the R-3101 Restricted Area, and surrounding airspace off the western and northwestern coast of Kauai. For airspace, the region of influence also includes KTF, Makaha Ridge, Kokee, Kaula, and Niihau.

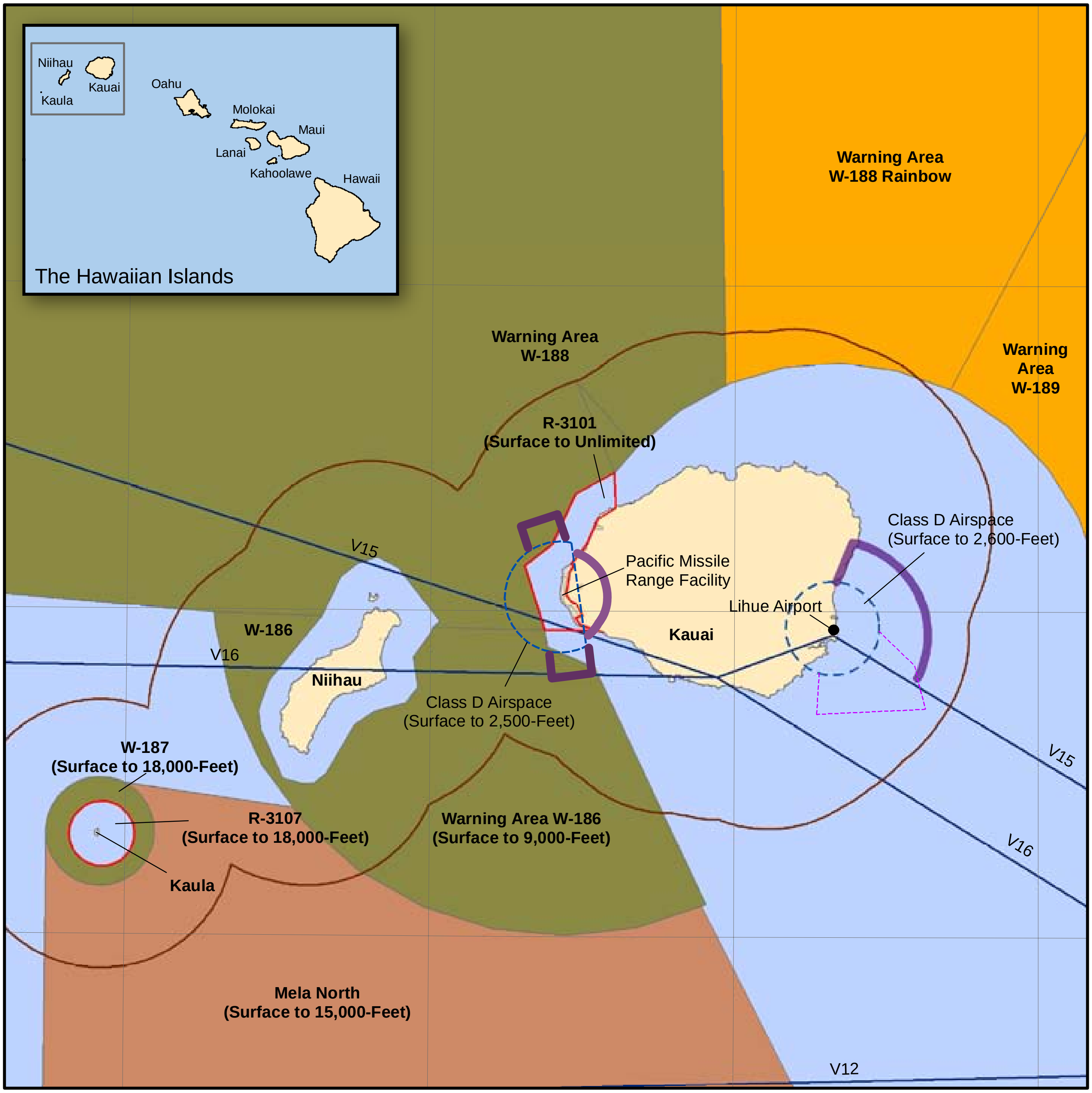
Affected Environment

The affected airspace use environment in the PMRF region of influence is described below in terms of its principal attributes: controlled and uncontrolled airspace, special use airspace, en route airways and jet routes, airports and airfields, and air traffic control. There are no military training routes in the region of influence.

Controlled and Uncontrolled Airspace

The airspace outside the special use airspace identified below is essentially international airspace controlled by Honolulu ARTCC. Class D airspace (described in Appendix C) surrounds the PMRF/Main Base airfield with a ceiling of 2,500 feet (ft). It is surrounded to the north, south, and east by Class D airspace with a floor 700 ft above the surface (see Figure 3.3.1.1.2-1). Lihue Airport, located approximately 20 nm east of PMRF, includes Class D, surface Class E, and additional Class E airspace with a floor 700 ft above the surface

No Class B (U.S. terminal control areas) airspace, which usually surrounds the nation's busiest airports, or Class C airspace is found in the region of influence.



EXPLANATION

- Airway
- Class E Airspace with Floor at the Surface
- Class E Airspace with Floor 700-Feet Above Surface
- Class D Airspace
- Restricted Airspace
- Oahu Warning Area
- Pacific Missile Range Facility (PMRF) Warning Area
- 12-Nautical Mile Territorial Limit
- Air Traffic Control Assigned Airspace (ATCAA)
- Installation Area
- Land

NORTH

0 5 10 20 Nautical Miles

Airspace Use Surrounding Pacific Missile Range Facility

Kauai, Niihau, and Kaula, Hawaii

Figure 3.3.1.1.2-1

Special Use Airspace

The special use airspace in the region of influence (see Figure 3.3.1.1.2-1) consists of Restricted Area R-3101 which lies immediately above PMRF/Main Base and to the west of Kauai, portions of Warning Area W-188 north of Kauai, and Warning Area W-186 southwest of Kauai, all controlled by PMRF. Warning Area W-187 surrounding Kaula is scheduled through the Navy Fleet and Area Control and Surveillance Facility Pearl Harbor which then coordinates with the FAA Hawaii Combined Facility. The Hawaii Combined Facility is the location in which the ARTCC, the Honolulu control tower, and the Combined Radar Approach Control are collocated.

Restricted Area R-3107 over Kaula, a small uninhabited rocky islet 19 nm southwest of Niihau that is used for fixed- and rotary-wing aircraft gunnery practice, and which lies within the W-187 Warning Area, is also special use airspace within the region of influence.

By Presidential Proclamation No. 5928, the U.S. territorial limit was extended from 3 to 12 nm. Special FAR SFAR 53-1, *Establishment of Warning Areas in the Airspace Overlying the Waters Between 2 and 12 Nautical Miles from the United States Coast*, establishes a Warning Area in the same location as non-regulatory Warning Areas previously designated over international waters within the new (3- to 12-nm) territorial airspace to allow continuation of military operations.

Table 3.3.1.1.2-1 lists the affected Restricted Areas and Warning Areas and their effective altitudes, times used, and their manager or scheduler. There are no Prohibited or Alert special use airspace areas in the PMRF airspace use region of influence.

Table 3.3.1.1.2-1. Special Use Airspace in the PMRF/Main Base Airspace Use Region of Influence

			Time of Use		
Number	**Location**	**Altitude (Ft)**	**Days**	**Hours**	**Controlling Agency**
R-3101	PMRF	To Unlimited	M-F	0600-1800	PMRF
R-3107	Kaula	To FL 180	M-F S-Su	0700-2200 0800-1600	HCF
W-186	Southwest of PMRF	To 9,000	Cont[1]	Cont[1]	PMRF
W-187	Kaula	To 18,000	M-F S-Su	0700-2200 0800-1600	HCF
W-188	Northwest of PMRF	To Unlimited	Cont[1]	Cont[1]	PMRF/HCF

[1]Cont = Continuous
R-Restricted, W-Warning
FL = Flight Level (FL 180 = 18,000 ft)
PMRF = Pacific Missile Range Facility
HCF = Hawaii Combined Facility, the location in which the Air Route Traffic Control Center (ARTCC), the Honolulu control tower, and the Combined Radar Approach Control (CERAP) are collocated.
Source: National Aeronautical Charting Office, 2006 and Federal Aviation Administration, 2006

En Route Airways and Jet Routes

Although relatively remote from the majority of jet routes that crisscross the Pacific, the airspace use region of influence has two IFR en route low altitude airways used by commercial air traffic that pass through the region of influence: V15, which passes east to west through the southernmost part of Warning Area W-188, and V-16, which passes east to west through the northern part of Warning Area W-186 and over Niihau (see Figure 3.1.1-1, Section 3.1.1). An accounting of the number of flights using each airway is not maintained.

The airspace use region of influence, located to the west, northwest, and north of Kauai, is far removed from the low altitude airways carrying commercial traffic between Kauai and Oahu and the other Hawaiian islands, all of which lie to the southeast of Kauai. There is a high volume of island helicopter sightseeing flights along the Na Pali coastline and over the Waimea Canyon, inland and to the east of PMRF, particularly out of Port Allen near Hanapepe on Kauai's southern coastline and other tourist and resort towns on the island. However, these do not fly over PMRF or into Restricted Area R-3101 (National Aeronautical Charting Office, 2006).

Airports and Airfields

With the exception of the airfield at PMRF/Main Base, and the Kekaha airstrip approximately 3 miles (mi) to the southeast of PMRF and 2 mi northwest of Kekaha, there are no airfields or airports in the airspace use region of influence. Lihue Airport is located 20 nm east of PMRF, outside the region of influence. In addition to helicopter and fixed-wing aircraft landings associated with PMRF's mission, the PMRF airfield serves as a training facility for landings and takeoffs. The overall number of air operations averaged 14,519 over the 4-year 1992-1995 period, but dropped from 18,260 in fiscal year (FY) 1992 to 12,335 in FY 1995.

There is a heliport, used by PMRF personnel, located at the Makaha Ridge Instrumentation Site, as well as a heliport at Kokee Park used by State Park personnel. The standard instrument approach and departure procedure tracks for Kauai's principal airport at Lihue are all to the east and southeast of the island itself, well removed from the airspace use region of influence. (U.S. Department of Commerce and Department of Defense, 2006)

Air Traffic Control

Use of the airspace by the FAA and PMRF is established by a Letter of Agreement between the two agencies. Under this agreement PMRF is required to notify the FAA by 2:00 p.m. the day before range operations would infringe on the designated airspace. Range Control and the FAA are in direct real-time communication to ensure safety of all aircraft using the airways and jet routes and the special use airspace. Within the special use airspace, military operations in Warning Areas W-186 and W-188 are under PMRF control, and the PMRF Range Control Officer is solely authorized and responsible for administering range safety criteria, the surveillance and clearance of the range, and the issuance of range RED (no firing) and GREEN (clearance to fire) status (Pacific Missile Range Facility, Barking Sands, Hawaii, 1991). Warning Area W-187 is scheduled through the Fleet Area Control and Surveillance Facility.

As Warning Areas are located in international airspace, the procedures of the International Civil Aviation Organization (ICAO), outlined in ICAO Document 444, *Rules of the Air and Air Traffic Services*, are followed. ICAO Document 444 is the equivalent air traffic control manual to FAA Handbook 7110.65, *Air Traffic Control*. The FAA acts as the U.S. agent for aeronautical information to the ICAO, and air traffic in the region of influence is managed by the Honolulu Air Route Traffic Control Center (ARTCCs).

3.3.1.1.3 Biological Resources (Terrestrial and Offshore)—PMRF/Main Base

Native or naturalized vegetation, wildlife, and the habitats in which they occur are collectively referred to as biological resources. Existing information on plant and animal species and habitat types in the vicinity of the proposed sites was reviewed, with special emphasis on the presence of any species listed as threatened or endangered by Federal or State agencies, to assess their sensitivity to the effects of the No-action Alternative, Alternative 1, or Alternative 2. For the purpose of discussion, biological resources have been divided into the areas of vegetation, wildlife, threatened and endangered species, and environmentally sensitive habitat.

Some of the main Federal Acts that provide guidance on avoiding or minimizing impacts to biological resources are detailed in Appendix C.

Region of Influence

The region of influence for biological resources includes the area within the PMRF/Main Base property boundary and offshore areas used for training. Within the region of influence, human activities have altered most of the natural terrestrial environment. The land in PMRF/Main Base is used for military operations such as aircraft operations, rocket launches, various training, and base maintenance operations. Most of the same terrestrial species discussed below for PMRF/Main Base could also occur within the adjacent restricted easement area.

Affected Environment

Vegetation

There are six recognized vegetation types on the undeveloped portions of PMRF/Main Base: kiawe-koa haole scrub, a'ali'i-nama scrub, pohinahina-naupaka dune, strand, drainage-way wetlands, and ruderal vegetation. Kiawe/koa haole and a'ali'i-nama scrub are the dominant vegetation in the undeveloped portions of the PMRF/Main Base region of influence. A well-developed native strand community exists along the shoreline. Drainage-way wetlands vegetation occupies only a small area on PMRF/Main Base. Ruderal (disturbed, weedy) vegetation is present along roadsides and other areas where man has disturbed the natural vegetation, and much of this vegetation is mowed on a regular basis. The broad, white, sandy beach that fronts Majors Bay supports only sparse littoral kiawe-koa haole thickets on the northern half and native aalii-nama scrub on the southern half. (Pacific Missile Range Facility, 2001)

Golden crown beard is a new invasive species on the Nohili dunes since the 2000 survey. It has recently begun to take over areas that were previously dominated by native vegetation such as nama (*Nama sandwicensis*). Other alien species include ironwood, sourbush, and swollen-fingergrass. (Pacific Missile Range Facility, 2006a)

The vegetation in the restrictive easement area was dominated by sugar cane, ruderal vegetation, and wetlands associated with agricultural ponds and drains. Sugar cane is being phased out and more diversified agricultural crops are being grown (Hawaii Coral Reef

Assessment and Monitoring Program, 2006). The non-native, non-agricultural vegetation is dominated by kiawe/koa haole. This vegetation type is the dominant type present on the relatively undisturbed areas of the sand dunes, associated with PMRF and Polihale State Park, as well as along the cliff face in the restrictive easement area. Because of the restrictions on off-highway vehicle activities, the sand dune related vegetation within the PMRF boundary is less disturbed than the vegetation in Polihale State Park. (Pacific Missile Range Facility, 2001)

At KTF, naupaka, beach morning glory, and ‘a’ali’i are common. Coastal dune vegetation covers much of the dunes north of KTF, which is located in the northern portion of the base. Vegetation at the Kokole Point Launch Complex in the southern portion of the base is composed of a mixture of Bermuda grass, portulaca, and buffelgrass. (Department of Energy, 1991; Pacific Missile Range Facility, 2001)

<u>Threatened and Endangered Plant Species</u>

Table 3.3.1.1.3-1 lists threatened and endangered species known or expected to occur within the PMRF/Main Base region of influence. There are no known listed plant species on PMRF/Main Base. (Pacific Missile Range Facility, 2001)

Table 3.3.1.1.3-1. Listed Species Known or Expected to Occur in the Vicinity of the PMRF/Main Base

Scientific Name	Common Name	Federal Status
Plants		
Panicum niihauense	Lau’ehu	E
Sesbania tomentosa	Ohai	E
Reptiles		
Caretta caretta	Loggerhead sea turtle	T
Chelonia mydas	Green sea turtle	T
Dermochelys coriacea	Leatherback sea turtle	E
Eretmochelys imbricata	Hawksbill sea turtle	E
Lepidochelys olivacea	Olive ridley sea turtle	T
Birds		
Anas wyvilliana	Koloa maoli (Hawaiian duck)	E
Fulica americana alai	'Alae ke'oke'o (Hawaiian coot)	E
Gallinula chloropus sandvicensis	Alae ula (Hawaiian common moorhen)	E
Himantopus mexicanus knudseni	Ae'o (Hawaiian black-necked stilt)	E
Pterodroma phaeopygia sandwichensis	‘Ua’u (Hawaiian dark-rumped petrel)	E
Puffinus auricularis newelli	‘A’o (Newell's Townsend’s shearwater)	T
Mammals		
Lasiurus cinereus spp. *semotus*	Hawaiian hoary bat	E
Monachus schauinslandi	Hawaiian monk seal	E

Source: U.S. Fish and Wildlife Service, 2005a;b

NOTES:

T Threatened

E Endangered

Two Federally listed plant species have been observed north of, but not on, PMRF/Main Base. Ohai (*Sesbania tomentosa*), a spreading shrub, is a Federally endangered species that has been observed in the sand dunes to the north of PMRF/Main Base in Polihale State Park and could potentially occur on the installation, including KTF. Lau'ehu (*Panicum niihauense*), an endangered species of rare grass, has been observed near Queens Pond also north of PMRF/Main Base. (Pacific Missile Range Facility, 2001; U.S. Department of the Navy, 1998a)

Wildlife

Birds identified at PMRF/Main Base include non-native, migratory and species endemic to Hawaii. The pueo *(Asio flammeus sandwichensis),* or Hawaiian short-eared owl, is State listed as endangered. This owl is the only endemic non-migratory bird species that occurs in the region. Non-native bird species on Kauai are usually common field and urban birds such as the zebra dove, ring-necked pheasant, cardinal, northern mockingbird, Japanese white-eye, and house finch. Several species of migratory waterfowl are present during some portion of the year. Brown boobies, sanderlings, wandering tattlers, ruddy turnstones, and Pacific golden plovers are commonly observed at PMRF/Main Base. A nesting colony of wedge-tailed shearwaters is located near the beach cottages. Nesting colony restoration efforts were begun in 2006, which included removing non-native trees and planting naupaka seedlings and native beach vegetation (pohinahina, iliama, and akiaki) seeds. The Laysan albatross, protected under the Migratory Bird Treaty Act, uses ruderal vegetation areas on the base for courtship and nesting. (Pacific Missile Range Facility, 2001; 2006b)

The Laysan albatross is being discouraged from nesting at PMRF to prevent interaction between the species and aircraft using the runway. Albatross on the airfield are tagged and released on the north portion of the base or returnees are relocated to Kilauea National Wildlife Refuge in order to prevent bird/aircraft strikes. This action is accomplished under a U.S. Fish and Wildlife (USFWS) permit. During the 2005 nesting season, PMRF staff in cooperation with the U.S. Department of Agriculture's Animal and Plant Health Inspection Service and the Kauai National Wildlife Refuge Complex relocated viable PMRF albatross eggs to Kilauea Point and other north shore nest sites to replace eggs that would never hatch. Every one of the resulting chicks was accepted by its new surrogate parents and should now return to the north shore when old enough to mate. With no chicks to feed, the adult albatross returned to the open sea. This surrogate parenting program continues through the 2006/2007 nesting season and is anticipated to continue as long as viable eggs are available at PMRF/Main Base. (U.S. Fish and Wildlife Service, 2005; U.S. Department of the Navy, 1998; U.S. Army Space and Missile Defense Command, 2001a)

Feral dogs and cats occur in the region and prey on native and introduced species of birds. Rodents including the Polynesian black rat, Norway or brown rat, and the house mouse are also known to occur in the region. (U.S. Department of the Navy, 1998; U.S. Army Space and Missile Defense Command, 2001a) PMRF has an ongoing feral dog-trapping program to protect the albatross as well as the wedge-tail shearwater and other birds on base. Reptiles observed on PMRF/Main Base during recent surveys were the house gecko, mourning gecko, and snake-eyed skink. The only amphibian observed was the marine toad. (Pacific Missile Range Facility, 2006c) PMRF has an ongoing feral dog-trapping program to protect the albatross as well as the wedge-tail shearwater and other birds on base. (U.S. Department of the Navy, 1998; U.S. Army Space and Missile Defense Command, 2001a)

Wildlife on KTF is similar to that described above for PMRF/Main Base. Birds on KTF include resident species such as the red junglefowl, ring-neck pheasant, and northern mockingbird. Non-resident species identified include the short-eared owl, brown noddy, and great frigate bird. The Laysan albatross has also been observed in the KTF area. Feral dogs and cats occur in the region. The roof rat, Norway or brown rat, and the house mouse are also expected to be present on KTF. (Pacific Missile Range Facility, 2001)

North of Mana Point on Kauai, a narrow fringing reef follows the coastline up to Nohili Point and Barking Sands (Figure 3.3.1.1.3-1). Coral density is low and is dominated by lobe coral (*Porites lobata*) and small stands of arborescent (branched or tree shaped) corals. Broad uncolonized pavement (1,772 ft wide) and colonized pavement (2,297 ft wide) stretch along the coastline seaward of the fringing reef. North of Nohili Point, the uncolonized pavement ends and the colonized pavement continues along a northward heading; it turns gradually to the east to join the coastline north of Keawanui. (Appendix G) Uncolonized pavement is flat, low relief, solid carbonate rock often covered by a thin sand veneer. The surface of the pavement often has sparse coverage of macroalgae, hard coral, and other sessile invertebrates that does not obscure the underlying surface. Colonized pavement is flat, low-relief, solid carbonate rock with coverage of macroalgae, hard coral, and other sessile invertebrates that are dense enough to begin to obscure the underlying surface. (Center for Coastal Monitoring and Assessment, 2006)

Essential Fish Habitat occurs and is incorporated within Kauai's Exclusive Economic Zone (EEZ), the 200-mi limit around the island. Essential Fish Habitat for adult and juvenile bottomfish includes the water column and all bottom habitat extending from the shoreline to a depth of 219 fathoms, which encompasses important steep drop-offs and high relief habitats. Shallow-water (0 to 328 ft) bottomfish species include uku, thicklip trevallys, groupers, emperors, amberjack, and taape. Deep-water (328 to 1,312 ft) species, which are discussed in Section 3.1.2, include ehu, onaga, opapaka, gindai, hapupuu, and lehi. (Western Pacific Fishery Management Council, 2005)

Pelagic habitat areas of particular concern that include the offshore area are designated as the water column down to 3,280 ft from the shoreline to the EEZ that lays above all seamounts and banks shallower than 1,100 fathoms. Marketable pelagic species include striped marlin, bluefin tuna, swordfish, albacore, mackerel, skipjack, sailfish, kawakawa, and various sharks. Banks with summits less than 16.3 fathoms have been designated as habitat areas of particular concern for crustaceans. Crustacean species include spiny lobster, slipper lobsters, and Kona crabs. (Western Pacific Fishery Management Council, 2005) A detailed description, including status, distribution, and habitat preference of managed fisheries is provided in Appendix G.

Terrestrial wildlife on KTF is similar to that described above for PMRF/Main Base. Birds on KTF include resident species such as the red junglefowl, ring-neck pheasant, and northern mockingbird. Non-resident species identified include the short-eared owl, brown noddy, and great frigate bird. The Laysan albatross has also been observed in the KTF area. Feral dogs and cats occur in the region and prey on native and introduced species of birds. Rodents including the roof rat, Norway or brown rat, and the house mouse are also known to occur in the region. (Pacific Missile Range Facility, 2001)

Source: National Centers for Coastal Ocean Science / National Oceanic and Atmospheric Administration (2003, 2004)

EXPLANATION

- Road
- Uncolonized Volcanic Rock/Boulder
- Colonized Pavement
- Colonized Volcanic Rock/Boulder
- Uncolonized Pavement
- Existing Structure
- Kauai Test Facility
- Installation Area
- Land

NORTH

0 1 2 4 Miles

Offshore Hardbottom Habitats of Pacific Missile Range Facility

Kauai, Hawaii

Figure 3.3.1.1.3-1

Threatened and Endangered Wildlife Species

Six birds Federally listed as threatened or endangered are potentially present or confirmed in the PMRF area (Table 3.3.1.1.3-1). Although none of the resident seabirds at PMRF are listed as threatened or endangered, Kauai provides the majority of Hawaii's habitat for the threatened Newell's Townsend's shearwater (*Puffinus auricularis newelli*). The Newell's shearwater nests from April to November in the interior mountains of Kauai. Nestlings leave the nesting grounds at night in October and November and head for the open ocean. They may become temporarily blinded by lights when flying near brightly lit urban areas or street lights and some may collide with trees, utility lines and light poles, buildings, and automobiles. (Audubon, 2006; Hawaii Department of Land and Natural Resources, no date)

The Hawaiian dark-rumped petrel, which is Federally listed as endangered, arrives in February and may traverse the area from its nesting grounds to the sea. Nesting occurs from April through May. Chicks begin hatching in late June and fledge in late October to November, slightly earlier than that of the Newell's Townsend's shearwater. (Audubon, 2006)

The Hawaiian coot (*Fulica americana alai*), Hawaiian black-necked stilt (*Himantopus mexicanus knudseni*), Hawaiian common moorhen (*Gallinula chloropus sandvicensis*), and Hawaiian duck (*Anas wyvilliana*) are endangered birds that have been observed in the drainage ditches and ponds on PMRF/Main Base. The Hawaiian coot, black-necked stilt, and common moorhen are non-migratory species, which nest year round, May through September, and April through October respectively. (U.S. Department of the Navy, 1998a)

The Hawaiian hoary bat is listed as a Federal and State endangered species. It has been recorded at PMRF; a group of four was observed foraging around the sewage treatment ponds and another group of five bats was seen just offshore of Recreation Area #1. It has also been observed at the Polihale State Park north of the base. (Pacific Missile Range Facility, 2001)

The threatened Newell's shearwater and endangered Hawaiian coot, Hawaiian black-necked stilt, Hawaiian common moorhen, and Hawaiian duck are potentially present or confirmed within or near the KTF area. The endangered Hawaiian hoary bat has been observed at the Polihale State Park north of KTF. (Pacific Missile Range Facility, 2001)

Two marine wildlife species Federally and State listed as threatened or endangered commonly occur on and in the offshore areas off PMRF/Main Base. The endangered Hawaiian monk seal (*Monachus schauinslandi*) is an indigenous mammal that has been observed at PMRF. The first Hawaiian monk seal birth recorded on a Kauai beach since 1993 occurred on PMRF in 1999 (Marine Mammal Commission, 2003; Pacific Missile Range Facility, 1999). Two pups were born on Kauai beaches in 2003 and 2004 (Kauai Monk Seal Watch Program, 2003; The Garden Island, 2004). Four pups were born on Kauai in 2006 (National Oceanic and Atmospheric Administration, 2006). Pups are born between February and August. Sitings of Hawaiian monk seal haul outs are documented by the PMRF Environmental Office.

Green sea turtles *(Chelonia mydas*) have been observed in an elongated depression within an area of caves and undercuts offshore of Nohili Ditch and basking on shore; the only area where basking/haul-out activity on PMRF/Main Base is observed. The PMRF Natural Resources Manager monitors sea turtle activity at Barking Sands. Green sea turtles have not nested anywhere along the beachfront. In the past 3 years only one apparent "false nesting" has been observed. (Burger, 2007b) Security patrols reports include a record of the presence and locations of turtles. Any records of green sea turtle sitings are maintained by the PMRF Environmental Office. (Pacific Missile Range Facility, 2001)

Reproduction of the Hawaiian green sea turtle population occurs mainly in the Northwest Hawaiian Islands. Ninety percent of the green sea turtle population returns to French Frigate Shoals in late spring to breed (National Oceanic and Atmospheric Administration, 2002). Adults return to the main Hawaiian Islands in late summer to early fall.

Environmentally Sensitive Habitat

<u>Wetlands</u>

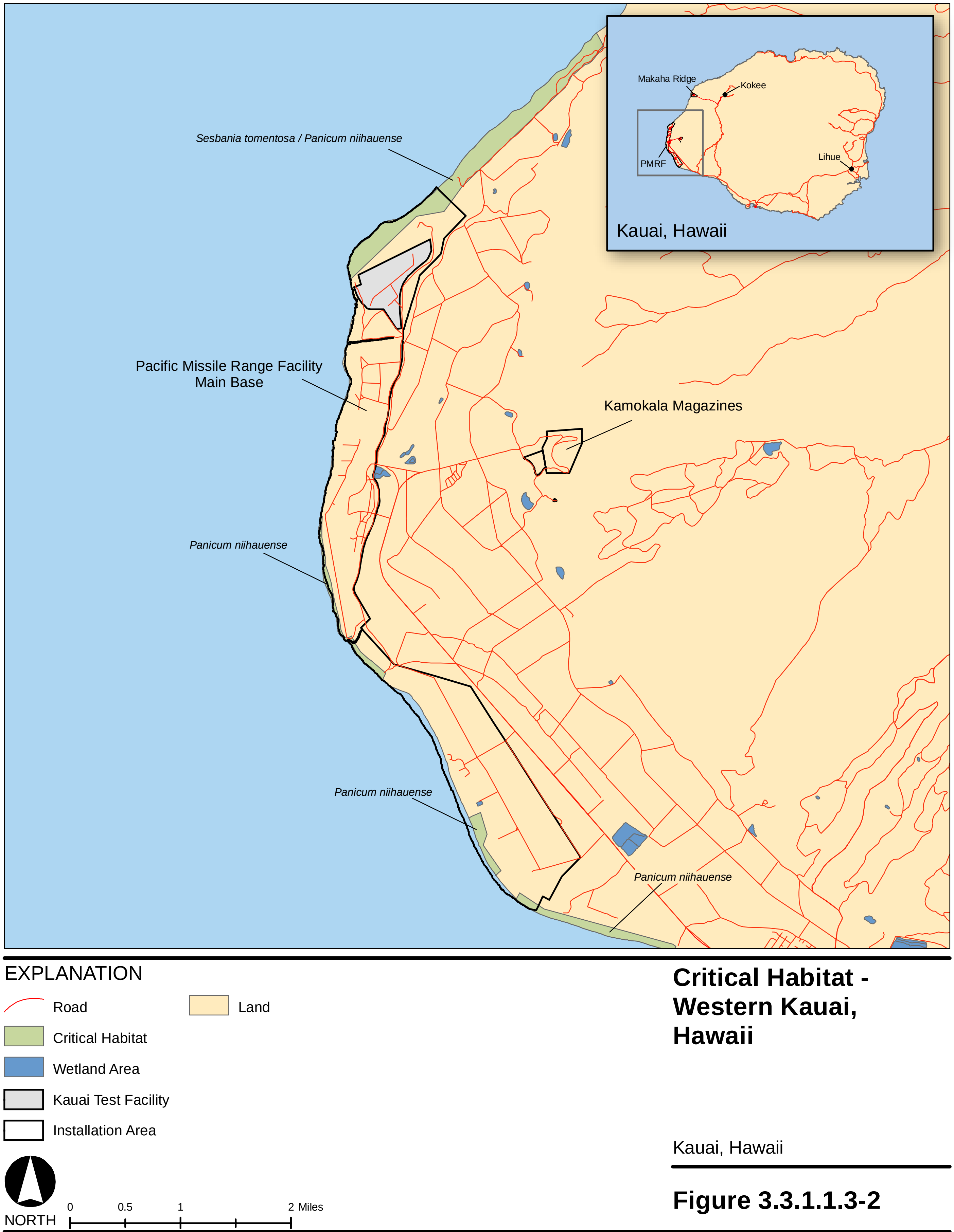
Wetlands are associated with the Mana base pond, Kawaiele wildlife sanctuaries (a State Waterbird Refuge for Hawaii's four endangered waterbird species, created at Mana during a sand removal program), and agricultural drains (Nohili and Kawaiele ditches) within PMRF/Main Base.

Two Marine System, Subtidal Subsystem, Reef Class, Coral Subclass, Subtidal wetlands exist along part of the coastline west of KTF. Wetlands are also associated with the Nohili Ditch to the south of KTF. (Pacific Missile Range Facility, 2001)

<u>Critical Habitat</u>

A proposed rule to designate critical habitat for 76 listed plant species on the islands of Kauai and Niihau published in November 2000 (Federal Register, 2000) included land in the northwestern end of PMRF near Polihale Park as critical habitat for the endangered ohai and lau'ehu. In January 2002, the USFWS proposed critical habitat for additional plant species on Kauai and Niihau, revising the total number of plants to 83, which included additional land in the southern portion of PMRF for protection of lau'ehu. (U.S. Fish and Wildlife Service, Pacific Region, 2002a; Federal Register, 2002) The USFWS reevaluated the dune habitat on PMRF and the habitat on Navy land at Makaha Ridge and determined that these lands were not essential for the conservation of ohai or dwarf iliau. Although lau'ehu does not grow on PMRF/Main Base, the USFWS has determined that land on PMRF adjacent to Polihale State Park and dune areas along the southern portion of the range contain primary constituents necessary for the recovery of lau'ehu because not enough areas exist outside of PMRF (Figure 3.3.1.1.3-2). The USFWS designated these areas as critical habitat because there are not enough other areas outside the base that contain the elements to achieve the USFWS's goal of 8 to 10 populations. (Federal Register, 2003)

The areas of critical habitat for the lau'ehu established along the coast of PMRF include the KTF coastal area and the area adjacent to Kokole Point. Lau'ehu has not been observed on KTF. (Pacific Missile Range Facility, 2001; Federal Register, 2003)



Critical Habitat - Western Kauai, Hawaii

Kauai, Hawaii

Figure 3.3.1.1.3-2

Hawaiian Islands Humpback Whale National Marine Sanctuary

The Hawaiian Islands Humpback Whale National Marine Sanctuary was created by Congress in 1992. Humpback whales are endangered marine mammals and are therefore protected under provisions of the Endangered Species Act and the Marine Mammal Protection Act wherever they are found. Humpbacks are seen in the winter months in the shallow waters surrounding the Hawaiian Islands where they congregate to mate and calve. The humpback population is growing by an average of 7 percent annually. The current estimated population in Hawaiian waters every year is 10,000, from November through May (National Oceanic and Atmospheric Administration, 2007) The whales travel more than 3,500 mi from Alaska to Hawaii's warm waters to mate, give birth, and care for their calves. The estimated 5,000 whales span more than a quarter-million square miles of ocean surrounding Hawaii. The first whales of the season usually arrive around October, with the greatest number seen around Hawaii between 1 December and 15 May. (Mobley, 2002)

3.3.1.1.4 Cultural Resources—PMRF/Main Base

Cultural resources include prehistoric and historic artifacts, archaeological sites (including underwater sites), historic buildings and structures, and traditional resources (such as Native American and Native Hawaiian religious sites). Appendix C includes a description of cultural resources and the laws and regulations pertaining to them.

Region of Influence

The region of influence for terrestrial cultural resources at PMRF/Main Base/KTF consists of areas throughout the installation. These areas include existing launch pads and locations for the construction of new facilities and infrastructure features (e.g., Directed Energy facilities) (see Figures 2.2.4.1-2, 2.2.3.5.4-5, and 2.2.4.4-1). Survey data indicate that most of the proposed construction locations are surficially devoid of archaeological sites; however, subsurface archaeological and traditional cultural materials (particularly burials) could be present anywhere within the boundary of the installation. Locations for the proposed warehouse and consolidated range operations complex (see Figure 2.2.3.5.4-6) are located with an area of medium sensitivity for burials. Building 282, where a new Automatic Identification System antenna is planned, has not been recommended as a historic building (see Appendix I).

The underwater cultural resources region of influence for PMRF would include offshore areas in Majors Bay and areas offshore from PMRF/Main Base (including PMRF Warning Area 188). The types of operations proposed for these areas include expeditionary assault and other amphibious landings; HAO/NEO; torpedo RDT&E; torpedo defense; submarine detection; deep and shallow water testing of antisubmarine torpedo sensors and weapons systems; mine-laying and neutralization; over-water missile launches and intercepts; GUNEX; BOMBEX; SINKEX; movement of the simulated underwater minefield (Kingfisher).

Affected Environment

Underwater Cultural Resources

For a discussion of open ocean area underwater cultural resources, see Section 3.1.3.

Near Shore Area Archaeological Resources

Within the offshore waters surrounding each island, there are a variety of submerged resources. The most common of these are shipwrecks and fishponds; however, junked motor vehicles, harbor features, and old shore line structures are also present.

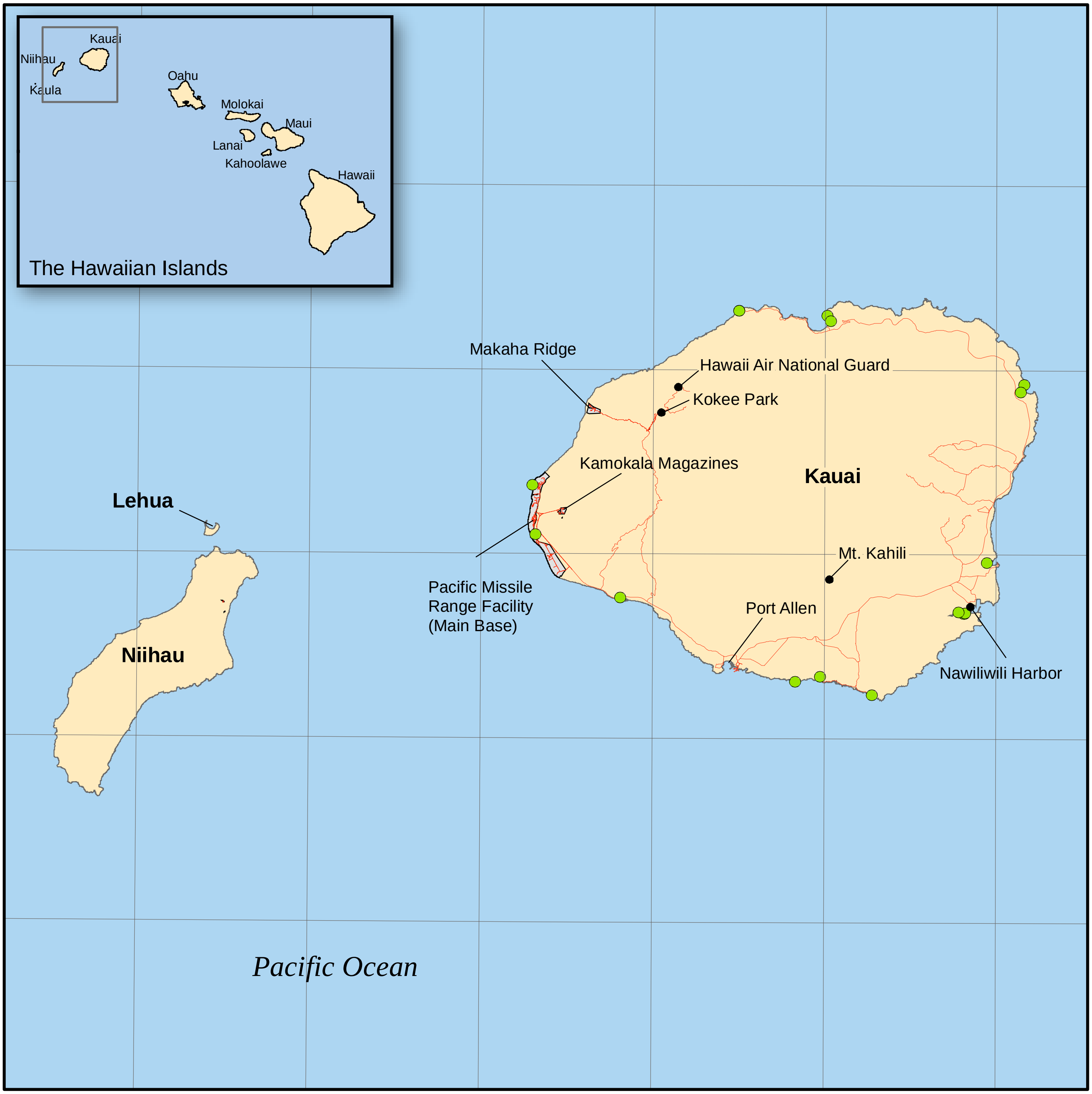
Historically, Native Hawaiians constructed four different types of fishponds—freshwater taro ponds, other freshwater ponds, brackish water ponds, and seawater ponds (Aquaculture in Hawaii, 2006). Aquaculture was employed to supplement their other fishing activities, and permanent fishponds guaranteed a stable food supply for populations in lean times. Tended ponds provided fish without requiring fishing expertise, and harvesting the pond, unlike fishing at sea, was not weather dependent. Village-owned fishponds also increased the wealth of the managing Hawaiian Chief. At the time of European contact there were hundreds of fishponds dotted along the coast of the Hawaiian Islands. Many of the fishponds remain, but few are actively used (Aquaculture in Hawaii, 2006). Saltwater fishponds constructed on shallow water coral reef platforms are unique to the Hawaiian Islands and are very important national and international historical assets. Evidence suggests that Hawaiian fishponds were constructed as early as A.D. 1000, if not earlier, and continued to be built until the 1820s. The operation of fishponds declined throughout the islands by the early 1900s; there are approximately 488 fishponds in varying states of repair scattered throughout the six major islands. A database of identified Hawaiian saltwater fishponds is managed by the University of Hawaii at Manoa to publicize research and restoration projects, and to raise awareness of their cultural value.

Figure 3.3.1.1.4-1 shows the distribution of fishponds in the waters surrounding the Hawaiian islands.

The underwater environment surrounding Kauai encompasses a large number of shipwrecks and Hawaiian fishponds (see Figures 3.1.3-1 and 3.3.1.1.4-1). Among the wrecks is *Pele*, a freighter that sank on March 22, 1892. *Pele* rammed into an underwater pinnacle (tearing the hull) and sank a half a mile later in 14 fathoms of water. Very little of the wreck remains—the boiler, some hull plates, and a couple of anchors.

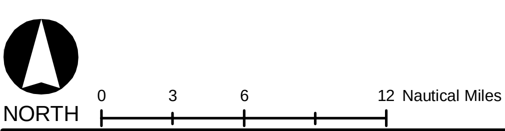
In 1824 the King of Hawaii used a vessel named *Ha`aheo o Hawaii (Pride of Hawaii)* as a private yacht, a cargo and passenger transport, and a diplomatic vehicle. The ship was also once used as a pirate ship. While the king was in route to England on a diplomatic mission, a Native Hawaiian crew sailed her to the north shore of the island of Kauai and wrecked her in the southwest corner of Hanalei Bay. The ship struck a 5-ft deep reef just a hundred yards offshore and sank after an unsuccessful salvage attempt by the local population. (Johnston n.d.a)

Within the specific offshore and open ocean underwater cultural resources region of influence for PMRF and KTF are a sparse distribution of shipwrecks and fishponds (see Figures 3.1.3-1 and 3.3.1.1.4-1).



EXPLANATION

- Fishpond
- Road
- Installation Area
- Land



Hawaiian Fishpond Locations in the Vicinity of Kauai and Niihau

Kauai and Niihau, Hawaii

Figure 3.3.1.1.4-1

Archaeological Resources (Prehistoric and Historic)

Brief Prehistory/Early History. PMRF/Main Base and KTF are situated in a region known as Mana. Throughout prehistory, large areas of the Mana Plain were covered by the great Mana swamp allowing Native Hawaiians to canoe as far south as Waimea (Von Holt, 1985; State of Hawaii, 1993). It is believed that these wet conditions encouraged the independent invention of aquaculture on Kauai and the construction of stone and earthen ponds for growing staples such as taro, yam, and sweet potatoes (Kikuchi 1987). After the arrival of Europeans to the island, aquaculture transitioned to agriculture through the eventual draining of the swamp and the cultivation of sugar cane and rice. The first successful sugar plantation to export from the islands was established at Koloa in 1835 (Hawaii Visitors Bureau, 1993), and by the 1930s, nearly all of the Mana swamp had been filled to produce this crop.

Brief Military History. In 1940, 549 acres in Mana were deeded to the U.S. War Department for an Army Air Corps flight training field. The Navy was given permission to use the facilities in 1944; however, after the Air Force was established (1947), it assumed control of the facility (redesignated Barking Sands Air Force Base), and continued operations through the Korean War years. In 1953, the base was re-named Bonham Air Force Base and in 1961, the U.S. Departments of Air Force and Navy were operating the facility under a joint use agreement. In 1964, 1,884 acres of the Mana Plain were officially transferred to the Navy and by 1966, the facility was renamed PMRF (Commander, Navy Region Hawaiʻi, 2005).

Throughout the Cold War years (1946-1991), PMRF supported both offensive and defensive Cold War missions, including offensive weapons managed by the Navy, air defense weapons managed by the Hawaii Air National Guard), and research into ballistic missile defensive systems. PMRF also supported atmospheric nuclear testing by the Atomic Energy Commission which led to the establishment of the KTF in the early 1960s. In 2007, PMRF is the largest instrumented multi-environment test range in the world. The range is unique in providing realistic testing environments for anti-submarine, air, surface, and subsurface weapons systems. The installation also provides services for training, tactics development, and evaluation of air, surface, and subsurface weapons systems for the Navy, other Department of Defense (DoD) agencies, foreign military forces, and private industry (Commander, Navy Region Hawaiʻi, 2005).

Native Hawaiian (Traditional) Information. Mana is an area specifically referred to in Hawaiian literature and oral tradition as a leina-a-ka-uhane, a place (generally cliffs or seacoast promontories) where the spirits of men, after death, plunge into eternity and are divided into one of three spiritual realms: the realm of the wandering spirits; the realm of the ancestral spirits; or the realm of the endless night (Han, et al., 1986; Fornander 1917). Typical of Native Hawaiian mortuary practices, burial sites believed to be associated with the Mana leina-a-ka-uhane have been identified throughout the area.

Large portions of PMRF have been systematically surface surveyed for archaeological resources; however, subsurface features may still be present (West and Desilets, 2005). Previous investigations have identified a variety of prehistoric and historic resources, including burial sites, heiaus (temples), campsites, house sites, lithic (stone) scatters, aquaculture ponds, and modern military associated sites, any or all of which could be potentially eligible for inclusion in the National Register. A list of significant archaeological and traditional resources is provided in Appendix I (Commander, Navy Region Hawaiʻi, 2005).

Historic Buildings and Structures

Since 1991, several architectural evaluations have been conducted for PMRF, including PMRF/Main Base, Kamokala Ridge, and Port Allen (Drolet et al., 1996; Rechtman, et al., 1998). The evaluations have covered pre-military facilities and features, as well as World War II and Cold War era resources. A list of the buildings and structures recommended eligible for inclusion in the National Register is provided in Appendix I (Commander, Navy Region Hawai‘i, 2005).

Traditional Resources

Traditional resources can include archaeological sites, burial sites, ceremonial areas, natural features (e.g., caves, mountains, water sources, trails, plant habitat or gathering areas), or any other natural area important to a culture for religious or heritage reasons. As such, many of the cultural materials identified within the region of influence could also be considered traditional resources. In addition to Native Hawaiians, several other cultures have also inhabited the island of Kauai. These include the Japanese, Korean, Portuguese, Chinese, and Filipino. A Japanese cemetery is located within the boundary of PMRF and cemeteries associated with each of the other cultures are located near Kekaha, Hanapepe, and Waimea.

A comprehensive cultural study of the Mana Plain was carried out by Flores and Kaohi in 1992 as part of investigations related to the proposed Strategic Defense Command Energy Dispersive X-Ray Analysis project (U.S. Army Strategic Defense Command, 1990). This study included historical research, review of documented Hawaiian traditions, and oral history interviews with knowledgeable local residents.

Intensive historical research and review of traditions was also undertaken by Maly and Wulzen (1997) as part of an extensive reconnaissance survey of PMRF Barking Sands and Makaha Ridge. Oral histories were collected by McGerty and Spear (1997a) for a project that technically covered an area inland of PMRF Barking Sands. Oral history information, however, is pertinent to the Mana Plain in general and thus provides a cultural context for PMRF.

In 1999, an assessment of traditional cultural properties on Navy lands in Hawaii was conducted. The PMRF research was conducted by Alitha Kachi and Kalani Flores, with some additional research by Tuggle and Tomonari-Tuggle. The assessment lists Kawaiele Ditch, Nohili Dune, and Elekuna Heiau as potential traditional cultural properties. Identified traditional Hawaiian sites under the jurisdiction of PMRF are listed in Appendix I. Traditional sites recommended as eligible for listing in the National Register are listed in Appendix I.

Burials. Burials are the most significant cultural resources concern within the sandy soils of PMRF. There have been numerous inadvertent discoveries of human remains in both the coastal and back bay areas of the installation. The sites represent both traditional Hawaiian and Plantation-era periods (see Appendix I).

3.3.1.1.5 Geology and Soils—PMRF/Main Base

Geology and soils are considered earth resources that may be adversely affected by proposed operations. This resource is described in terms of existing information on the land forms, geology, and associated soil development as it may be subject to erosion, flooding, mass wasting, mineral resource consumption, contamination, and alternative land uses resulting from proposed construction and launch activities. Appendix C includes a description of geology and soils.

Region of Influence

Geology and soils are considered resources that may be adversely affected by proposed operations. These resources are described in terms of existing information on land forms, geology, and associated soil development.

Affected Environment

Physiography

PMRF/Main Base is situated on a strip of low-lying coastal terrace called the Mana Plain. The plain bounds the western flank of the island, forming gentle westerly slopes ranging from about 2 percent near the volcanic uplands to relatively flat over the coastal margin occupied by PMRF/Main Base. The plain does not form cliffs at the PMRF/Main Base shoreline. Local relief is formed by low beach barrier dunes, mildly undulating blanket sands, and the more prominent Nohili Dune located at the northern portion of PMRF/Main Base, adjacent to the northwest side of KTF at Nohili Point. Ground elevations over the facility average between 10 ft to 20 ft rising to 100 ft at Nohili Dune. PMRF/Main Base is not traversed by perennial or ephemeral streams. Surface runoff is controlled by manmade channels located at Nohili Ditch on northern PMRF/Main Base, Kawaiele Drainage in central PMRF/Main Base, and a drainage channel just south of Kawaiele Drainage.

Geology

Kauai is the result of a massive shield volcano, part of the chain of similar volcanoes that migrated northwest to southeast to form the Hawaiian archipelago. Kauai is the oldest of the eight main islands. Volcanic rocks exposed in the western half of the island are composed of Pliocene basaltic flows of the Waimea Volcanic Series (U.S. Army Strategic Defense Command, 1992). The volcanic terrain forms an abrupt, crescent-shaped scarp at the eastern boundary of the Mana Plain, the result of wave action from a higher sea stand. The surface of the volcanic basement complex plunges beneath the Mana Plain at approximately 5 degrees (U.S. Army Strategic Defense Command, 1992).

The Mana Plain is composed of alluvium, lagoon, beach, and dune deposits that overlie the volcanic basement. This sedimentary sequence forms a wedge that thickens east to west, attaining an approximate thickness of 200 ft at the eastern base boundary, increasing to about 400 ft at the coast (U.S. Army Strategic Defense Command, 1992). Older and younger terrestrial alluvium interfingers with gypsum bearing clayey lagoonal deposits and marine near-shore deposits at depth. Sediments are characteristically red and brown near volcanic outcrops, changing to tan and gray calcareous sand near the coast.

The surface of the Mana Plain typically consists of loose sand associated with younger (Modern) alluvium and flattened dunes with little relief (U.S. Army Strategic Defense Command, 1992). The dune sands can be of substantial thickness along the coastal margin where they have been reported to be in excess of 42 ft thick at the Kokole Point housing area (U.S. Army Strategic Defense Command, 1992). The dunes are composed of loose fine sand and silty sand that is weakly to strongly indurated (hardened) a few meters below ground surface. This indurated surface can form resistant remnants, or fossil dunes, fronting the beach along some reaches of the PMRF shoreline. The beach berm is about 10 ft high and is breached only where drainage canals have been excavated at Nohili and Kawaiele (U.S. Army Strategic Defense Command, 1992).

Coral reefs developed on the eroded platform around the island when the sea was about 5 ft above its current level (U.S. Army Strategic Defense Command, 1992). Wave action has eroded the coral surface, creating a primary source for beach sand which is actively being deposited and reworked along the shoreline. Beach sand is generally medium to coarse grained.

Soil

The U.S. Department of Agriculture Soil Conservation Service published a soil survey that includes the surficial deposits of the Mana Plain (PMRF and Easement areas). The dominant soil within the PMRF area has been mapped as Jaucas loamy fine sand, 0 to 8 percent slopes (U.S. Army Strategic Defense Command, 1992). The U.S. Department of Agriculture describes this soil as occurring on old (inactive) beaches and on windblown sand deposits. It is pale brown to very pale brown sand, and in some cases it is more than 5 ft deep. In many places, the surface layer is dark brown as a result of accumulated organic matter and alluvium. The silt is neutral to moderately alkaline through its profile. It has an available water capacity of 0.05 to 0.07 inch per foot of soil (U.S. Army Strategic Defense Command, 1992). The soils are permeable, and infiltration is rapid. Wind erosion is severe when vegetation has been removed.

Along the ocean margin of PMRF/Main Base are areas of active dunes and beaches. Dune lands consist of hills and ridges of sand drifted and piled by the wind. The hills and ridges are actively shifting, or so recently stabilized that no soil horizons have developed. The sand is chiefly calcareous, derived from coral and seashells (U.S. Army Strategic Defense Command, 1992).

Soil samples at the Vandal launch site were obtained to determine if lead concentrations exceeded the 400 milligrams per kilogram (mg/kg) cleanup goal established by the Hawaii Department of Health for residential use. No site soil samples had lead concentrations exceeding the limit prior to the 1994 Vandal launches. After five 1994 launches, two sites contained lead concentrations exceeding 400 mg/kg. Both of these sites were located within 50 ft of the launch site. Concentrations of lead 100 ft away in the same direction were only 30 and 75 mg/kg. None of the lead concentrations outside this 100-ft range were above the reporting limit. (U.S. Department of the Navy)

Although the Vandal target missile is no longer used, past launches from PMRF appear to have caused elevated lead concentrations in soil only within 100 ft of the launch mechanism. The location of these soil samples suggests that lead concentrations do not pose an immediate risk to human health because the launch pad is restricted from public access and that none of the apparently contaminated sand has been or will be transported to the beach.

A study was conducted by the Department of Energy to determine if elevated aluminum concentrations occur at PMRF/Main Base and/or KTF as a result of their rocket emissions. Analysis of background aluminum levels from Mana Plain soils ranged from 0.2 to 1.1 ounces per pound (oz/lb). Kauai soil aluminum values range from 0.09 to 0.7 oz/lb. Deposits of gibbsite, the trihydrate of aluminum oxide, occur naturally in the high rainfall areas of windward Kauai (Land Study Bureau, 1967). The study suggested that if there has been an increase in the amount of aluminum in the soil at PMRF/Main Base as a result of rocket emissions, the total amount is still less than nearby soils.

KTF also tested for lead and found levels up to 270 mg/kg and indicated that these were not “actionable levels” (U.S. Army Strategic Defense Command, 1992). The KTF report described studies of lead poisoning in children, which found that levels of lead of 300 to 400 mg/kg (300 to 400 parts per million) are acceptable. An additional study of the soils of the Mana Plain and KTF area revealed that chloride and pH do not indicate residual effects from past missile launches at KTF.

3.3.1.1.6 Hazardous Materials and Hazardous Waste—PMRF/Main Base

Appendix C includes a discussion of hazardous materials and waste resource laws and regulations.

Region of Influence

The region of influence for hazardous materials and hazardous waste would be limited to areas of the PMRF/Main Base, including KTF, to be used for launch preparation, launch, and post-launch activities and in areas where hazardous materials are stored and handled.

Affected Environment

Hazardous Materials

PMRF manages hazardous materials through the Navy’s Consolidated Hazardous Materials Reutilization and Inventory Management Program (CHRIMP). CHRIMP mandates procedures to control, track, and reduce the variety and quantities of hazardous materials in use at facilities. The CHRIMP concept established Hazardous Materials Minimization Centers as the inventory controllers for Navy facilities. All departments, tenant commands, and work centers must order hazardous materials from the Hazardous Materials Minimization Centers, where all such transactions are recorded and tracked. The exception to this is KTF, which obtains its hazardous materials through Department of Energy channels. Hazardous materials on PMRF are managed by the operations and maintenance contractor through CHRIMP. Hazardous materials managed through the CHRIMP program other than fuels are stored in Building 338. Typical materials used on PMRF/Main Base and stored at Building 338 include cleaning agents, solvents, and lubricating oils.

PMRF has management plans for oil and hazardous materials outlined in the *PMRF Spill Prevention Control and Countermeasures Plan* and the *Installation Spill Contingency Plan.*

These plans regulate both PMRF/Main Base as well associated sites and tenant organizations, including KTF, Makaha Ridge, Kokee, Kamokala Magazines, and Port Allen.

PMRF has developed programs to comply with the requirements of the Superfund Amendments and Reauthorization Act Title III and Emergency Planning and Community Right-to-Know Act. This effort has included submission to the State and local emergency planning committees of annual Tier II forms, which are an updated inventory of chemicals or extremely hazardous substances in excess of threshold limits. These chemicals at PMRF include jet fuel, diesel fuel, propane, gasoline, aqueous fire fighting foam, chlorine, used oil, paint/oils, and paint.

Hazardous Waste Management

PMRF/Main Base is a large-quantity hazardous waste generator with a USEPA identification number. Hazardous waste on PMRF is not stored beyond the 90-day collection period. In 2004, PMRF/Main Base generated 35,613 lb of hazardous waste.

PMRF/Main Base has two accumulation points on base for hazardous wastes: Building 392 and Building 419. Building 392 accumulates all base waste except for OTTO (torpedo) fuel, a liquid monopropellant. Building 419 is the torpedo repair shop. At present, both buildings are not used at their maximum hazardous waste storage capacity. KTF has one hazardous waste accumulation point. Makaha Ridge and Kokee generate only used oil, which is recycled. Port Allen activities generate used oil and oily bilge water, which are taken to PMRF/Main Base to be recycled and processed. The oily bilge water is processed through an oil/water separator and then is fed into the PMRF/Main Base sewage treatment plant.

PMRF outlines management and disposal procedures for used oils and fuels in the Hazardous Waste Management Plan. PMRF maintains a Used Oil transporter/Processor Permit through the Hawaii Department of Health. Additionally, degraded jet fuel is used in crash-fire training exercises. The majority of wastes are collected and containerized at PMRF/Main Base for direct offsite disposal through the Defense Reutilization and Marketing Office (DRMO) at Pearl Harbor within 90 days. The DRMO provides for the transportation and disposal of the wastes to the final disposal facility.

KTF is a small-quantity hazardous waste generator and has a USEPA identification number. There is one hazardous waste accumulation point on KTF; however, KTF has not generated enough hazardous waste for disposal since becoming a small quantity generator in 1994. (Sandia National Laboratory, 2006)

Pollution Prevention/Recycling/Waste Minimization

PMRF has a pollution prevention plan in place for the Main Base and all sites on Kauai, which follows CHRIMP procedures for controlling, tracking and reducing hazardous materials use and waste generation. PMRF/Main Base currently has three hazardous waste elimination programs in place. These involve the recycling toner cartridges, mercury from mercury lamps, and acid/lead batteries.

Installation Restoration Program

PMRF/Main Base has 19 IPR sites. Two fire fighting training pits, the battery acid disposal, three former oil change pits, a battery acid neutralization unit and the torpedo post run facility require no further action based on the results of past investigations and approval by the Hawaii Department of Health. Three landfills (5, 6, and 7), tanker truck pod facility, former missile (Regulus) defueling pit, and the former oil/fuel pipeline are scheduled to be investigated in FY 2011. A site investigation of transformer sites (four) and the reclamite asphalt rejuvenation burial areas is complete. A recommendation for a No Further Action was sent to the Hawaii Department of Health for these sites.

There are no Environmental Restoration sites at KTF. Three Environmental Restoration sites were identified in 1995 and were given a No Further Action determination by the USEPA in 1996 (Sandia National Laboratory, 2006).

Underground and Aboveground Storage Tanks

PMRF/Main Base has nine 50,000-gallon (gal) field constructed underground storage tanks (USTs) located at the Fuel Farm, one 30,000-gal UST located at the Power Plant, two 5,000-gal USTs at the Navy Exchange, three 5,000-gal USTs at the gasoline station, and one 560-gal UST at the Calibration Lab. With the exception of the field constructed tanks, all tanks are double-walled, fiberglass-reinforced plastic. All USTs are equipped with a vapor detection system. (Burger, 2006)

There are two 25,000-gal aboveground storage tanks (ASTs) at the Kokee Power Plant, two 6,000-gal diesel ASTs and one 1,000 gas AST at Makaha Ridge, three 200-gal ASTs near building 510 and one 1,000-gal AST near building 450. All tanks have proper capacity spill containment systems. (Burger, 2006)

There is one underground storage tank and one 10,000-gal aboveground fuel tank at KTF. KTF complies with PMRF's management plans for oil and hazardous materials outlined in the *PMRF Spill Prevention Control and Countermeasures Plan* and the *Installation Spill Contingency Plan.* (Sandia National Laboratory, 2006)

Asbestos, Lead-Based Paint, and Polychlorinated Biphenyls

PMRF manages asbestos in accordance with the base asbestos management plan. Prior to any construction projects, areas to be disturbed are surveyed for asbestos, and any asbestos is removed, before disturbance, by a certified asbestos contractor. The handling of hazardous materials and the potential generation and disposal of hazardous wastes follow ongoing, standard, and applicable regulations and procedures at PMRF.

All facilities associated with PMRF follow its lead-based paint management plan. The exception is KTF, which follows Department of Energy plans for the removal of lead-based paint wastes.

No known components at PMRF/Main Base contain polychlorinated biphenyl (PCBs). In the event that components containing PCBs are found at PMRF/Main Base and become waste, they would be labeled according to the Toxic Substances Control Act, 40 CFR 761, requirements for shipping, and disposed of through the DRMO or a contractor within 1 year of the waste's initial storage.

KTF follows the Department of Energy plans for the removal of any lead-based paint wastes. The transformers on the KTF site have been tested and are free of PCBs, and there are no asbestos issues at the site. (Sandia National Laboratory, 2006)

Liquid Fuels and Other Toxic Fuels

PMRF uses gasoline and diesel fuels to power range trucks and equipment. Aircraft at PMRF utilize jet fuel and Jet-A. Jet-A is available at the fuel farm near the airfield. Both aircraft fuels are delivered to the flight line in refuelers.

3.3.1.1.7 Health and Safety—PMRF/Main Base

Health and safety includes consideration of any activities, occurrences, or operations that have the potential to affect one or more of the following:

The well-being, safety, or health of workers—Workers are considered to be persons directly involved with the operation producing the effect or who are physically present at the operational site.

The well-being, safety, or health of members of the public—Members of the public are considered to be persons not physically present at the location of the operation, including workers at nearby locations who are not involved in the operation and the off-base population. Also included within this category are hazards to equipment, structures, plants, and wildlife.

Appendix C includes a detailed discussion of health and safety resources laws and regulations.

Region of Influence

The region of influence for potential impact related to the health and safety of workers includes work areas associated with range operations, training operations, and RDT&E operations. The population of concern includes the workers employed at PMRF/Main Base, including KTF, but also encompasses the contractor, military, and government civilian personnel directly involved with range operation, training operations, and RDT&E operations.

The region of influence for potential impact related to public health and safety includes the areas of Kauai County and the island of Kauai and Niihau affected by range operations, training operations, and RDT&E operations. These areas include the PMRF overwater training areas. The population of concern consists of visitors to Kauai and permanent residents living in Kauai County.

Affected Environment

PMRF takes every reasonable precaution during the planning and execution of the operations, training operations, and RDT&E operations to prevent injury to human life or property. In addition to explosive, physical impact, and electromagnetic hazards, potential hazards from chemical contamination, ionizing and non-ionizing radiation, radioactive materials, and lasers are studied by PMRF Range Safety Office to determine safety restrictions.

Range Safety

Range Safety at PMRF is controlled by Range Control, which is responsible for hazard area surveillance and clearance and control of all PMRF operational areas. Range Control maintains real time surveillance, clearance, and safety at all PMRF areas including PMRF/Main Base. PMRF sets requirements for minimally acceptable risk criteria to occupational and non-occupational personnel, test facilities, and non-military assets during range operations. For all operations at PMRF, the Range Control Officer requires a safety plan. A Range Safety Operation Plan (RSOP) is generated by PMRF Range Safety personnel prior to range operations.

The PMRF Range Safety Office is responsible for establishing Ground Hazard Areas and Launch Hazard Areas over water beyond which no debris from early flight termination is expected to fall. The Ground and Launch Hazard Areas for missile launches are determined by size and flight characteristics of the missile, as well as individual flight profiles of each flight test. Data processed by ground-based or onboard missile computer systems may be used to recognize malfunctions and terminate missile flight. Before a launch is allowed to proceed, the range is determined cleared using input from ship sensors, visual surveillance from aircraft and range safety boats, radar data, and acoustic information.

Other safety areas under PMRF's control include radars, explosives, and airspace. All range users must: (1) provide a list of project materials, items, or test conditions that could present hazards to personnel or material through toxicity, combustion, blast, acoustics, fragmentation, electromagnetic radiation (EMR), radioactivity, ionization, or other means; (2) describe radiation, toxic, explosive, or ionization problems that could accumulate as a result of their tests; (3) provide aerodynamic and flight control information, and destruct system information and parameters; (4) submit plans, specifications, and procedural or functional steps for operations involving explosives to conform to criteria in the PMRF instruction; and (5) provide complete operational specifications of any laser to be used and a detailed description of its planned use. (U.S. Department of the Navy, Pacific Missile Range Facility, 2005)

Missile Flight Analysis

PMRF conducts missile flight safety, which takes into account potential hazards from chemical contamination, ionizing and non-ionizing radiation, radioactive materials, and lasers in accordance with Naval Air Warfare Center Weapons Division Instruction. Missile flight safety includes analysis of missile performance capabilities and limitations, of hazards inherent in missile operations and destruct systems, and of the electronic characteristics of missiles and instrumentation. It also includes computation and review of missile trajectories, launch azimuths, kinetic energy intercept debris impact areas, and hazard area dimensions, review and approval of destruct systems proposals, and preparation of the RSOP required of all programs at PMRF. These plans are prepared by the PMRF Safety Office for each mission and must be approved by the Commanding Office prior to any launch. Launch is only allowed when the risk levels are less than the acceptable risk criteria in PMRF Instruction 8020.16, which are equivalent to the criteria developed by the Range Commanders Council (e.g., RCC 321).

Ground Safety

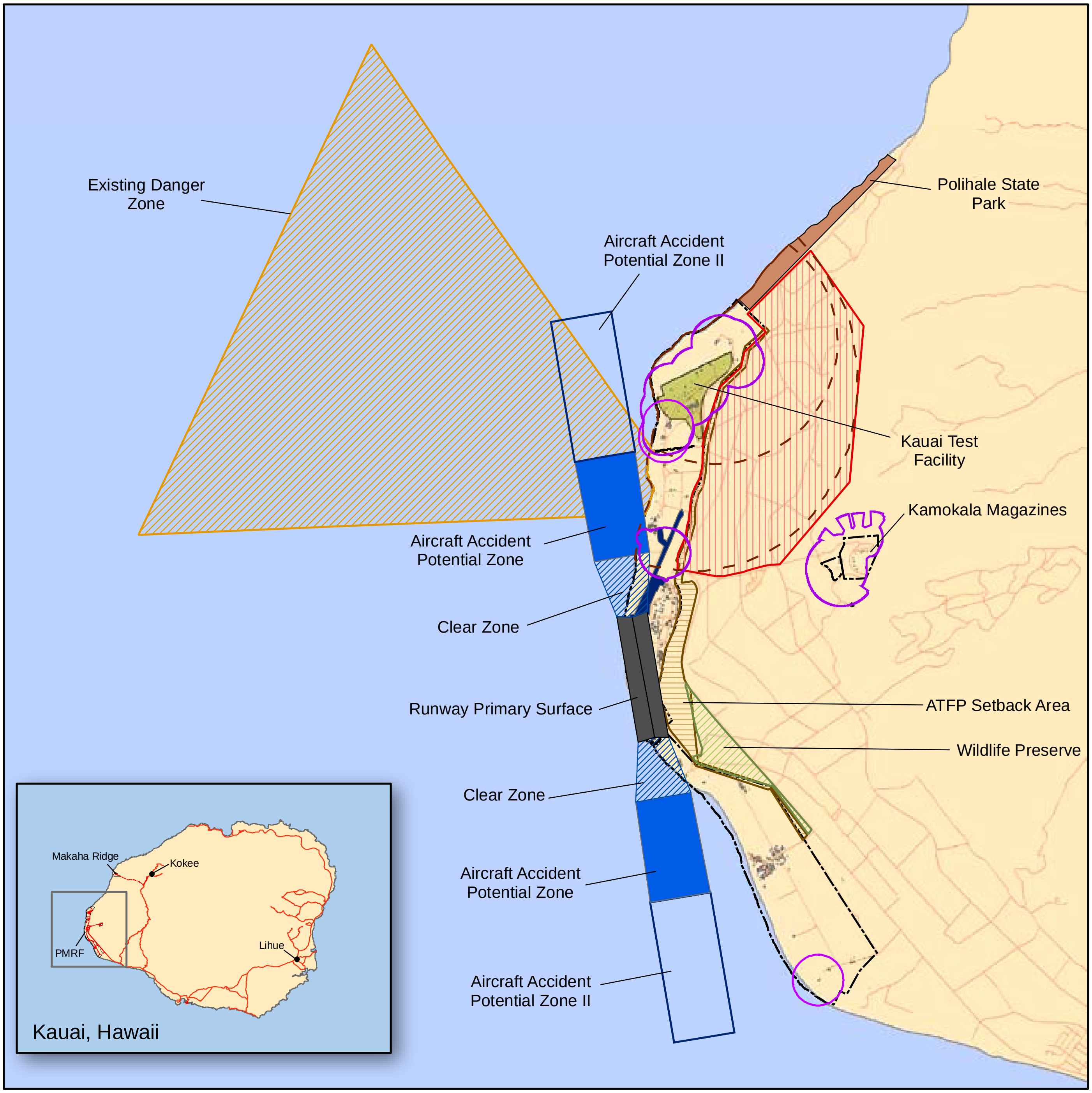
The Range Control Officer using PMRF assets is solely responsible for determining range status and setting RED (no firing - unsafe condition due to a fouled firing area) and GREEN (range is clear and support units are ready to begin the event) range firing conditions. The Range Safety Approval and the RSOP documents are required for all weapons systems using PMRF (Pacific Missile Range Facility, Barking Sands, 1998). PMRF uses RCC 321, *Common Risk Criteria for National Test Range*s. RCC 321 sets requirements for minimally-acceptable risk criteria to occupational and non-occupational personnel, test facilities, and non-military assets during range operations. Under RCC 321, the general public shall not be exposed to a probability of fatality greater than 1 in 10 million for any single mission and 1 in 1 million on an annual basis. (Range Commanders Council, Range Safety Group, 2002) Figure 3.3.1.1.7-1 shows the PMRF health and safety areas including the Ground Hazard Areas associated with missile launch activities at PMRF/Main Base.

To ensure the protection of all persons and property, standard operating procedures (SOPs) have been established and implemented for the Ground Hazard Areas. These SOPs include establishing road control points and clearing the area using vehicles and helicopters (if necessary). Road control points are established 3 hours prior to launches. This allows security forces to monitor traffic that passes through the Ground Hazard Areas. At 20 minutes before a launch, the Ground Hazard Area is cleared of the public to ensure that, in the unlikely event of early flight termination, no injuries or damage to persons or property would occur. After the Range Safety Officer declares the area safe, the security force gives the all-clear signal, and the public is allowed to reenter the area. (U.S. Department of the Navy, Pacific Missile Range Facility, 2005) No inhabited structures are located within the off-base sections of the Ground Hazard Area. The potential for launch-associated hazards are further minimized through the use of the PMRF Missile Accident Emergency Team. This team is assembled for all launches from PMRF facilities and on-call for all PMRF launches in accordance with PMRF Instruction (PMRFINST) 5100.1F.

Ordnance Management and Safety

Ordnance safety includes procedures to prevent premature, unintentional, or unauthorized detonation of ordnance. Any program using a new type of ordnance device for which proven safety procedures have not been established requires an Explosive Safety Approval before the ordnance is allowed on PMRF or used on a test range. This approval involves a detailed analysis of the explosives and of the proposed operations, procedures, and facilities for surveillance and control, an adequacy analysis of movement and control procedures, and a design review of the facilities where the ordnance items will be handled.

Ordnance management procedures are found in PMRFINST 8020.5, *Explosive Safety Criteria for Range Users Ordnance Operation*s. The Range Control Branch of the Range Programs Division is responsible for: (1) providing detailed analysis of all proposals concerning missiles or explosives and their proposed operation on the range; (2) establishing procedures for surveillance and control of traffic within and entering hazard areas; (3) reviewing the design of facilities in which ordnance items are to be handled to ensure that safety protection meets the requirements of Naval Sea System Command Publication (NAVSEAOP) -5, *Ammunition and Explosives Ashore; Safety Regulations for Handling, Storing, Production, Renovation, and*



EXPLANATION

- Road
- Existing ESQD Arc
- 6,000-Foot and Modified 10,000-Foot Ground Hazard Area
- Restrictive Easement
- Aircraft Accident Potential Zone II
- Aircraft Accident Potential Zone
- Clear Zone
- Runway Primary Surface
- Airfield Area
- Wildlife Preserve
- ATFP Setback Area
- Restricted Anchorage
- Polihale State Park
- Kauai Test Facility
- Existing Structure
- Installation Area
- Land

NORTH

0 0.5 1 2 Miles

Pacific Missile Range Facility Health and Safety Areas

Kauai, Hawaii

Figure 3.3.1.1.7-1

Shipping, Chapter 4; (4) training, certifying, and providing Launch Control Officers, Safety Monitors, and Ordnance personnel for operations involving explosive ordnance; (5) assuming responsibility for the control of all emergency facilities, equipment, and personnel required in the event of a hazardous situation from a missile inadvertently impacting on a land area; (6) providing positive control of the ordering, receipt, issue, transport, and storage of all ordnance items; and (7) ensuring that only properly certified handling personnel are employed in any handling of ordnance.

Ordnance is either delivered to PMRF/Main Base by aircraft to the on-base airfield or by ship to Nawiliwili Bay, then over land by truck transport along Highway 50 to the base (see Figure 2.1-1). The barges carrying explosives are met at Nawiliwili Harbor by trained ordnance personnel and special vehicles for transit to and delivery at PMRF/Main Base. All ordnance is transported in accordance with U.S. Department of Transportation regulations. Ordnance is stored in caves at the Kamokala Magazine area, except for the Strategic Target System, which is stored in a specially constructed facility on KTF. No mishaps involving the use or handling of ordnance have occurred at PMRF.

PMRF/Main Base has defined explosive safety-quantity distance (ESQD) arcs. The arcs are generated by launch pads, the Kamokala Magazine ordnance storage area, the Interim Ordnance Handling Pad, and the Missile Assembly/Test Buildings 573 and 685. Only the ESQD arcs generated by the Interim Ordnance Handling Pad and Building 573 are covered by a waiver or exemption. The Sandia Launcher site can accommodate a 1,250-ft ESQD arc.

A 1,250-ft ESQD Red Label Area, to handle incoming and outgoing ordnance items, is centered on the airfield taxiway, 1,250 ft from Building 412 (see Figure 3.3.1.1.7-1). A soft pad in the Red Label recovery area is used by helicopters for setting down targets and weapons recovered from the range. The 800-ft ESQD surrounding the soft pad falls totally within the Red Label ESQD area.

Ocean Area Clearance

Range Safety officials manage operational safety for projectiles, targets, missiles, and other hazardous operations into PMRF operational areas. The operational areas consist of two Warning Areas (W-186 and W-188) and one Restricted Area (R-3101) under the local control of PMRF. The Warning Areas are in international waters and are not restricted; however, the surface area of the Warning Areas is listed as “HOT” (actively in use) 24 hours a day. For special operations, multi-participant or hazardous weekend firings, PMRF publishes dedicated warning Notices to Mariners (NOTMARs) and Notices to Airmen (NOTAMs) 1 week before hazardous operations. In addition, a 24-hour recorded message is updated daily by Range Operations to inform the public when and where hazardous operations will take place.

Prior to an operation proceeding, the range is determined to be cleared using inputs from ship sensors, visual surveillance of the range from aircraft and range safety boats, radar data, and acoustic information from a comprehensive system of sensors and surveillance from shore.

Transportation Safety

PMRF transports ordnance by truck from Nawiliwili Bay to PMRF along Highway 50 (see Figure 2.1-1). The barges carrying explosives are met at Nawiliwili Bay by trained ordnance personnel and special vehicles for transit to and delivery at PMRF. All ordnance is transported in accordance with U.S. Department of Transportation regulations. PMRF has established PMRFINST 8023.G, which covers the handling and transportation of ammunition, explosives, and hazardous materials on the facility.

In addition, liquid fuels (e.g., nitrogen tetroxide and unsymmetrical dimethylhydrazine) are transported to KTF. These fuels can be shipped to the site by truck, aircraft or barge, which do not affect transportation routes on the island of Kauai. Transportation of these materials is conducted in accordance with U.S. Department of Transportation regulations and specific safety procedures developed for the location.

Range Control and the FAA are in direct communication in real time to ensure the safety of all aircraft using the airways and the Warning Areas. Within the Special Use Airspace, military operations in Warning Areas W-186 and W-188 are under PMRF control. Warning Areas W-189, W-187, and W-190 are scheduled through the Fleet Area Control and Surveillance Facility. Section 3.3.1.1.2 provides further airspace details.

The Warning Areas are located in international airspace. Because they are in international airspace, the procedures of the ICAO are followed. The FAA acts as the U.S. agent for aeronautical information to the ICAO, and air traffic in the region of influence is managed by the Honolulu ARTCC.

Fire and Crash Safety

The Navy has developed standards that dictate the amount of fire/crash equipment and staffing that must be present based on the number and types of aircraft stationed on base, and the types and total square footage of base structures and housing. PMRF Crash/Fire is located in the base of the Air Traffic Control Tower, Building 300. Personnel are trained to respond to activities such as aircraft fire fighting and rescue in support of airfield operations, hazardous material incidents, confined space rescue, and hypergolic fuel releases, plus structure and brush fire fighting, fire prevention instruction and fire inspections.

Ambulance and Class II Emergency Medical Technician services are provided by Emergency Medical Technicians assigned to Crash/Fire. These contractor operated services are available to military, civil service and non-government personnel at PMRF, 24 hours a day, 7 days a week. More extensive emergency medical services are available from the West Kauai Medical Center in Waimea, 10 mi from the Main Gate at Barking Sands.

KTF

KTF is a launch facility operated by Sandia National Laboratories for the Department of Energy on PMRF/Main Base through inter-Service Support Agreements (U.S. Department of the Navy, Pacific Missile Range Facility, 2005). KTF notifies PMRF Operations, Security, Fire Department, and Ordnance/Explosive Disposal as required prior to launch and other hazardous operations. (Sandia National Laboratory, 2006)

All hazardous operations at KTF are performed under strict adherence to SOPs. A site SOP provides general requirements and guidance for all operations at KTF, including ordnance safety, pre-launch and hazardous operations control, ordnance handling and storage facilities, liquid fuels storage and handling, and launch pad operations.

KTF rocket motors and other ordnance components are stored in explosive storage magazines by PMRF, except when needed by KTF for processing, assembly, and launch. The movement of explosives and other hazardous materials between PMRF and KTF is conducted in accordance with PMRF procedures and DoD Explosives Safety Standards.

PMRF provides fire protection and fire fighting services to KTF, and enforces base safety regulations and programs on KTF.

3.3.1.1.8 Land Use—PMRF/Main Base

This section describes current land-based uses including recreational activities. The No-action Alternative will be a continuation of operations which currently occur on PMRF/Main Base, and the Alternative Actions are incremental increases of operations which already occur or have occurred. The Navy has no intention of expanding land ownership in the PMRF/Main Base Area. Appendix C includes a definition of land use and laws and regulations that pertain to it. Additionally, Appendix J describes the circumstance by which the lands now known as PMRF came into Federal ownership.

Region of Influence

The region of influence for land use includes the Main Base Complex and adjacent areas on the Mana Plain. Because KTF resides entirely within PMRF/Main Base, all discussion regarding land use and recreation stated for PMRF/Main Base would apply to KTF.

Affected Environment

On-base Land Use

PMRF's land use is managed via the 2006 Comprehensive Infrastructure Plan. The plan promotes efficient, effective use of resources through a consolidation of like land uses and the minimization, recognition, and deconfliction of existing constraints. The plan supports the protection of essential mission operations from encroachment and the protection of human and natural environments (U.S. Department of Navy, 2006b, U.S. Department of Navy, 1998).

According to the State Land Use Classification, PMRF is located within a conservation district (Figure 3.3.1.1.8-1). The 2000 Kauai General Plan and the Waimea-Kekaha Region Development Plan classify PMRF as a Military Land Use area. Kauai County has designated the dune area from Nohili Point to the north boundary of PMRF as a scenic ecological area. The Nohili and Kinikini Ditches act as natural dividers, separating the PMRF into three zones: North, Central and South (Figure 3.3.1.1.8-1).

EXPLANATION

State Land Use - Western Kauai, Hawaii

Kauai, Hawaii

Figure 3.3.1.1.8-1

The North Zone is used for rocket launches and its associated support activities, administration, and services. This includes ESQD Arcs and Ground Hazard Areas. The Central Zone contains air operations, administration, supply, base services, range operations, ordnance maintenance, and fuel/supply. In addition, the runway has Clear Zones and Accident Potential Zones (I & II) as safety measures which are discussed further in Section 3.3.1.1.7. The South Zone contains housing, personnel support, recreational, communications and rocket launcher facilities (KTF). ESQDs and ground hazard areas exist for the rocket launcher pad as well. Additionally, KTF, as shown in Figure 3.3.1.1.8-1 is located in the northern portion of PMRF/Main Base. Sandia National Laboratories operates KTF for the Department of Energy and provides testing, evaluation, research and development of rocket systems (Sandia National Laboratories, 2006; Commander, U.S. Pacific Fleet, 2006).

On-base Recreation

Recreational services available to military and civilian personnel include an auto hobby shop, a craft center, a 200-seat outdoor movie theater, a recreation center, a wood hobby shop, and a racquetball/handball court. Outdoor facilities include three tennis courts, a lighted golf driving range, a lighted softball field, a lighted multi-purpose playing court, a year-round swimming pool, and an 18-hole miniature golf course (U.S. Department of Navy, 1998).

Public access to the installation's approximately 1,000 ft wide by 8 mi long coastline is outlined in PMRF Instruction 5530.7 (March 2004). Kauai residents possessing a PMRF approved beach access pass are currently allowed to access the Majors Bay recreation area at PMRF to use the beach. PMRF Range Operations maintains a 24-hour hotline, which is updated daily in order to provide information on recreational area access. Recreational activities include surfing, fishing and boating. The physical areas accessible for fishing/surfing/recreation/and socializing run from Shenanigans (All-hands club) up to KiniKini Ditch (south end of runway) Under PMRF Instruction 5530.7, normal access is allowed 7 days a week from 6:00 am to 30 minutes after sunset, except during heightened force protection conditions or operational periods.

Fishing is also allowed up to 1,000 ft in the Special Use Fishing Area (Kawaiele Ditch northward to the windsock adjacent to the runway) on weekends and Federal holidays, except during heightened force protection conditions and operational periods. Use of this area is limited to 25 fishermen at one time. Surfing is also permitted in front of the PMRF housing area.

Off-base Land Use

Current land uses adjacent to PMRF are agricultural, recreational, and a landfill. No inhabited buildings are within these areas. The non-developed, open-type uses of these adjacent lands are compatible with the operations and safety requirements of PMRF. The State Land Use District Boundary Map (Figure 3.3.1.1.8-1) classifies adjacent lands to the north of PMRF/Main Base (Polihale State Park) and adjacent lands to the South of PMRF/Main Base (Kekaha Landfill), as conservation. Adjacent lands to the east of PMRF/Main Base is classified as agricultural (formerly sugarcane fields). To the west of PMRF/Main Base is the Pacific Ocean (for Naval training and recreational activities). The County of Kauai classifies adjacent lands as open and agricultural. The State and County's designations are compatible with base activities and limits development that would conflict with current use.

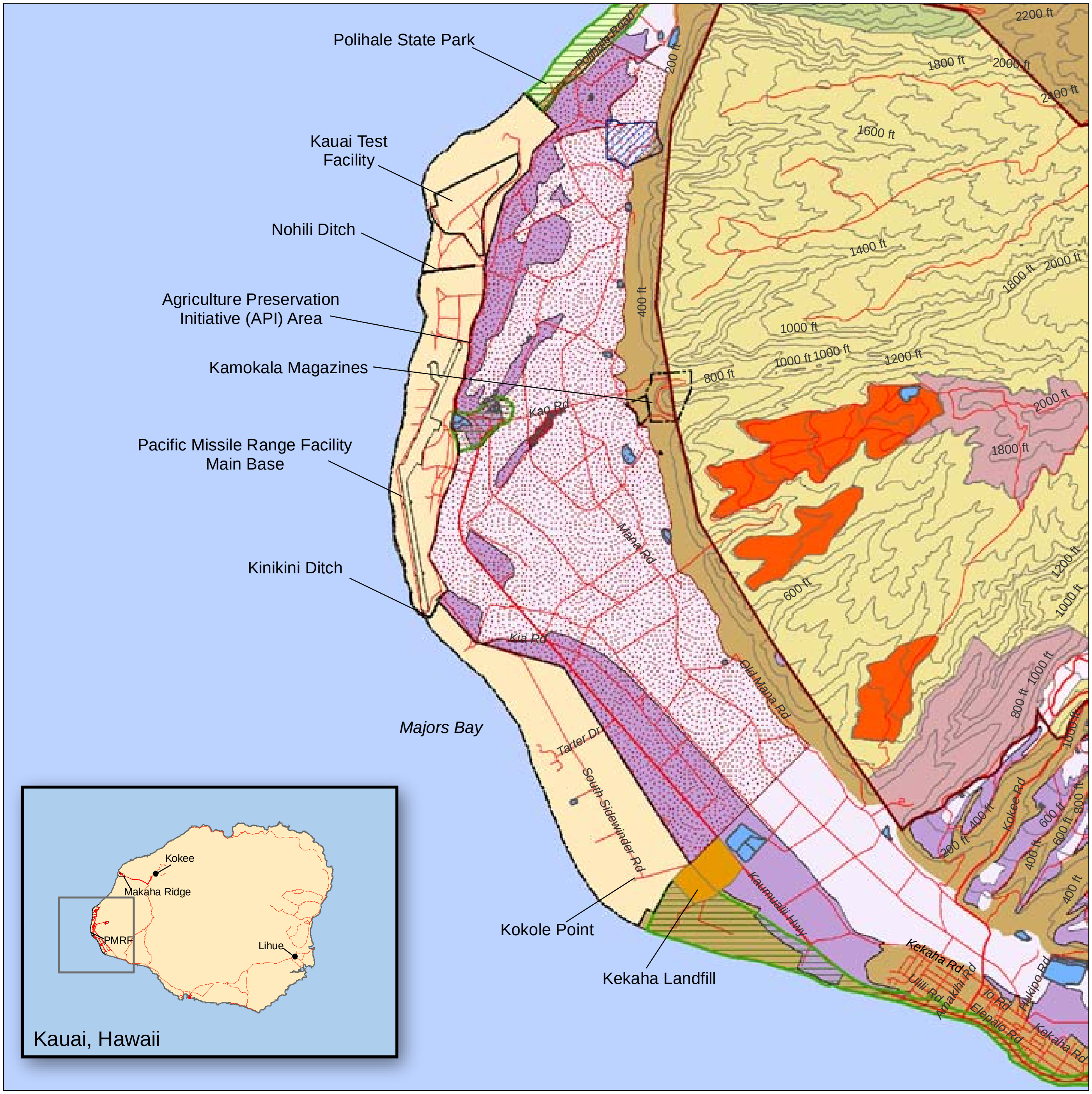
Polihale State Park, a small area just east of PMRF North Gate, and a parcel of land south of PMRF and south makai, from the Kekaha Landfill have been designated as special management areas (U.S. Department of the Navy, 1998). Kauai County established guidelines for reviewing proposed developments in special management areas (Figure 3.3.1.1.8-1) as part of the Coastal Zone Management Act Program. Any development in these areas requires a special management use permit.

In May of 2004, by amendments, the State Board of Land and Natural Resources approved the Agricultural Preservation Initiative (API) (U.S. Department of the Navy, 2006). The purpose of the Agricultural Preservation Initiative is to ensure lands adjacent to PMRF (5,371 acres + 270 acres-leased = 5,641 acres), which are currently designated as agricultural by the State Land Use Commission, remain agricultural lands for the term of the agreement (the agreement expires December 31, 2030 – see 1998 PMRF Enhanced Capability EIS). The use of this land requires activation of a restrictive easement. The initiative is consistent with the Kauai General Plan policy for agricultural lands, which states: "The primary intent of the Agriculture designation is to conserve land and water resources (Kauai, County of, 2005." The agricultural land is owned by the State of Hawaii and is leased to the Agribusiness Development Corporation per GEO 4007 (an agency with the State Department of Agriculture).

The API benefits to the Navy include; (1) land use remains compatible with PMRF activities, thus preventing encroachment issues; (2) able to maintain compliance with Anti-Terrorism Force Protection criteria (Unified Facilities Criteria 4-010-01); and (3) improved Homeland defense/physical security. The API includes 270 leased acres, which contain the pumping system for the Mana Plain. By placing the drainage pumps under a Navy lease, the Navy will be able to use Federal funds to maintain the pumps that help prevent flooding in the Mana Plain (Department of Navy, 2006b). The approximately 6,000 acres maintained in the API supports the initiatives of the State Department of Agriculture in its charge to preserve important resources to ensure the viability of Hawaii's diversified agricultural industry. Figure 3.3.1.1.8-2 shows the land use alignment of PMRF and the Agricultural Preservation Initiative/Mana Plan and Figure 3.3.1.1.7-1 shows the Restrictive Easement.

Kekaha Landfill sits on 64 acres of land, of which 32 acres make up the footprint of the lined Subtitle-D landfill itself. Kekaha averages 230 tons per day and 88,000 tons per year. The Landfill was opened in 1953 and was expected to close in 2004, but was recently given permission to operate until approximately 2012 (Kauai Island Utility Cooperative, 2006).

PMRF activities which affect off-base land uses include those within the ESQD arcs, EMR areas, aircraft noise contours and missile ground hazard areas. ESQD arcs that extend beyond the PMRF boundary include four areas in the northern area and one in the central portion of the base. The off-base land use within these State-owned lands has been designated by both the County and State as agricultural areas. Missile ground hazard areas which are only used during launch events, and extend off-base, occur in northern PMRF and encompass agricultural and recreational uses.



EXPLANATION

- Road
- Elevation
- Department of Hawaiian Homelands Area (DHHL)
- Agriculture Preservation Initiative (API) Area
- Proposed State Expansion Area for Polihale State Park
- Wetland Area
- Military Reservation
- Special Management Area
- Prime Land
- Unique Land
- Other Land
- Unclassified Land
- DHHL Future Development
- DHHL Conservation
- DHHL Special District
- DHHL Subsistence Agriculture
- DHHL General Agriculture
- Non-Agricultural Land
- Kekaha Landfill

NORTH

0 3,000 6,000 12,000 Feet

Agricultural Lands of Importance to the State of Hawaii / Department of Hawaiian Homelands

Kauai, Hawaii

Figure 3.3.1.1.8-2

Off-base Recreation

Off-base recreation within the region of influence is limited to operations within the 140 acres of Polihale State Park (Figure 3.3.1.1.8-2). The park provides overnight camping and day use recreational activities (swimming, shore fishing, subsistence fishing, picnicking). It is operated by the Department of Land and Natural Resources, Division of State Parks, which estimates half a million people visit during the day, each year. Approximately 70 acres of the southern extent of the park is within the restrictive easement boundary (Figure 3.3.1.1.7-1). None of the developed campsites or picnic areas is within the restricted easement or the ground hazard area (southern extent). The northern area, where picnicking and camping facilities are located, is accessible via a 5-mi dirt road from Highway 50 and is within a ground hazard area.

The Division of State Parks plans to expand Polihale State Park, subject to the availability of funds. The expansion would include a portion of a sugar cane field and cliffs adjacent to the park's boundary (Figure 3.3.1.1.8-2). The purpose is to encompass sensitive cultural resources and biological resources within the park boundary. No park development, other than interpretive trail signs, is expected within the expansion area (U.S. Department of the Navy, 1998).

3.3.1.1.9 Noise—PMRF/Main Base

Appendix C includes a definition of noise and the main regulations and laws that govern it.

Region of Influence

The region of influence for noise analysis is the area within and surrounding PMRF in which humans and wildlife may suffer annoyance or disturbance from noise sources at PMRF. This would include all areas on the Mana Plain (PMRF, Polihale State Park, and sugar cane fields), KTF, and the city of Kekaha.

Affected Environment

Primary sources of noise on PMRF/Main Base include missile, rocket and drone launches, and airfield and range operations. Airfield operations include take-offs and landings of high-performance and cargo/passenger aircraft, as well as helicopter operations. Range operations include exercise support. Ambient noise levels from natural sources include wind, surf, and wildlife.

Noise levels produced by airfield operations tend to have a continuous impact on PMRF/Main Base. Existing noise levels near the runway may average as high as 75 dBA. Buildings in this area are insulated to achieve a noise reduction of up to 35 dBA. Noise levels farther away from the runway are more characteristic of a commercial park, with levels not exceeding 65 dBA. Airfield noise zones have been established to safeguard the public and all station personnel from the effects of noise from aircraft operations.

Range operations that may impact the sound environment include, but are not limited to, power generation, exercise support, maintenance operations, and construction or renovation.

The activity with the most noticeable sound events is the launch of missiles, rockets, and drones. These launch operations result in high-intensity, short-duration sound events. Past launches include Strategic Target System, Strypi, and ZEST missile launches and have resulted in no public noise complaints. Table 3.3.1.1.9-1 lists the noise levels monitored for previous ZEST and Strategic Target System launches at PMRF/Main Base.

Table 3.3.1.1.9-1. Noise Levels Monitored for ZEST and Strategic Target System Launches

Launch Vehicle	Distance (ft)	Measured Average Peak (dB)
ZEST	725	124.8
	1,000	122.5
	1,263	119.6
	1,400	119.5
	2,975	110.5
Strategic Target System	575	125.3
	800	123.0
	881	121.8
	1,222	118.2
	1,584	115.3
	10,000	97.1
	35,000	54.0

Source: U.S. Army Strategic Defense Command, 1992

The nearest on-base housing area is located approximately 5 mi south of the northern KTF and PMRF launch areas and 1 mi from the southern launch site. The nearest off-base residential area is Kekaha, which is approximately 8 mi south of the northern launch areas and 2 mi from the southern launch sites.

KTF supports a variety of sounding rocket missions; therefore, occasional rocket, missile, or drone launches produce high-intensity, short-duration sound events. Table 3.3.1.1.9-1 lists noise levels associated with these launches. Data collected in the nearest town of Kekaha indicated that levels were no louder than noise generated from passing vehicles on a nearby highway. No noise-sensitive land uses are affected by existing noise levels (Sandia National Laboratory, 2006).

Wildlife receptors at the PMRF/Main Base area are discussed in Section 3.3.1.1.3, Biological Resources (Terrestrial).

3.3.1.1.10 Socioeconomics—PMRF/Main Base

Socioeconomics describes the social and economic character of a community through the review of several metrics including population size, employment characteristics, income generated, and the type and cost of housing. This section presents a socioeconomic overview of the Kauai region. Appendix C includes a general definition of socioeconomics.

Region of Influence

The region of influence for socioeconomics is defined as the island of Kauai, which covers 552 mi^2. The entire island is designated as Kauai County.

Affected Environment

Population and Income

In 2000, the population of Kauai County was 58,463. The 2005 Bureau of Census Counties Profile estimates that the population for the County rose to 62,640 in 2005 (equal to 4.9 percent of the population of Hawaii), a change of approximately 7.1 percent over the 5-year period. The projected population for 5 and 10 years out is 65,900 people in 2010 and 70,200 people in 2015 (Hawaii, State of, 2004b). Table 3.3.1.1.10-1 summarizes the demographics of the population of Kauai in 2000. Table 3.3.1.1.10-2 illustrates the age profile of those living in Kauai County in 2000.

Table 3.3.1.1.10–1. Demographics of the Population of Kauai in 2000

Persons		**58,463**
	Male	29,252
	Female	29,211
Race	Asian	21,042
	White	17,255
	Native Hawaiian & Other Pacific Islander	5,334
	Hispanic/Latino	4,803
	Other	10,029
Households		**20183**
Families		**14,572**

Source: U.S. Counties 2000, U.S. Census Bureau, 2000.

Table 3.3.1.1.10-2. Age Profile of Kauai County Residents in 2000

	Kauai County		Hawaii	
Age group (years)	**Population**	**Percentage**	**Population**	**Percentage**
17 and younger	15,434	26.4	295,615	24.4
18-24	4,150	7.1	115,096	9.5
25-44	15,901	27.2	362,249	29.9
45-64	14,908	25.5	277,441	22.9
65 and over	8,067	13.8	161,134	13.3

Source: U.S. Counties 2000, U.S. Census Bureau, 2000.

Personal income in Kauai was estimated by the Department of Business, Economic Development and Tourism to be $1.595 billion in 2005 (FY 2000 dollars). This represented 4 percent of the total personal income of Hawaii. In FY 2000 the annual average salary for Kauai County was $26,550, while the annual average income in 2005 for Kauai County was $29,650, which is an 11.6 percent increase.

In FY 2005 the total defense expenditures of Hawaii were $5.6 billion, an increase of 8.7 percent over FY 2004, and for this same time period, defense procurement contracts in Hawaii totaled $2.0 billion, an increase of 16.2 percent over FY 2004. Appropriations for FY 2006 defense projects in Hawaii totaled $767 million, which includes a military construction program of $354 million, and $413 million for defense related projects. Appropriations for FY 2007 defense projects total nearly $622 million (Hawaii Department of Business, Economic Development & Tourism, 2007). Table 3.3.1.1.10-3 shows the economic impact of the military in Hawaii for 2006.

PMRF is a major contributor to the economy of Kauai County, particularly on the western side of the island. The installation employs nearly 1,000 military, civilian and contract personnel and has a $130 million impact annually on the local economy. In FY 2001, expenditures for PMRF and other defense initiatives on Kauai totaled about $144 million (Division of Economics, U.S. Fish and Wildlife Service, 2002). In FY 2005 expenditures for PMRF and other defense initiatives on Kauai totaled about $113 million (Inouye, 2004).

Housing

In 1993, housing on Kauai was characterized as overcrowded, costly, and in short supply (U.S. Department of the Navy, 1998). In December 2006 sales remained fairly steady at half sold for more than $592,500 and half for less, as the median price dropped 2 percent. In December 2005, the median price of a Kauai home was $605,000. At the market height of summer 2005, the median sales price on Kauai reached closed to $700,000. Median home prices declined by 15.4 percent between the summer of 2005 and December 2006 and declined by 2.1 percent between December 2005 and December 2006 (Star Bulletin, 2007). Condominium prices on Kauai, on the other hand, increased to by 17.7 percent; up to $570,000 in December 2005 from $484,500 in December 2005 (Star Bulletin, 2007).

Table 3.3.1.1.10-3. 2006 Economic Impact of the Military in Hawaii

Industry Output (millions of dollars)		Employment (number of jobs)		Household Income (millions of dollars)	
Fed.Def-Military & civilian	766	Fed Def-Military & civilian	10,371	Def-Military & civilian	690
Real estate & Rentals	149	Retail trade	1,198	Health services	45
Health services	88	Health services	1,086	Professional services	35
Mining & Construction	77	Business services	771	Mining & construction	31
Retail Trade	77	Professional services	721	Retail trade	29
Professional services	68	Other services	667	Business services	22
Finance & insurance	51	Mining & construction	530	Finance & insurance	16
Other manufacturing	47	Eating & drinking	503	Other services	15
Business services	39	Real Estate & rentals	400	Wholesale trade	11
Other services	35	Finance & insurance	326	Other government	11
Wholesale trade	30	Wholesale trade	256	Information	10
Information	29	Educational services	231	Other manufacturing	9
Eating & drinking	26	Other government	213	Eating & drinking	9
Transportation	23	Arts & entertainment	172	Real estate & rentals	8
Utilities	22	Information	172	Transportation	7
All other industries	61	All other industries	721	All other industries	23
Total	1,588	Total	18,338	Total	971

Source: Hawaii Department of Business, Economic Development & Tourism, Research & Economic Analysis Division, January 2007

Employment

Government, tourism, and tourism-related services, have been the main employment generators on Kauai since the 1992 hurricane (U.S. Department of the Navy, 1998). In 2006, government and tourism were the main employment generators. In FY 2006 PMRF employed a total of 821 employees, which comprised 128 DoD civilian personnel, 54 military personnel, 512 ITT personnel (Prime Support Contractor), 97 other contractors personnel, and 30 Hawaii Island Air National Guard. Table 3.3.1.1.10-4 shows the number of individuals employed in the main sectors of the economy of Kauai and in Hawaii as a whole.

Unemployment in Kauai has steadily declined from 4.5 percent in 2000 to 2.7 percent in 2005. This is the lowest the rate has been in over 15 years, which is also significantly lower than the 1998 unemployment rate of 11.6 percent. During the same period, the total labor force has increased from 30,350 in 2000 to 32,350 in 2005, a 6.7 percent increase (Hawaii, State of, 2005a).

Table 3.3.1.1.10-4. Employment in Kauai and Hawaii

Employment Sector	Kauai Employees		Hawaii Employees	
	Number of Employees	Percent of Total	Number of Employees	Percent of Total
Agriculture, forestry, fishing, hunting, and mining	1,227	4.6	12,119	2.3
Construction	2,083	7.8	32,180	6.0
Manufacturing	652	2.4	18,979	3.5
Transportation and public utilities	1,497	5.6	33,559	6.2
Wholesale trade	456	1.7	17,188	3.2
Retail trade	3,341	12.5	65,693	12.2
Finance, insurance and real estate	1,667	6.2	37,867	7.0
Services	15,866	59.3	320,324	59.5
Total	**26,789**	**100**	**537,909**	**100**

Source: U.S. Counties 2000, U.S. Census Bureau, 2000.

Agriculture

Although the number of farms on Kauai increased from 450 in 1994 to 600 in 2004, and the number of self-employed farm operators and their unpaid family members stood at 350 persons in 2004, farm acreage declined by approximately 25 percent (Hawaii, State of, 2005b). Despite the decline in farmland, sales of all crops increased 14 percent from 2002 to 2004. Sugar cane had the highest sales in 2004 with 15.3 million dollars, approximately 32 percent of Kauai's total crop sales. However, the reduction of sugar cane farms (only two are left, one on Kauai and one on Maui) has led to the diversification of crops. This diversity includes the production of coffee, seed corn, vegetables, melons, fruits, macadamia nuts, taro, field crops, flowers and nursery products. The Aquaculture industry is on the rise as well, increasing from 85 operations with $22 million in sales in 2000 to 100 operations with $28 million in sales in 2004.

Tourism

The tourism industry has been the economic mainstay of the Hawaiian Islands since statehood in 1959. The industry accounts for 22.3 percent of all jobs in Hawaii (Kauai, County of, 2006). Kauai's share of the Hawaii visitor market was 14.5 percent in 2005. Despite terrorism concerns and periodic economic slumps, the tourism industry on Kauai has remained robust, with the number of annual visitors consistently over 1 million/year in the past 5 years (Kauai, County of, 2006). Estimated visitor expenditure in 2005 was $11.9 billion, a 9.6 increase from 2004 (Department of Business, Economic Development & Tourism, 2006).

The accommodation inventory for Kauai rose 18 percent between 1998 and 2005, with 447 properties providing 8,081 rooms. This inventory is slightly less than the peak capacity in 2004 of 8,105 rooms. The capacity could increase by 6,225 units based on projects on file in the County of Kauai Planning and Permitting Department (Kauai, County of, 2005). Concurrently, the number of annual visitors is expected to rise to approximately 1.5 million (Kauai, County of, 2005). Table 3.3.1.1.10-5 shows the numbers of annual visitors to Kauai from 2000 through 2004.

Table 3.3.1.1.10-5. Visitors to Kauai (2000 - 2004)

Year	Kauai Visitors	State of Hawaii Visitors
2000	1,074,821	6,948,594
2001	1,008,698	6,303,790
2002	1,005,897	6,389,058
2003	975,867	6,380,439
2004	1,022,442	6,917,166

Source: Department of Business, Economic Development & Tourism, 2006.

Education

Each year since FY 2000, the DoD has contributed $5 million to the Hawaiian public education system via the Joint Venture Education Forum. The Joint Venture Education Forum was started in 1998 as a cooperative effort between the Hawaii Department of Education and U.S. Pacific Command, and was formalized as an organization, via charter, in August of 2005. The organization is comprised of public school educators and leaders from military commands, business, government, and the community (Joint Venture Education Forum, 2005). In FY 2005-06, the federal education budget included $46 million in impact aid funding for Hawaii's public schools (Economic Impact of the Military in Hawaii, 2006). Additionally, in FY2005-06, $5.5 million was provided to improve infrastructure for Hawaii's public schools with high enrollments of military children; more than $31 million has been given over the past 6 years (Chamber of Commerce of Hawaii, Military Affairs Council, 2006).

Fishing

This section focuses on subsistence fishing. See Open Ocean Areas (Section 3.1.7) for a description of the affected environment of commercial and recreational fishing. Hawaii Revised Statutes (HRS) Section 188-22.6 defines subsistence fishing as the customary and traditional Native-Hawaiian uses of renewable ocean resources for direct personal or family consumption or sharing. HRS defines Native-Hawaiian as any descendant of the races inhabiting the Hawaiian Islands prior to 1778.

Although most people in Hawaii no longer fish to obtain food, fishing is still an extremely popular pastime (Western Pacific Fishery Management Council Area, 1999). Recent data indicate that a quarter of Hawaii's population participates in some form of fishing at least once a year. Hawaii's annual fish consumption is about 90 lb per capita, over twice the national average (Western Pacific Fishery Management Council Area, et al., 2004).

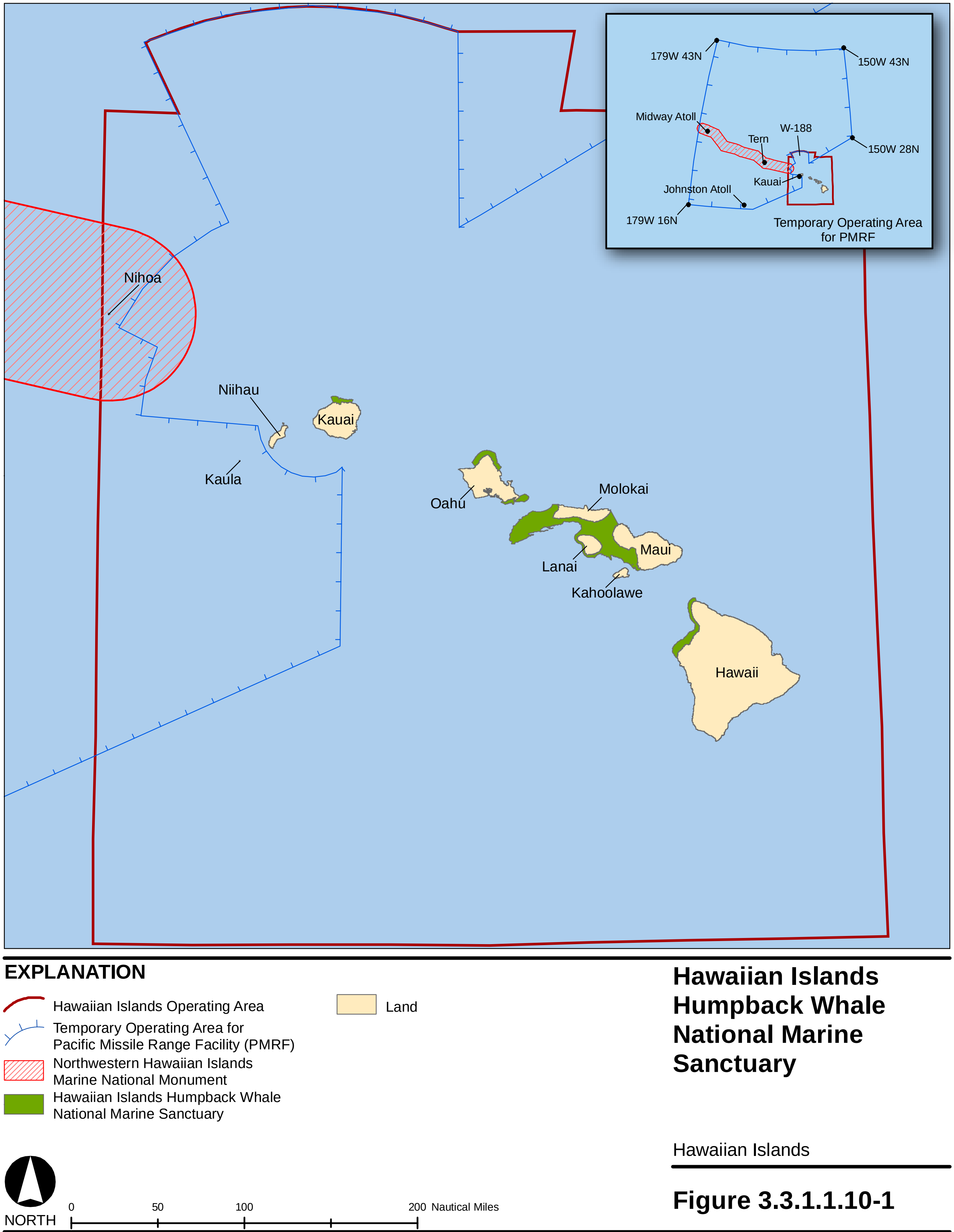
The overall level of subsistence fishing activity is difficult to assess, due to a lack of detailed catch data. Under-reporting by commercial fishermen and the existence of a large number of recreational and subsistence fishermen without licensing or reporting requirements have resulted in uncertainty in actual fisheries catch statistics for the state. Consequently, in the past no formal attempt to assess the subsistence fishing contribution to island economies has been made, but the value of fishing for subsistence by contemporary Native Hawaiians is known to be an important component of some communities, particularly rural communities (Pooley, 1993). However, it is believed that offshore recreational and subsistence catch is likely equal to or greater than the offshore commercial fisheries catch, with more species taken using a wider range of fishing gear (Friedlander, A, et al., 2004).

The Pacific Islands Region has a special mandate under the Magnuson and Stevens Fishery Conservation and Management Act to promote the sustained participation of indigenous communities. In March of 2004, the "Strategic Plan for the Conservation and Management of Marine Resources in the Pacific Islands Region" was developed by three federal agencies: the National Marine Fisheries Service (NMFS's) Pacific Islands Fisheries Science Center, the Pacific Islands Regional Office, and the Western Pacific Regional Fishery Management Council. The plan discusses critical issues facing the region and provides plans for addressing the issues. The plan identifies five research projects which the offices have started: (1) developing of a sociological baseline of the Hawaii longline fishery; (2) developing profiles of fishing communities and fishing ports; (3) compiling and analyzing historical fishing club and tournament records, studies concerning fishing capacity in Hawaii's commercial fisheries; (4) developing an economic evaluation of fishing tournaments; and (5) developing cost-earning studies for Hawaii fisheries.

Hawaii's coastal fisheries, as in other parts of the world, are facing unprecedented overexploitation and severe depletion. In heavily populated areas of the main Hawaiian Islands, fishing demands for offshore resources appear to exceed the capacity for resource renewal (Friedlander, et al., 2004).

The Western Pacific Regional Fishery Management Council and the National Oceanic and Atmospheric Administration worked together to prepare a Supplemental EIS to the Final Environmental Impact Statement on the Fishery Management Plan for Bottomfish and Seamount Groundfish Fisheries of the Western Pacific Region in May of 2005. The purpose of the Supplemental EIS was to implement measures which would end overfishing in the bottomfish complex in the Hawaiian Archipelago. The draft of this document was published in March of 2006. The draft Supplemental EIS analyzed five alternatives: (1) No Action; (2) Area Closures; (3) Seasonal Closures; (4) Catch Quotas; and (5) Combination of alternatives two and three. The draft Supplemental EIS concluded that the most effective means of ending overfishing would be implementation of alternative three (seasonal closures). For seasonal closures to be effective State and Federal regulations would need to be promulgated (Western Pacific Regional Fishery Management Council, National Oceanic and Atmospheric Administration, 2006).

State and federal agencies have given protective status to a variety of marine areas in Hawaii in efforts to improve fisheries. These include Marine Life Conservation Districts, Fisheries Management Areas, Fisheries Replenishment Areas, Bottomfish Restricted Fishing Areas, Hawaii Marine Laboratory Refuge-Coconut Island, Kahoolawe Island Reserve, Paiko Lagoon Wildlife Sanctuary, Ahihi-Kinau Natural Area Reserve, South Kona opelu fishing area and the Hawaiian Islands Humpback Whale National Marine Sanctuary (Figure 3.3.1.1.10-1), and the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve (Figure 3.2.1-1) (Friedlander, A, et al., 2004).



Hawaiian Islands Humpback Whale National Marine Sanctuary

Hawaiian Islands

Figure 3.3.1.1.10-1

In Hawaii, habitats with low spatial relief and limited shelter were found to be associated with low biomass and diversity of reef fishes, whereas highly complex habitats harbored high fish biomass and diversity. Ideally, essential fish habitat in the main Hawaiian Islands should consist of an area with high rugosity (roughness) or relief and moderate wave exposure that has a high percentage of branching and/or lobate coral coupled with legal protection from fish pressure. Habitats with these optimal characteristics should possess fish assemblages with high species richness, abundance, biomass, and diversity. If protective areas are to be effective, they must include the diversity of habitats necessary to accommodate the wide range of fish species (Friedlander, A, et al., 2004).

Due to the shape of Kauai and lack of any protective barrier reef structure, the shoreline region is nearly continually scoured by the force of breaking waves. The essentially "round" shape of Kauai results in exposure from swells emanating from both the north and the south Pacific, hence the nearly continual wave action. The entire region offshore of PMRF is directly exposed to long-period swells generated by storms in both the north (winter) and south (summer) Pacific. As a result of these physical processes, the offshore areas are subjected to extreme stress from wave impact and scouring of sediment from wave action. Consequently there is minimal coral reef development in the offshore areas off the coast of PMRF (Navy Region Hawaii, 2006). Since the implementation of the Force Protection Restriction, after September 11, 2001, there has been a decline in fishing activities in the waters fronting PMRF and this has corresponded to increases in the abundance, mean size, and biodiversity of fish in the area (Navy Region Hawaii, 2006).

3.3.1.1.11 Transportation—PMRF/Main Base

Transportation is the movement within the area of study of all equipment, facilities, and resources (materials, manpower) by ground, water, and air. Transportation fluctuates depending on training operations, testing, and construction activities which occur throughout the year. Appendix C includes definition and general description of transportation.

Region of Influence

The region of influence for transportation includes ground transportation and waterways in the vicinity of PMRF expected to be utilized for project operations. There are no railways within the region of influence. See Section 3.3.1.1.2 for the discussion on PMRF/Main Base airways.

Affected Environment

Ground Transportation

Imiloa Road is a two-lane roadway that provides direct access to PMRF from the southwest through its intersection with State Highway 50 (Kaumualii Highway), a primary circulation route connecting the base with Kekaha and Lihue. Kaumualii Highway, in the vicinity of Imiloa Road, is a two-lane road with a posted speed limit of 50 mi per hour. On September 20 and 21, 2005, a Hawaii Department of Transportation traffic counter, located on Kaummualii Highway between Imiloa Road and Kao Road, measured 24-hour total volumes of 469 and 516 vehicles respectively. The average daily volume of 493 translates to LOS B which is a 50-75 percent volume-to-capacity of the roadway capacity. Another traffic counter between Imiloa Road and Kia Road on the same days counted 749 and 747 vehicles respectively in a 24-hr period, which again translates into LOS B (Hawaii Department of Transportation, 2005; Highway Capacity

Manual 2000, 2006). North Nohili Road, which branches off Imiloa Road, provides access to KTF.

Waterways

There is no commercial shipping to PMRF, although boat tours are conducted within the region of influence. A primary commercial shipping route exists approximately 50 mi north of Kauai (EDAW, Inc., 2005).

3.3.1.1.12 Utilities—PMRF/Main Base

This section discusses utilities serving the existing and proposed project areas, which include water supply, wastewater treatment, electricity, and natural gas. Additionally, this section identifies utility providers and the major attributes of utility systems in these areas such as existing capacity and existing demand. The PMRF Public Works Office maintains base facilities and oversees the facility's environmental program (U.S. Army Space and Missile Defense Command, 2002). Appendix C includes a definition and general discussion of utilities.

Region of Influence

The utility systems that could potentially be affected include potable water distribution, wastewater collection, solid waste collection and disposal, and electrical lines within or servicing the project sites.

Affected Environment

Water

Potable water at PMRF is a blend of on-base and municipal sources, including both the State Department of Land and Natural Resources and the Waimea-Kekaha Service Area of the Kauai Department of Water. The water department of Kauai County supply water to PMRF, that originates from the Kekaha's Waipao Valley Well, Paua Valley Well, and Shaft 12, as well as Waimea wells A and B (County of Kauai, Department of Water, 2005); PMRF's portion is stored in two 126,000-gal tanks at Kokole Point. These sources serve the southern portions of the base. The Department of Land and Natural Resources supply water originates from the Mana well (located approximately 1,000 ft south of the Kamokala Ridge magazine), which is pumped to PMRF and stored near the Main Hanger in one 100,000-gal tank and one 420,000-gal tank, This source serves the central and northern portions of the base (U.S. Army Space and Missile Defense Command, 2002). In 2006, PMRF's water consumption from the Mana well system was 78, 533,000 gal and 10,817,909 gal from the Kauai County Department of Water. The monthly consumption from the Mana well ranged from as low as 3,753,000 gal in November 2006 to as high as 8,827,000 gal in July 2006. The monthly consumption from the Kauai County Department of Water ranged from as low as 215,147 gal in November 2006 to as high as 1,719,843 gal in May 2006 (Maintained Logs and Records, PMRF, 2006). The Navy chlorinates and fluoridates all purchased water before distribution, except that provided by the State of Hawaii (Commerce Business Daily, 2000). The maximum delivery capacity of water from the State is 320,000 gal per day (GPD).

Wastewater

The PMRF wastewater system comprises two domestic sewage treatment facilities and a collection system. These facilities include a treatment plant located approximately one half-mile south of the Main Gate and an oxidation pond south of the family housing area (U.S. Army Space and Missile Defense Command, 2002).

A package treatment plant located at PMRF/Main Base treats approximately 8,000 GPD, or 27.7 percent of its 30,000-GPD design capacity. On the southern end of the base, an oxidation pond receives 20,000 to 25,000 GPD of its 54,000-GPD capacity. Both sites discharge their effluent into leach fields. For the period of 6 June 1995 to 31 May 1996, the average flow into the leach field (situated between the runway and the coast) was 9,500 GPD, or 37 percent of its 26,000-GPD design capacity. PMRF also has approximately 22 septic tank/leachfield systems and cesspools serving individual buildings in the northern part of PMRF/Main Base (U.S. Army Space and Missile Defense Command, 2002; Commerce Business Daily, 2000).

Solid Waste

Kekaha Landfill sits on 64 acres of land, of which 32 acres make up the footprint of the lined Subtitle-D landfill itself. Kekaha averages 230 tons per day and 88,000 tons per year. The Landfill was opened in 1953 and was expected to close in 2004, but was recently given permission to operate until approximately 2012. The FY 2006 total for refuse deposited into the landfill from PMRF was 530.6 tons, and 252.32 tons were recycled by PMRF (Burger, 2007a). To minimize waste flow, PMRF maintains a recycling program for aluminum cans, glass, paper and cardboard, all of which are collected biweekly. Green waste is collected and chipped for composting and use on the base (U.S. Army Space and Missile Defense Command, 2002).

Electricity

Power for the base is a blend of both municipal and on-base sources. Until recently, PMRF's municipal power was provided by Kauai Electric; however, in 2002 Kauai Electric was purchased by Kauai Island Utility Cooperative (Pacific Business News, 2002). The total firm electrical generating capacity on the island is 110 megawatts (MW), with an additional 4.1 MW provided by non-firm sources (Kauai County, 2003).

PMRF is located in Kauai County's West Side region. The West Side's main transmission line runs along Kaumualii Highway from Port Allen to Mana, and includes double circuits between Port Allen and Kekaha. There are switchyards in Kekaha and Port Allen, as well as substations in Mana and Kaumakani (Kauai County, 2003). Power to PMRF/Main Base and northern complex area is supplied via a 57-kilovolt (kV)/69 kV transmission line between the Kauai Island Utility Cooperative's Mana Substation and Kekaha Switchyard. This West Side transmission line's capacity is 7.6 MW at 95 percent power factor; the current peak load is 2.5 MW (U.S. Department of the Navy, Naval Sea Systems Command, 2005). A 12.47-kV feeder circuit system owned by Kauai Island Utility Cooperative supplies primary power to the base's southern area; this circuit has a capacity of 4.3 MW at 95 percent power factor (U.S. Department of the Navy, Naval Sea Systems Command, 2005). In the event of a power outage PMRF provide additional power, utilizing commercial power as a backup. The PMRF power plant contains two 600-kilowatt (kW) and three 300-kW generator units (Department of Defense, Missile Defense Agency, 2002).

By 2003, PMRF's energy consumption had been considerably reduced from its 1985 baseline; moreover, the base's energy consumption during peak hours had decreased by $100,000 annually, allowing the Kauai Island Utility Commission to redirect energy to other areas on the island (United States House of Representatives, 2003). PMRF has been recognized for these energy-saving efforts, as well as initiating innovative high-tech energy conservation projects, including using methane gas by the County of Kauai's Kekaha landfill and using fuel cells to support base operations (United States House of Representatives, 2003). Recently, photovoltaic panels have been used to augment base requirements without increasing consumption from the island's commercial electric utility grid (U.S. Navy Region Hawaii, 2005).

3.3.1.1.13 Water Resources—PMRF/Main Base

Water resources include those aspects of the natural environment related to the availability and characteristics of water. For our purposes, water resources can be divided into three main sections: surface water, groundwater, and flood hazard areas.

Surface water includes discussions of runoff, changes to surface drainage, and general surface water quality. Groundwater discussions focus on aquifer characteristics, general groundwater quality, and water supply. Flood hazard area discussions center on floodplains.

Where practicable, water resources are described quantitatively (volume, mineral concentrations, salinity, etc.); otherwise they are described qualitatively (good, poor, etc.) when necessary. Appendix C includes a description of the primary laws and regulations regarding water resources.

Note that detailed fresh water quality descriptions, and descriptions of well water supplies, can be found in the Utilities section of this EIS/OEIS.

Region of Influence

The region of influence for PMRF/Main Base includes the area within and surrounding the PMRF property boundaries. The region of influence also includes KTF and the restrictive easement, including the Mana Plain and the Ground Hazard Area.

Affected Environment

Surface Water

The surface water within the PMRF boundary is in the canals that drain the agricultural areas east of PMRF. Apart from these drainages, no surface drainage has been established because the rain sinks into the permeable sand. There are numerous drains and several irrigation ponds in the agricultural land.

The waters in the irrigation ponds generally do not meet drinking water standards for chloride salts, but have near neutral to slightly alkaline pH. A surface water quality study for chloride was conducted in the Mana Plain/KTF area. The chloride levels do not indicate residual hydrochloric acid effects of the past launches at KTF (U.S. Army Program Executive Office, 1995). The surface waters on the southern half of PMRF/Main Base are expected to have similar chemical characteristics. Because the drainage ditches are designed to move water away from the agricultural fields during irrigation and rainfall, and to leach salts from the soil, no residual effects of past launches are expected. (U.S. Army Program Executive Office, 1995)

Surface water in the area of the restrictive easement on the Mana Plain is restricted to drains and agricultural irrigation ponds. Within the restrictive easement boundary, the surface water and storm water runoff drain onto Amfac Sugar-Kauai lands and agricultural ponds below the Mana cliffs. The Mana Plain is drained by canals that flow seaward. Typically, the water from the canals that drain from the sugar cane fields is brackish. (U.S. Army Space and Strategic Defense Command, 1993)

The waters in the agricultural ponds along the Mana cliffs generally do not meet drinking water standards for chloride salts but are near neutral to slightly alkaline. The highest chloride salt levels, near those of seawater, were observed in water from the Mana Pond Wildlife Sanctuary near the north gate of PMRF. This may be due to the infiltration of brackish to saline groundwater into the pond basin or excessive evaporation to a low surface level. (U.S. Army Space and Strategic Defense Command, 1993)

Water quality along the PMRF shoreline was within Department of Health standards with the exception of two locations where sugar cane irrigation water, pumped from the sugar cane fields, is discharged to the ocean (Belt Collins Hawaii, 1994). In these areas, Department of Health water quality criteria are exceeded within 164 ft of the shoreline. Mixing processes are sufficient to dilute the drainage water to near background levels within 164 to 328 ft from the shoreline (Belt Collins Hawaii, 1994).

Groundwater

Bedrock, alluvium, and sand dunes make up hydraulically connected aquifers within the region of influence. The bedrock (basement volcanics, primarily basalt) is highly permeable, containing brackish water that floats on seawater. (U.S. Army Space and Strategic Defense Command, 1993)

The overlying sediments act as a caprock because of their overall low permeability, although individual layers, such as buried fossil coral reefs, may be as permeable as the basalt. Although the sediments are saturated, they are not exploitable as an aquifer because of unfavorable hydraulic characteristics. The groundwater in the sediments originates as seepage from irrigation percolation and rainfall in the basalt aquifer, especially where the sediments are thin near the inland margin of the Mana Plain.

The dune sand aquifer on which PMRF/Main Base lies has a moderate hydraulic conductivity and moderate porosity of about 20 percent. It consists of a lens of brackish groundwater that floats on seawater and is recharged by rainfall and by seepage from the underlying sediments. The only record of an attempt to exploit this groundwater is of a well drilled for the Navy in 1974, 4 to 5 mi south of KTF. The well was drilled to a depth of 42 ft, and tested at 300 gal per minute. In 1992, the water was too brackish for plants and animals to consume, and consequently, the well is not used. (U.S. Army Program Executive Office, 1995)

The nearest fresh groundwater sources are in the Napali formation at the inland edge of the coastal plain along the base of the Mana cliffs. Groundwater in the region is generally considered to be potable at the base of the cliffs, increasing in salinity closer to the coast. (U.S. Army Space and Strategic Defense Command, 1993)

The groundwater beneath the restrictive easement increases in salinity from the base of the Mana cliffs to the Pacific Ocean. To keep the groundwater table below the root zone of the sugar cane, thousands of feet of canal have been excavated to drain excess water from the soil. The water is then pumped into canals such as the Nohili Ditch for release into the ocean. (U.S. Army Space and Strategic Defense Command, 1993)

Sampling for perchlorate was initiated at PMRF in 2006. The USEPA adopted an oral reference dose for perchlorate in 2005, following a National Academy of Sciences recommendation that it not exceed 24.5 parts per billion in drinking water. Until the USEPA promulgates standards for perchlorate the DoD has established 24 parts per billion as the current level of concern for managing perchlorate. This level has also been adopted in the Navy Perchlorate Sampling and Management Policy, 15 April 2006.

As part of the implementation of the Navy policy, sampling has been conducted at two drinking water supply locations. One location is the “Mana well”, which is the former Kekaha Sugar/AMFAC well from which PMRF obtains drinking water, referenced as "BS 335", and supplies the “north end” of PMRF. It is a hand-dug well, now concrete-lined, approximately 90 ft deep and is located at the base of the ridge near the Kamokala Caves. The pumps and electric motors are down in the well. The other location is the water tank at the south end of the base identified as reference code "BS 820." Water in the tank comes from the County of Kauai. The results are shown in Table 3.4.1.1.13-1:

Table 3.4.1.1.13-1. Water Tank Sampling

Sample Location	Sample date 1	Sample Date 2
BS 335	0.860 ppb	< 4 ppb (specifics pending)
BS 820	3.500 ppb	< 4 ppb (specifics pending)

ppb=parts per billion

Perchlorate concentrations at both sites were less than the initial screening level of 4.0 parts per billion. Based on guidance PMRF received from Navy Region Hawaii, since the two consecutive samples were less than 4 parts per billion, no further analysis was required.

Flood Hazard Areas

The primary flood hazard is from overflow of the ditches that drain the Mana Plain. Extended period of heavy rainfall have resulted in minor flooding of low-lying areas of PMRF/Main Base. In addition, most of PMRF/Main Base is within the tsunami evacuation area.

3.3.1.2 MAKAHA RIDGE

Of the 14 resources considered for analysis, air space, geology and soils, land use, noise, socioeconomics, transportation, utilities, visual and aesthetics, and water resources are not addressed. Any issues with these resources that are associated with Makaha Ridge are included within the PMRF/Main Base discussion.

3.3.1.2.1 Air Quality—Makaha Ridge

Appendix C includes a definition of air quality and the main regulations and laws governing its protection.

Region of Influence

For inert pollutants (all pollutants other than ozone and its precursors), the region of influence is generally limited to an area extending a few miles downwind from the source. The region of influence for ozone may extend much further downwind than the region of influence for inert pollutants. However, as the project area has no heavy industry and very few automobiles, ozone and its precursors are not of concern. Consequently, for the air quality analysis, the region of influence for project operational activities is the existing airshed surrounding Makaha Ridge.

Affected Environment

Climate and Regional Air Quality

Section 3.3.1.1.1 provides a description of climate and regional air quality on Kauai, which includes Makaha Ridge.

Existing Emission Sources

The primary air pollutant emissions at Makaha Ridge are from diesel generators. The two 600-kW and two 300-kW generators are permitted by the State of Hawaii under a non-covered source permit.

3.3.1.2.2 Biological Resources (Terrestrial)—Makaha Ridge

Appendix C includes a definition of biological resources and the main regulations and laws that govern their protection.

Region of Influence

The region of influence for biological resources encompasses Makaha Ridge and limited adjacent areas.

Affected Environment

Vegetation

Vegetation at the sites is dominated by introduced non-native, naturalized species. The most common native species that occur on the cliffs in the area are false sandalwood or naio and kawela, a bunch grass. Thirteen endemic species are represented within the boundaries of the Makaha Ridge facility: ‘ahinahina (*Artemisia australis*), ko’oko’olau (*Bidens sandwicensis*), *Carex wahuensis*, *Gahnia beecheyi, Pteridium aquilinum* var. *decompositum,* koa (*Acacia koa)*, naupaka kuahiwi (*Scaevola gaudichaudi)*, kawelu (*Eragrostis variabilis),* hakonakona (*Panicum torridum),* kumuniu (*Doryopteris decipiens),* lepelepe a moa (*Selaginella arbuscula*), the native herb (*Spermolepis hawaiiensis),* and dwarf iliau (Wilkesia hobdyi). The last 2 species are discussed below as endangered plant species. There are also 14 indigenous species on the property including naio (*Myoporum sandwicense)*, and ‘ilima (*Sida fallax).* (Pacific Missile Range Facility, 2006d) A few shrubs of naio and introduced lantana occur along the makai (coastal) edge of the Makaha Ridge complex. Pine plantings and mixed scrub covers most of the area at the Makaha Ridge facility. Rows or scattered clumps of pine trees have been planted for erosion control. There are high levels of erosion at the ridge with a lot of areas having less than 10 percent cover due most likely to ungulates (hoofed mammals). Silk oak trees are also abundant. Mixed scrub consisting mainly of lantana shrubs and molasses grass with scattered guava shrubs are located between the trees. Some native koa trees are located in the southern portion of the property. Well-maintained grassy lawns and landscape plantings are located around the existing buildings. (Pacific Missile Range Facility, 2001; U.S. Department of the Navy, 1998)

<u>Threatened and Endangered Plant Species</u>

The endemic dwarf iliau (*Wilkesia hobdyi*), a shrub species Federally and State listed as endangered occurs on cliffs overlooking the Makaha Valley along the northern boundary of the Makaha Ridge site. The Makaha Ridge population was estimated to be about 50 plants in 2000. A survey conducted in April 2006 documented an additional 11 colonies of dwarf iliau on cliffs within and adjacent to the Makaha Ridge boundary totaling 214 individuals (Pacific Missile Range Facility, 2006d). The plants are out of the reach of goats that frequent the area. (Center for Plant Conservation, 2006; Federal Register, 2002; Pacific Missile Range Facility, 2001)

Also during the April survey, two large colonies (about 700 individual plants) of another endangered plant, a native herb *(Spermolepis hawaiiensis*) were discovered. This herb is a member of the parsley family. It was previously thought to be extinct on Kauai, but including this new discovery, about 2,400 reproducing individuals have been documented on the island. (Pacific Missile Range Facility, 2006d)

Wildlife

Sixteen birds were observed during a wildlife survey conducted in 2000, including two indigenous species, the white-tailed tropicbird and the Pacific golden plover. The golden plover is a migratory native bird, and the tropicbird is a native seabird. Species of introduced birds commonly found in this area of Kauai and observed during the survey included the spotted dove, zebra dove, house finch, northern mockingbird, chukar, and the common myna. (Pacific Missile Range Facility, 2001; 2006b) Another introduced species, the Japanese white-eye, is very abundant at the facility during a 2006 survey (Pacific Missile Range Facility, 2006b).)

The green anole, house gecko, and mourning gecko were documented during a 2006 survey, as well as rats (Pacific Missile Range Facility, 2006c). Although no evidence of cats or rats was observed, it is likely that these mammals inhabit the Makaha Ridge area. Feral goats, pigs, and black-tailed deer are also seen in this general area. Goat densities on Makaha Ridge are likely higher than densities from other areas on the island due to no hunting allowed on base. (Pacific Missile Range Facility, 2001; 2006c)

<u>Threatened and Endangered Wildlife Species</u>

The threatened Newell's shearwater may fly over the site while on the way to its feeding grounds at sea. In addition, the endangered Hawaiian goose, or nene (*Branta sandvicensis*), occurs as a breeding population within the Makaha Ridge facility. The endangered Hawaiian hoary bat is known to frequent the area and may forage or roost on the property or in surrounding forested areas. (Pacific Missile Range Facility, 2001)

Environmentally Sensitive Habitat

No critical habitat is located at the Makaha Ridge Facility (Figure 3.3.1.2.2-1).

3.3.1.2.3 Cultural Resources—Makaha Ridge

Appendix C includes a description of cultural resources and the laws and regulations pertaining to them.

Region of Influence

The region of influence for cultural resources at Makaha Ridge encompasses the location for a new laboratory, power plant, and fiber optic cable. There are no archaeological resources within the region of influence. Building 720 (see Figure 2.2.3.5.4-3), where a new Automatic Identification System antenna is planned, has not been identified as a historic property.

Affected Environment

Archaeological Resources (Prehistoric and Historic)

Operated as a sub-installation of PMRF, Makaha Ridge encompasses 244 acres of a prominent ridgeline overlooking the Mana Plain. The area consists of range operations communications facilities (Commander, Navy Region Hawai'i, 2005). Makaha Ridge has been surveyed for archaeological resources and found to contain no significant archaeological sites (Commander, Navy Region Hawai'i, 2005).

Historic Buildings and Structures

There are no identified historic buildings or structures at Makaha Ridge (Commander, Navy Region Hawai'i, 2005).

Traditional Resources

Makaha Ridge has been surveyed and found to contain no significant traditional Hawaiian sites (Commander, Navy Region Hawai'i, 2005).

EXPLANATION

Road

Critical Habitat

Installation Area

Land

Critical Habitat - Northwestern Kauai, Hawaii

Kauai, Hawaii

NORTH

0 0.5 1 2 Miles

Figure 3.3.1.2.2-1

3.3.1.2.4 Hazardous Materials and Waste—Makaha Ridge

Appendix C includes a discussion of hazardous materials and waste resource laws and regulations.

Region of Influence

The region of influence for hazardous materials and potential hazardous waste is limited to areas of Makaha Ridge where hazardous materials are stored, handled, and consumed.

Affected Environment

Hazardous materials and potential hazardous waste activities at Makaha Ridge are included in PMRF management plans for these types of materials. Daily activities are in accordance with those plans and similar operations described in Section 3.3.1.1.6 for PMRF/Main Base.

Makaha Ridge follows PMRF's hazardous materials management plans as described under PMRFINST 5100.2C, *Hazardous Material Control and Management Program*. The hazardous materials used at Makaha Ridge consist of lubricating oils, low sulfur diesel fuel, and some minor amounts of solvents. Each hazardous material storage area has appropriate Material Safety Data Sheets.

Hazardous waste generated at Makaha Ridge has been eliminated through Best Management Practices for routine operations. Small aerosol solvent requirements for electrical parts/radar maintenance do not generate hazardous waste, and empty containers are returned to the PMRF Hazardous Material Minimization Center for disposal. Corrosion control/painting operations do not generate hazardous waste. Generator overhauls, following 1,000 hours of operations, produce “on-specification used oil fuel” confirmed by routine laboratory testing.

There are two 600-kW and two 300-kW generators supplied by two 6,000-gal diesel tanks and four 300-gal day tanks. There is one 1,000-gal gasoline tank and one 55-gal drum of motor oil. All tanks are above ground with appropriate containment devices.

Pesticide use at Makaha Ridge is applied by the certified applicator from PMRF. There are no radon issues at the site, and ordnance is not stored at Makaha Ridge. No medical or radioactive wastes are generated, and there are no Installation Restoration Program (IRP) sites at Makaha Ridge. Lead-based paint management and asbestos management at Makaha Ridge follow the same procedures as described for PMRF/Main Base.

3.3.1.2.5 Health and Safety—Makaha Ridge

Appendix C includes a detailed discussion of health and safety resources laws and regulations.

Region of Influence

The region of influence for health and safety of workers includes immediate work areas and EMR hazard areas. The region of influence for public safety includes areas bordering Makaha Ridge.

Affected Environment

Hazards to health and safety potentially occur as a result of EMR at the site. There are four tracking radars, two surveillance radars, and the primary PMRF telemetry station at Makaha Ridge. Frequency Interference Control, Electronic Warfare (EW) and Communication Facilities are also located at Makaha Ridge.

Hazards of EMR to personnel and fuel (called HERP and HERF, respectively) are the main concerns at Makaha Ridge. No ordnance is stored at the site, so there are no Hazard to Electromagnetic Radiation to Ordnance (HERO) issues. The helicopters that use the heliport at Makaha Ridge may have Electro-explosive Devices; however, the area is below HERO unsafe levels due to sector blanking (i.e., filtering) of the area. To ensure conditions are safe, the site is regularly surveyed for radiation hazards, and all systems have warning lights to inform personnel when radar units are operating. Because of Makaha Ridge's location at the end of a ridge, there are no health and safety issues associated with the public. As discussed under airspace, aircraft are warned through aeronautical charts of the potential EMR hazards associated with Makaha Ridge.

3.3.1.3 KOKEE

Kokee supports tracking radars, telemetry, Ultra-High Frequency/Very High Frequency (UHF/VHF) communications, and C2 systems. Of the 14 resources considered for analysis, air space, cultural resources, geology and soils, land use, noise, socioeconomics, transportation, utilities, visual and aesthetics, and water resources are not addressed. Any issues with these resources that are associated with Kokee are included within the PMRF/Main Base discussion.

3.3.1.3.1 Air Quality—Kokee

Appendix C includes a definition of air quality and the main regulations and laws governing its protection.

Region of Influence

For inert pollutants (all pollutants other than ozone and its precursors), the region of influence is generally limited to an area extending a few miles downwind from the source. The region of influence for ozone may extend much further downwind than the region of influence for inert pollutants; however, as the project area has no heavy industry and very few automobiles, ozone and its precursors are not of concern. Consequently, for the air quality analysis, the region of influence for project operational activities is the existing airshed surrounding Kokee.

Affected Environment

Climate and Regional Air Quality

Section 3.3.1.1.1 provides a description of climate and regional air quality on Kauai, which includes Kokee.

Existing Emission Sources

The primary air pollutant emissions at Kokee are from backup diesel generators. The two 500-kW, two 350-kW, and one 250-kW generator sets are permitted by the State of Hawaii under a current non-covered source permit.

3.3.1.3.2 Biological Resources (Terrestrial)—Kokee

Appendix C includes a definition of biological resources and the main regulations and laws that govern their protection.

Region of Influence

The region of influence for biological resources is the area within the fence surrounding the site.

Affected Environment

Vegetation

A botanical assessment survey was conducted at Kokee in 2000. The vegetation on the site is dominated by non-native species. The site is surrounded by forested areas that are a mixture of exotic species and some native trees and shrubs. Kokee sites A-E are composed of mainly intact koa-ohia mesic native forest that is contiguous with the surrounding State forest (Pacific Missile Range Facility, 2006e). Most of the areas around existing buildings and within the fenceline are paved or are grassy lawns (kikuyu grass). Native plants observed include koa, ‘ohi’a, and ‘a’ali’i. The areas outside the fence line of sites A and B are periodically maintained and consist of grassy lawn. Dense thickets of blackberry, mats of kikuyu grass, and scattered firetree and firethorn are located outside the common fence line surrounding sites C, D, and E. Kokee D contains large iliahi/sandalwood trees. A small patch of Asian melastome, an invasive species targeted for removal in the Kokee area, was found near the roadside at Kokee D. (Pacific Missile Range Facility, 2001; 2006e)

Threatened and Endangered Plant Species

No threatened or endangered plant species were identified during the surveys conducted as part of the Integrated Natural Resources Management Plan process.

Wildlife

A bird and feral mammal survey was conducted at Kokee in 2001. Native and migratory bird species observed at Kokee included the Pacific golden plover, the common amakahi, short-eared owl, Kauai ‘elepaio, i'iwi, and ‘apapane. The ‘apapane was the most abundant bird observed in 2006, followed by the Kauai amakihi and ‘elepaio. ‘I’iwi were not observed in 2006. Other birds observed at Kokee included the common myna, Japanese white-eye, red junglefowl, spotted dove, white-rumped shama, northern cardinal, house finch, hwa-mei, zebra dove, and nutmeg manikin. (Pacific Missile Range Facility, 2001; 2006b)

No evidence of cats or rats was noted at the facility, but these mammals likely do occur on or near the site. Roof and Norway rats were captured at Kokee during a 2006 survey. The metallic skink was observed during the same survey. There was evidence of dogs, black-tailed deer, and feral pigs on sites D and E. (Pacific Missile Range Facility, 2001; 2006c)

Threatened and Endangered Wildlife Species

The threatened Newell’s shearwater may fly over the Kokee site. Three endangered Hawaiian hoary bats were observed at Site 3, foraging above the forest. (Pacific Missile Range Facility, 2001)

Environmentally Sensitive Habitat

No environmentally sensitive habitat is located at the Kokee site (Figure 3.3.1.2.2-1).

3.3.1.3.3 Hazardous Materials and Waste—Kokee

Appendix C includes a discussion of hazardous materials and waste resource laws and regulations.

Region of Influence

The region of influence for hazardous materials and potential hazardous waste would be limited to areas of Kokee where hazardous materials are stored, handled, and consumed.

Affected Environment

Hazardous materials and potential hazardous waste activities at Kokee are included in PMRF management plans for these types of materials. Daily activities are in accordance with those plans and similar operations described in Section 3.3.1.1.6 for PMRF/Main Base.

Kokee follows PMRF's hazardous materials management plans as described under PMRFINST 5100 and the Navy's CHRIMP. The hazardous materials used at Kokee consist of lubricating oils, low sulfur diesel fuel, and some minor amounts of solvents. Each hazardous material storage area has appropriate Material Safety Data Sheets.

Hazardous waste generated at Kokee has been eliminated through Best Management Practices for routine operations. Small aerosol solvent requirements for electrical parts/radar maintenance do not generate hazardous waste, and empty containers are returned to PMRF Hazardous Material Minimization Center for disposal. Corrosion control/painting operations do not generate hazardous waste. Generator overhauls, following 1,000 hours of operations, produce “on-specification used oil fuel” confirmed by routine laboratory testing.

Hydrostatic oil associated with the radar units is replaced every 4 years and generates approximately 55 gal of used oil. There are five generators at Kokee, two 500-kW, two 350-kW, and one 250-kW, with associated fuel tanks. There are two 25,000-gal aboveground diesel tanks, and one 500-gal day tank. All tanks have appropriate containment devices.

Pesticide use at Kokee is applied by the certified applicator from PMRF. There are no radon issues at the site, and ordnance is not stored at Kokee. No medical or radioactive wastes are generated, and there are no IRP sites at Kokee. Lead-based paint management and asbestos management at Kokee follow the same procedures as described for PMRF/Main Base.

There are no PCB-containing transformers at Kokee. Kokee radar facilities do have capacitors and other components that contain PCBs. When such an oil-containing part is no longer functional and requires disposal, the component is disposed according to PMRF's Hazardous Waste Management Plan. When a component suspected of containing PCBs needs to be disposed of, the manufacturer is called to determine if PCBs are actually present in the part. Disposal occurs according to the required procedures.

3.3.1.3.4 Health and Safety—Kokee

Appendix C includes a detailed discussion of health and safety resources laws and regulations.

Region of Influence

The region of influence for health and safety of workers includes immediate work areas and EMR hazard areas. The region of influence for public safety includes areas bordering Kokee.

Affected Environment

Kokee supports tracking radars, telemetry, UHF/VHF Communications, and C2 systems. Hazards to health and safety potentially occur as a result of EMR at the site. Hazards of electromagnetic radiation to personnel and fuel (called HERP and HERF, respectively) are the main concerns at Kokee. No ordnance is stored at the site, so there are no HERO issues. The only fuel stored at the site (low sulfur diesel fuel for the electrical generators) is located outside of any EMR generating areas, so there are no HERF issues at the site. Appropriate sector blanking and the elevation of the radar units above the ground have eliminated any potential HERP issues at Kokee. To ensure conditions are safe, the site is regularly surveyed for radiation hazards, and all systems have warning lights to inform personnel when the radar units are operating. The public is not exposed to any unsafe EMR levels. As discussed under airspace, aircraft are warned through aeronautical charts of the potential EMR hazards associated with Kokee operations.

3.3.1.4 HAWAII AIR NATIONAL GUARD KOKEE

The Hawaii Air National Guard provides operation and maintenance of the Hawaii Digital Microwave System. Hawaii Air National Guard Kokee is a radar site and PMRF maintains an APS-134, X-band, surface search radar. Of the 14 resources considered for analysis, air quality, airspace, cultural resources, geology and soils, hazardous materials and waste, health and safety, land use, noise, socioeconomics, transportation, utilities, visual and aesthetics, and water resources are not addressed. All of these resources are similar to those discussed under Kokee, except for socioeconomics, which is included within PMRF/Main Base. The Hawaii Air National Guard Wing's 150th Aircraft Control and Warning Flight operate the radar site at Kokee. The radar site is linked to the Hawaii Region Air Operations Center at Wheeler Army Airfield, Oahu, where 24-hour air surveillance of the Hawaiian island chain is provided. Operations at the Kokee radar site follow all applicable regulations and procedure established by the Air Force and the Navy to protect human health and the environment.

3.3.1.4.1 Biological Resources (Terrestrial)—Hawaii Air National Guard Kokee

Appendix C includes a definition of biological resources and the main regulations and laws that govern their protection.

Region of Influence

The region of influence includes the areas on and surrounding Kokee.

Affected Environment

Kokee Air Force Station is located on 11 acres of leased land operated by Hawaii Air National Guard 150th Aircraft Control and Warning Squadron.

Vegetation

Kokee Air Force Station lies within the Na Pali-Kona Forest Reserve. ‘Ohi’a and koa trees are present in the area as well as native dry-land shrubs pukiawe and `a`ali`i.

<u>Threatened and Endangered Plant Species</u>

No rare, threatened, or endangered plants have been recorded at Kokee Air Force Station (Air Force Center for Environmental Excellence Environmental Services Office, 2003).

Wildlife

Wildlife present in the Kokee Air Force Station area is similar to that described above in Section 3.3.1.3.2, such as the birds Kauai elepaio, i'iwi, and ‘apapane. Feral pigs and goats are also located in the area.

<u>Threatened and Endangered Wildlife</u>

Three endangered species have been recorded at Kokee Air Force Station: the Newell’s shearwater, dark-rumped petrel, and the Hawaiian hoary bat. The Hawaiian hoary bat roosts and forages on the station property or in adjacent forested areas. The seabirds are known to nest near the installation. (Air Force Center for Environmental Excellence Environmental Services Office, 2003)

Environmentally Sensitive Habitat

There are three designated wetlands located in the immediate vicinity of Kokee Air Force Station. Kalalau Stream and Honopu Stream are directly downslope and north of the installation in the direction of its surface runoff. Alakai Swamp is approximately 1 mi east of the station. (Air Force Center for Environmental Excellence Environmental Services Office, 2003)

3.3.1.5 KAMOKALA MAGAZINES

Kamokala Magazines provide secure explosive storage. Of the 14 resources considered for analysis, air quality, airspace, biological, cultural resources, geology and soils, land use, noise, socioeconomics, transportation, utilities, visual and aesthetics and water resources are not addressed. Use of the Kamokala storage magazine does not require control of the air space above this land area. Any air quality, biological, cultural resources, land use, noise, socioeconomics, transportation, utilities, and water issues are included within the PMRF/Main Base discussion. HRC operations do not affect the scenic quality of the Kamokala Magazines area.

3.3.1.5.1 Hazardous Materials and Waste—Kamokala Magazines

Appendix C includes a discussion of hazardous materials and waste resource laws and regulations.

Region of Influence

The region of influence for hazardous materials and potential hazardous waste would be limited to areas of Kamokala Magazines where hazardous materials are stored, handled, and consumed. The only hazardous materials stored at the Kamokala Magazines are associated with the devices authorized for storage; specifically, hypergolic fuels, solid propellants, and other ordnance. These materials are contained in the devices that are required to be stored in the Kamokala Magazines with proper ventilation, marking, and placarding.

Affected Environment

No hazardous materials are used or hazardous waste generated from operations at Kamokala Magazines. There are no storage tanks or known IRP sites at this location. The gunnite material lining the caves has not been tested for asbestos, and therefore, must be presumed to be an asbestos-containing material. The site does not have any PCB-containing material or radon issues.

The magazines are a secured area controlled by the PMRF Ordnance Office, Code 7331, and they are the storage sites for the ordnance and solid rocket motors used in training exercises at PMRF. When needed, they are transported to the launch or loading site. All explosive ordnance, including solid rocket motors, are handled in accordance with NAVSEA OP5, Volume 1.

3.3.1.5.2 Health and Safety—Kamokala Magazines

Appendix C includes a detailed discussion of health and safety resources laws and regulations.

Region of Influence

The region of influence for health and safety consists of the immediate work areas and ordnance hazard areas. The region of influence for public safety includes Kamokala Magazines, Mana Plain, and the ESQD not within the surrounding cliffs.

Affected Environment

Kamokala Magazines are an explosive storage area consisting of 10 magazines. The health and safety issues for Kamokala Magazines are associated with the transfer and storage of ordnance. No more than 30,000 lb net explosive weight can be stored at each magazine cave; this generates a safety area with a 2,350-ft radius in a 60-degree arc to the front of each 30,000-lb net explosive weight tunnel, diminishing in radius by 30-degree increments away from the front (see Figure 3.3.1.1.7-1). Storage of ordnance is conducted in accordance with DoD and Navy standards. In addition, PMRF has established instruction 8023.G, which details how the storage and handling of ordnance is conducted.

3.3.1.6 PORT ALLEN

Port Allen is a State of Hawaii harbor facility operating under the jurisdiction of the State Department of Transportation. A review of the 14 resources against program operations determined there were no impacts from site operations under the No-action Alternative, Alternative 1, or Alternative 2 at Port Allen. Port Allen hosts PMRF's Range Support Boats and maintenance facilities and provides pier space, protected anchorage, and small-boat launch facilities. Use of Port Allen does not require control of the airspace above this land area. There are no reports of emission from Navy operations affecting the air quality for Port Allen. Because no ground disturbance or building modifications would occur, there would be no impact to biological resources, cultural resources, or geology and soils. Additionally, there are no known significant archaeological sites at Port Allen. Operation of this site does require small amounts of hazardous materials for facility maintenance and generates small amounts of hazardous waste. All hazardous materials used and hazardous waste generated would continue to be managed in accordance with PMRF's hazardous materials management plans as described under PMRFINST 5100.2c and all other applicable regulations. No noise-sensitive land receptors are affected by existing noise levels at the site. All operations at Port Allen are conducted in accordance with OSHA and OPNAVINST 5100.23D, Navy Occupational Safety and Health Program Manual; there are no public health and safety issues. The site is compatible with existing surrounding land uses, and land use does not conflict with recreational activities occurring in or adjacent to the harbor. Any transportation and utility issues associated with Port Allen are included within the PMRF/Main Base discussion. There is no socioeconomic impact from operation of the site, and the site does not block any prominent public vistas. Operations at the site would not generate any waste streams that could impact local water quality.

3.3.1.7 KIKIAOLA SMALL BOAT HARBOR

A review of the 14 resources against program operations determined there were no impacts from site operations under the No-action Alternative, Alternative 1, or Alternative 2 at the Kikiaola Small Boat Harbor. The Harbor hosts Range Support Boats and small-boat launch facilities. PMRF's Seaborne Powered Targets are launched from Kikiaola. The Navy does not require control of the airspace above this land area. Any emissions from naval operations associated with the use of range support boats and small-boat-launch facilities do not affect the air quality of the area. Additionally, all operations adhere to Navy policy, statutory and regulatory requirements for hazardous materials and hazardous waste, range safety guidelines, and noise, as discussed in Appendix C. There are no ground-disturbing activities or building modifications that could affect biological and geology and soils resources. Additionally, there are no naval operations that could affect the land-based use, including recreation and tourism-related-activities. The work force assigned to the site would not affect local transportation levels of service or utilities. There is no socioeconomic impact from operating the site, and, the site does not block any prominent public vistas.

3.3.1.8 MT. KAHILI

Mount Kahili is a Department of Energy communication site that contains a repeater station. A review of the 14 environmental resources against program operations determined there would be no impacts from site operations under the No-action Alternative, Alternative 1, or Alternative 2 at Mount Kahili. Operations at this site consist of existing telemetry towers and communications, and no building modifications would occur. No air emissions would be generated from operations at the site unless use of diesel generators would be required for backup power. The site does not affect the existing airspace structure in the region. Because no ground disturbance or building modifications would occur, there would be no impact to biological resources, cultural resources, or geology and soils. Operation of this site does require small amounts of hazardous materials for facility maintenance and generates small amounts of hazardous waste. All hazardous materials used and hazardous waste generated would continue to be managed in accordance with applicable regulations. There is no electromagnetic radiation generated at the site; therefore, there are no public health and safety issues. The site is compatible with existing surrounding land uses. No noise is generated by operations at the site. The site, which is only manned during operations, employs two to four persons. Such a small work force would not affect local transportation levels of service or utilities. There is no socioeconomic impact from operation of the site, and the site does not block any prominent public vistas. Operations at the site would not generate any waste streams that could impact local water quality.

3.3.1.9 NIIHAU

Niihau is a privately owned island that features a remotely operated surveillance radar, an 1,100-acre Test Vehicle Recovery Site, the Perch EW site, multiple EA Portable Simulator sites, and a Helicopter Terrain Flight training course. Of the 14 resources considered for analysis, air quality, airspace, cultural resources, geology and soils, land use, noise, socioeconomics, transportation, utilities, visual aesthetics, and water resources for Niihau are not addressed. Use of the island does not require control of the air space above this land area. Emissions from HRC operations would not change the regional air quality surrounding Niihau. There are no HRC operations that affect any cultural resources, land-forms, land use, geology and associated soil development. Under the No-action Alternative, Alternative 1, or Alternative 2, there are no socioeconomic impacts on Niihau. No noise-sensitive land receptors are affected by HRC operations. The limited existing transportation infrastructure on Niihau is rudimentary and is not used during HRC operations. There are no central utility systems on the island. No visual and aesthetic issues exist for Niihau. Operations at the site would not generate any waste streams that could impact local water quality.

3.3.1.9.1 Biological Resources (Terrestrial and Offshore)—Niihau

Appendix C includes a definition of biological resources and the main regulations and laws that govern their protection.

Region of Influence

The region of influence for biological resources is the island of Niihau and its offshore environment.

Affected Environment

Vegetation

The vegetation of the island is dominated by non-native plant species and plant communities. The dominant types of vegetation on Niihau are kiawe forest, grassland, and koa haole. On the northern lowland areas, the kiawe forest is more open and has a kiawe overstory with an extensive shrub understory of ‘ilima. A coastal dry herbland/grassland community is present along the northeastern coastal region of Niihau. A dry coastal community, koa haole shrubland, often dominated by pure stands of koa haole occurs at scattered locations at higher elevations on the island. This vegetation community is often associated with abandoned pasture areas. In some locations the koa haole canopy is so thick and grazing pressure of feral sheep and pigs so intense that there is little, if any, herbaceous understory. Small mixed stands of eucalyptus and common ironwood occur in a few sheltered areas at higher elevations. Ironwood also occurs in coastal areas near the ocean. Scattered individuals of the endemic naio occur at higher elevations in a mixed kiawe/koa haole shrub association. (Pacific Missile Range Facility, 2001; U.S. Department of the Navy, 1998*)*

<u>Threatened and Endangered Plant Species</u>

Alula (*Brighamia insignis*), Federally listed as endangered, was historically known on Niihau. A population occurred on the Kaali Cliff, but has not been observed since 1947. Threats to the species include loss of native pollinators, browsing by goats, and invertebrate pests (Hawaii Department of Land and Natural Resources, 2006).

Wildlife

The wildlife on Niihau is dominated by non-native species. The terrestrial vertebrate animal community is dominated by feral pigs, sheep, cattle, horses, donkeys, turkeys, quail, pheasants, and peacocks. Large numbers of pigs and sheep freely roam the island. The common bird species are introduced species such as the spotted dove, cardinal, and mynah. The migratory Laysan albatross nests on Niihau, but its success is limited by depredation of habitat by feral pigs.

Reefs offshore of Niihau are poorly developed due to extreme wave energy from all directions. There are no substantial bays that could shelter coral development. High-wave energy coral communities appear to be most common and are dominated by cauliflower coral (*Pocillopora meandrina*) and lobe coral (*Porites lobata*). Black coral (*Antipathes sp.*) occurs as shallow as 90 ft off the northern end of the island. (Hawaii Institute of Marine Biology, 2006)

Pelagic fish such as tuna swim close to steep vertical walls around the northwest portion of Niihau. Large kumu (white saddle goatfish), u'u (Squirrelfish), and uhu (parrotfish) are abundant. Sharks are also numerous off of Niihau. (Hawaii Institute of Marine Biology, 2006) A detailed description, including status, distribution, and habitat preference of managed fisheries is provided in the Appendix G.

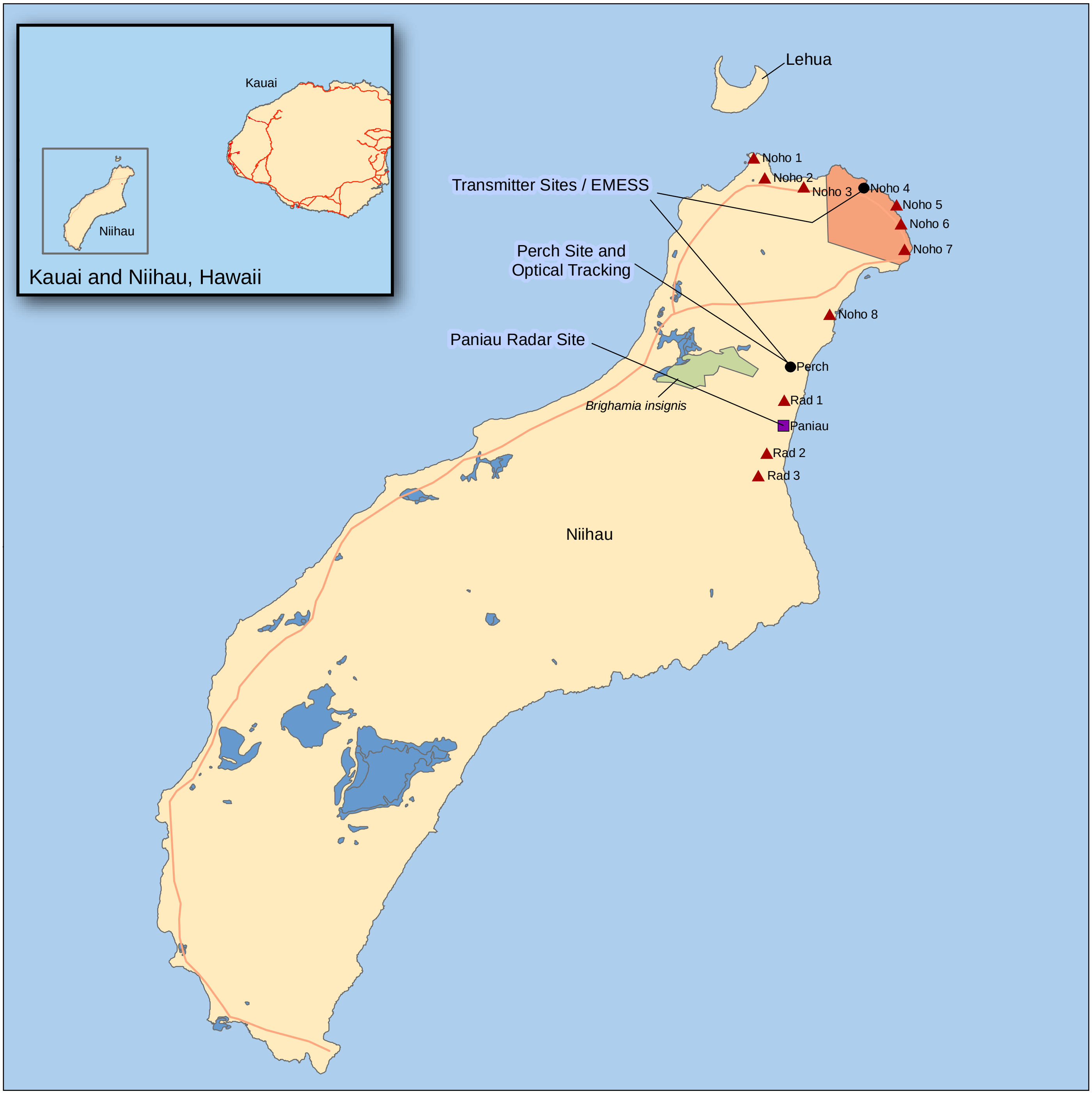
<u>Threatened and Endangered Wildlife Species</u>

The koloa maoli (Hawaiian duck), alae ula (common moorhen), ae'o (Hawaiian stilt), and the 'alae ke'oke'o (Hawaiian coot) are found in and around the lakes (playas) on the southern part of Niihau.

The endangered Hawaiian monk seal uses most of the coastline on Niihau to haul out, bask, and occasionally pup. From 10 to 12 pups are born on Niihau annually (Hawaii Institute of Marine Biology, 2006). The threatened green sea turtle has been observed to come ashore on selected beaches and occasionally nests at some of these locations.

Environmentally Sensitive Habitat

An area of 357 acres in the northern portion of Niihau has been designated as critical habitat for the alula (*Brighamia insignis*) (Figure 3.3.1.9.1-1). This area is considered essential to the conservation of the taxon by the USFWS. (Federal Register, 2003)



EXPLANATION

- Transmitter Site
- Radar Site
- Electro-magnetic Environmental System Simulator (EMESS) Site
- Dirt Road
- Road
- Leased Area
- Critical Habitat
- Wetland Area
- Land

NORTH

0 1 2 4 Miles

Critical Habitat - Niihau, Hawaii

Niihau, Hawaii

Figure 3.3.1.9.1-1

3.3.1.9.2 Hazardous Materials and Waste—Niihau

Appendix C includes a discussion of hazardous materials and waste resource laws and regulations.

Region of Influence

The region of influence for hazardous materials and potential hazardous waste would be limited to areas of Niihau where hazardous materials are stored, handled, and consumed.

Affected Environment

Hazardous materials are used on Niihau during the minor maintenance activities associated with PMRF facilities including some aerosol solvents, diesel fuel for generators, paint, and oil. These materials are used for the radar unit and EW site facilities. These materials are brought to Niihau when required for maintenance. General site maintenance is provided by Niihau Ranch. All hazardous materials used and waste generated is managed in accordance with PMRF procedures described in Section 3.3.1.1.6.

PMRF does maintain two aboveground diesel fuel storage tanks on Niihau to operate the electrical generators for the radar site and EW site. These fuel storage tanks consist of a 1,000-gal tank for the radar site and a 100-gal tank for the EW site. There are no radon issues associated with operation of facilities on Niihau, and there are no IRP sites. There are no PCB-containing devices in any of the radar or power-related components at Niihau.

3.3.1.9.3 Health and Safety—Niihau

Appendix C includes a detailed discussion of health and safety resources laws and regulations.

Region of Influence

The region of influence for health and safety is Niihau.

Affected Environment

Niihau is a privately owned island that through agreements with the owners, PMRF uses to support operations. The primary health and safety concern to the residents of Niihau is the potential for a fire on the island. Due in part to the dry climate and kiawe vegetation that dominates the island, there is the potential for very large fires to occur. Currently, the island does not have any firefighting equipment. Emergency medical evacuation service can be provided by the helicopter owned by the Robinson family.

PMRF operates a radar at Paniau that is remotely operated from PMRF/Main Base. The radar unit, which is located on top of a facility, presents no HERP hazards at ground level where any island resident could be affected. PMRF/Main Base also operates the Niihau Perch site EW system, which has a HERP EMR hazard of 12 ft in front of where the system is pointing. A warning light and warning signs are placed in the area when the system is operating. In addition, PMRF flies AEGIS drone targets along the east coast of the island away from inhabited areas. Presently, helicopters are airborne with buckets during nearland/overland operations occurring on or near Niihau to deal with potential fire hazards.

3.3.1.10 KAULA

Kaula is used by the Navy for aircraft gunnery and inert ordnance target practice. Strike Warfare exercises and Close Air Support are typical operations at Kaula.

Of the 14 resources considered for analysis, air quality, noise, hazardous materials and waste, socioeconomics, transportation, utilities, visual and aesthetics, and water resources are not addressed. Emissions from HRC operations would not change the regional air quality surrounding Kaula. Any hazardous materials and hazardous waste issue is addressed under geology and soils. Access to the island is restricted due to live ordnance training. Because access to the island is restricted, no noise impacts to civilian or military personnel would occur. Potential noise impacts to wildlife are addressed under the biological resources section. Additionally, access restriction eliminates socioeconomic issues for the island. There are no facilities, transportation or utilities, systems on the island. No visual and aesthetic issues exist for Kaula. Operations at the site would not generate any waste streams that could impact local water quality.

3.3.1.10.1 Airspace—Kaula

Appendix C includes a detailed description of airspace. Kaula is included in the region of influence for the PMRF/Main Base. See Section 3.3.1.1.2 for the airspace affected environment that includes Kaula.

3.3.1.10.2 Biological Resources (Terrestrial and Offshore)—Kaula

Kaula is an uninhabited island approximately 108 acres in size that currently serves as a bird sanctuary. Kaula is used by the Navy for aircraft gunnery and inert ordnance target practice. Strike Warfare exercises and Close Air Support are typical operations at Kaula. Appendix C includes a definition of biological resources and the main regulations and laws that govern their protection.

Region of Influence

The region of influence for biological resources associated with Kaula includes the island and offshore area.

Affected Environment

Vegetation

Due to strong, dry, and continuous winds, the vegetation on Kaula is very sparse. The dominant vegetation is low-growing shrubs or herbs that belong to a semi-arid and strand flora. A small number of koa haole has been noted on the island. The vegetation composition includes 5 endemic Hawaiian species, 10 indigenous species, and 14 introduced (exotic) species. Native ilima and ihi are the most abundant species. (Pacific Missile Range Facility, 2001; Offshore Island Restoration Committee, undated)

Threatened and Endangered Plant Species

None of the species of plants known to occur on Kaula are listed as threatened or endangered. (Pacific Missile Range Facility, 2001)

Wildlife

Twenty-six different species of seabirds have been observed on Kaula. An estimated 18 species of seabirds currently nest on the island (Offshore Island Restoration Committee, undated). These species appear to be healthy and are reproducing normally. The species include three species of migratory shorebirds that occasionally stop on Kaula seasonally and small numbers of six species of exotic (introduced) land birds. The sooty tern, brown noddy, red-footed booby, and masked booby are some of the more common species observed. No other terrestrial wildlife is known to occur on Kaula, and none is expected. (Pacific Missile Range Facility, 2001; Offshore Island Restoration Committee, undated)

Kaula Island is surrounded by Kaula Bank, which supports some of the best-developed coral reefs in the main Hawaiian Islands. The entire bank has been identified as a Habitat Area of Particular Concern in the Coral Reef Ecosystem Fisheries Management Plan. Several commercially important fish, such as tunas and jacks observed spawning in the area, have been reported. Another species seen in the area is the whale shark that is rarely sighted in the main Hawaiian Islands. Spinner dolphins frequent the water around Kaula. (Pacific Missile Range Facility, 2001)

Threatened and Endangered Wildlife Species

None of the species of birds Federally listed as threatened or endangered occur on Kaula. Coastal waters off Kaula are considered viable foraging habitat for green sea turtles, but no sightings of sea turtles have been documented. (Pacific Missile Range Facility, 2001)

The humpback whale occurs in the ocean waters off Kaula. Four consecutive NMFS humpback whale surveys conducted between 1976 and 1979 established that humpback whales also occur in the offshore waters of Kaula during the peak of the winter season on an annual basis. (Pacific Missile Range Facility, 2001) Hawaiian monk seals bask on Kaula and are located in its offshore waters. Three Hawaiian monk seals were observed on Kaula in a 2000 aerial survey (Baker and Johanos, undated).

Environmentally Sensitive Habitat

Kaula Rock is one of the most important seabird colonies in Hawaii, is a State Seabird Sanctuary, and is home to a variety of other Native Hawaiian species, including coastal plants, insects, and Hawaiian monk seals.

3.3.1.10.3 Cultural Resources—Kaula

Appendix C includes a description of cultural resources and the laws and regulations pertaining to them.

Region of Influence

The region of influence for cultural resources at Kaula encompasses the southwestern tip of the island where there is an existing, heavily disturbed ordnance impact area (see Figure 2.1-1). There are no known historic properties within the impact area; however, due to the presence of unexploded ordnance only a portion has been surveyed (Commander, United States Pacific Fleet, 2006).

Proposed or ongoing operations with the potential to affect cultural resources on Kaula and within Warning Area W-187 include BOMBEX and GUNEX. Both BOMBEX and GUNEX (Air-to-Ground) involve the islet only and not the surrounding waters.

Affected Environment

Underwater Cultural Resources

There are no recorded underwater cultural resources surrounding Kaula (see Figures 3.1.3-1 and 3.3.1.1.4-1).

Archaeological Resources (Prehistoric and Historic)

Kaula has no evidence of extensive human habitation, although six archaeological sites located in the northern portion of the islet indicate some level of visitation (U.S. Department of the Navy, Commander, Third Fleet, 2006).

Historic Buildings and Structures

Two stone features (possibly heiaus); a sea cave with a low man-made wall; and a small unmanned light station, derrick, and shelter constructed by the United States Lighthouse Service in 1932 are the only structures mentioned in the literature for Kaula (Resture, 2006; Columbia Gazetteer of North America, 2000).

Traditional Resources

References to Kaula have been noted in Hawaiian oral traditions; however, there are no recorded traditional Hawaiian sites on the islet.

3.3.1.10.4 Geology and Soils—Kaula

Region of Influence

The region of influence for geology and soils is the southern end of Kaula, specifically, the southernmost 10 acres, currently leased for airborne ordnance training.

Affected Environment

Physiography

Kaula is a small, crescent-shaped volcanic island located southwest of Niihau. The island is the remnant of a breached volcanic cone that has been heavily eroded. The island is fairly symmetrical, with the highest elevation achieved near the center of the island at slightly greater than 500 ft. Steep sea cliffs occur around the island perimeter; however, the remnants of a narrow wave-cut terrace, cut 8 to 10 ft above current sea level, are evident on the eastern shore. Near the northwest end of the convex (leeward) side of the island, slopes are the steepest, reaching approximately 140 percent and greater. In general, the sea cliffs are relatively smooth; however, in some areas, joints and fissures in the rock have promoted large blocks of ash to erode, making elongated sea caves (U.S. Department of the Navy, 1980). On the concave windward side, upland slopes generally range from 75 to 125 percent. Gullies on the leeward slopes are relatively few and small, whereas those on the windward slopes tend to be more numerous and larger (U.S. Department of the Navy, 1980).

Geology

The distance and water depth between Kaula and Niihau suggest that Kaula was an independent volcanic center (U.S. Department of the Navy, 1980). Earlier geologic surveys reported by Palmer (1927) indicate a geologic history typical of other islands in the Hawaiian chain. Kaula was raised to sea level, or near sea level, during a major period of Tertiary volcanism when large volumes of lava were deposited. An erosional unconformity ensued, during which coral reefs developed on the summit of the submerged volcano or the beveled base of the subaerial mountain. A second eruptive epoch followed, during which a tuff crater was formed. The crater was probably unsymmetrical, with the leeward side being the highest and the windward side considerably lower, possibly not above sea level. The tuff crater was subsequently eroded by wind, waves, and runoff, and a submarine terrace was cut around most of the island. The sea has since recessed to about 15 ft below the wave cut terrace.

Volcanic rock at Kaula is reported as a light brownish gray tuff (U.S. Department of the Navy, 1980). Embedded in the tuff are olivine nodules, which may be the same age as the tuff. Other inclusions encompass fragments of older lava and reef limestone, which suggests that the last phase of volcanic activity dislodged and incorporated these materials during violent eruptions (U.S. Department of the Navy, 1980).

Soils

Soil is primarily composed of water lain detritus, which mantles the wave cut terrace on the leeward side of the island. The detritus is fine to coarse grained tuffaceous material and has not been reworked; therefore, the grains are generally angular. The coarsest grains are composed of fresh to decomposed volcanic glass, fine grained basalt, and fragments of bird bones along with a few olivine fragments (U.S. Department of the Navy, 1980). The relicts in the finer grained material suggest that the parent material was of basaltic composition. Augite and feldspar, common elements of Hawaiian basalts, however, have been weathered out (U.S. Department of the Navy, 1980).

3.3.1.10.5 Health and Safety—Kaula

Appendix C includes a detailed discussion of health and safety resources laws and regulations.

Region of Influence

The region of influence for health and safety is Kaula and the immediate surface danger zone around the island.

Affected Environment

The primary health and safety issue concern associated with Kaula is the aerial inert bombing/aircraft gunnery impact area; no other hazardous operations occur on the island. To minimize health and safety risks, a Surface Danger Zone surrounding Kaula was established for the primary purpose of ensuring an adequate margin of safety to both personnel and equipment during the conduct of gunnery training operations by the military. In addition, because of the potential for unexploded ordnance to be present on and just below the surface of the island and adjacent waters, the island and tidal shoreline are closed to unauthorized personnel at all times. Prior to any bombing operations, an aircraft flies over the island and determines if it is safe to conduct the mission.

To allow some fishing use of the waters surrounding the island (excluding the tidal zone), the Navy does open the surface danger zone on weekends and holidays for fishing by notifying the appropriate State agency. The Commander Fleet Air Hawaii, as the controlling and scheduling agency for the military use of Kaula, is responsible for notifying the Hawaii Department of Land and Natural Resources, Division of Fish and Game, and Commander Fourteenth Coast Guard District, in writing, of the period of time the Surface Danger Zone will be opened for fishing.

3.3.1.10.6 Land Use—Kaula

Appendix C includes a definition of land use and laws and regulations that pertain to it.

Region of Influence

The region of influence is the island rock of Kaula. The Navy has no intention of expanding land holdings at this location.

Affected Environment

Kaula Rock is a 108-acre island southwest of Niihau and is part of Kauai County (Figure 2.1-1). There are no recreational activities associated with or occurring on Kaula. Ordnance delivery is limited to the southeastern tip of the island (Department of Defense, 2006). The State Land Use classification for Kaula is Conservation Land, and there is no County land use designation for Kaula.

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3.4 OAHU

Oahu serves as the main commerce port for all of Hawaii. It is the third largest of the Hawaiian Islands in size and the largest in population, with roughly 75 percent of the State's residents. Honolulu County encompasses the entire island of Oahu; its county seat is the city of Honolulu. Current and proposed Hawaii Range Complex (HRC) operations on or offshore of Oahu addressed in this Environmental Impact Statement (EIS)/Overseas EIS (OEIS) are located at Kaena Point, Marine Corps Training Area–Bellows (MCTAB), Pearl Harbor, Ford Island, Marine Corps Base Hawaii (MCBH), Hickam Air Force Base (AFB), Wheeler Army Airfield, Schofield Barracks, Coast Guard Air Station Barbers Point/Kalaeloa Airport, Makua Military Reservation, Kahuku Training Area, Mt. Kaala, Wheeler Network Segment Control/Pacific Missile Range Facility (PMRF) Communication Sites, Dillingham Military Reservation, Mauna Kapu Communication Site, Makua Radio/Repeater/Cable Head, Explosive Ordnance Disposal (EOD) Shore Range-West Loch, Naval Inactive Ship Maintenance Facility Pearl Harbor, Lima Landing, Puuloa Underwater Range, Ewa Training Minefield, Barbers Point Underwater Range, Naval Undersea Warfare Center (NUWC) Range, and Keehi Lagoon.

3.4.1 PEARL HARBOR

3.4.1.1 NAVAL STATION PEARL HARBOR

Of the 14 environmental resources considered for analysis, air quality, airspace, geology and soils, hazardous materials and hazardous waste, health and safety, land use, noise, transportation, utilities, visual and aesthetics, and water resources are not addressed. Under the No-action Alternative, Alternative 1, or Alternative 2, there would be no air emissions generated other than that from an occasional aircraft operation. The aircraft operations would not change regional air quality. Airspace is not affected by the types of ongoing and proposed operations at Naval Station-Pearl Harbor. All operations adhere to policies and regulations governing hazardous materials and waste, health and safety, and noise, as discussed in Appendix C. There are no current or proposed operations that could affect land use, land forms, geology, and associated soils development on Naval Station-Pearl Harbor. The proposed operations associated with Alternative 1 or Alternative 2 would not affect modes of transportation and utility demands on Oahu. There is no planned construction or alteration associated with the Navy that would affect the visual aesthetic quality of the area. Operations at the site would not generate any waste streams that could impact local water quality. For clarification, "Pearl Harbor" refers to the Pearl Harbor Naval Defensive Sea Area which is all the waters and submerged lands from the shoreline to a 3-mile (mi) offshore area (as depicted in Figure 2.1-2) under the Navy's exclusive control.

3.4.1.1.1 Biological Resources (Terrestrial and Offshore)—Naval Station Pearl Harbor

Appendix C includes a detailed description of biological resources.

Region of Influence

The region of influence includes the land area and waters adjacent to Pearl Harbor that could be affected by current and proposed operations.

Affected Environment

Vegetation

Exotic imported grasses and trees maintained by intensive landscaping efforts make up the majority of the vegetative community at Pearl Harbor. Native vegetation, including grasses, trees, and shrubs are present only in small areas. These areas of native vegetation provide control for erosion except under the heaviest rainfall conditions.

Vegetation along the shoreline and the intertidal zone is dominated by the alien red mangrove at the heads of the three lochs. This exotic species has been successful because there are no mangrove predators, herbivores and insects, or diseases. (U.S. Department of the Navy, Commander Navy Region Hawaii, 2001)

Threatened and Endangered Plant Species

No threatened and endangered plant species have been identified at Pearl Harbor.

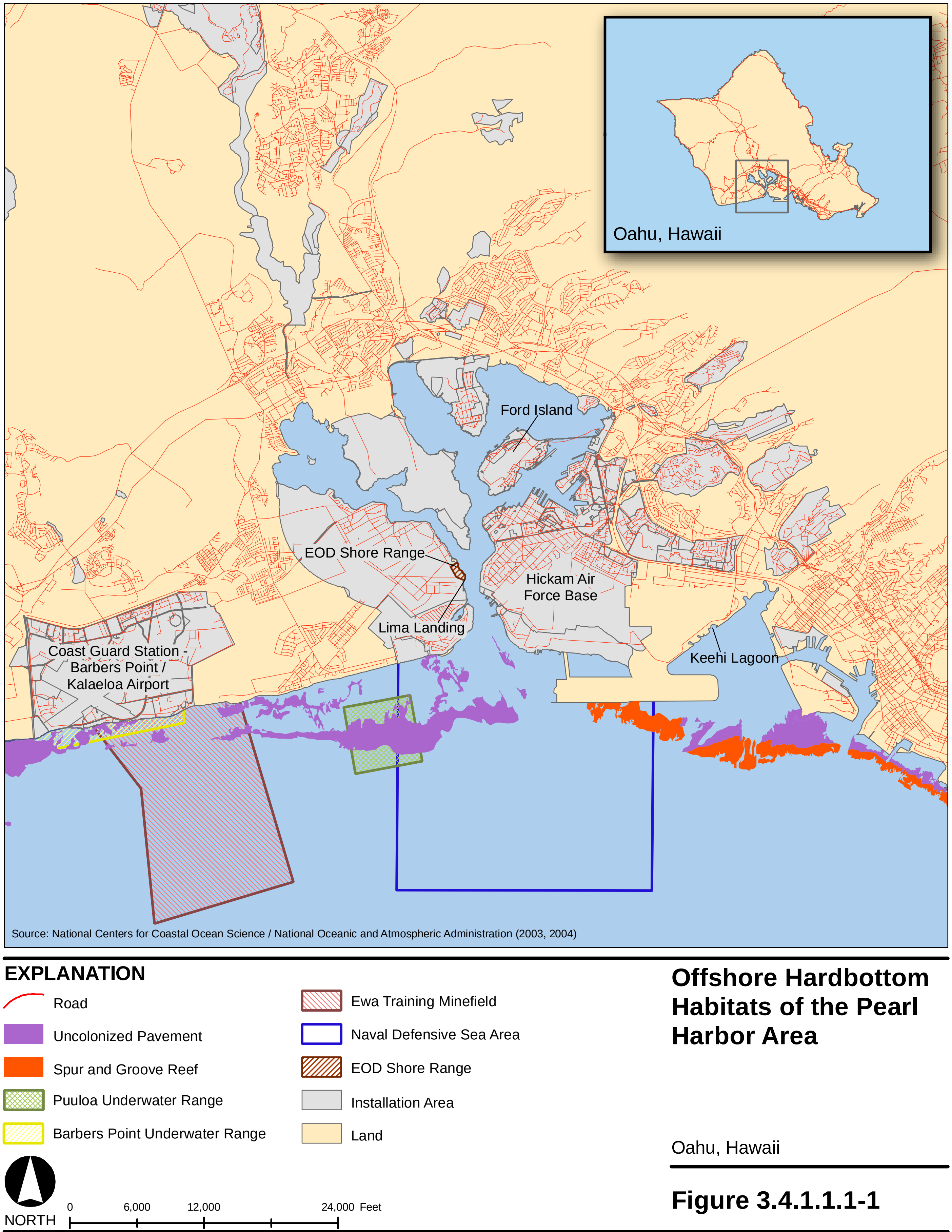
Wildlife

Feral dogs and cats, mongoose, and rodents are present throughout the region of influence. The majority of forest birds at Pearl Harbor are exotic or introduced species. The common myna, red-vented bulbul, Japanese white-eye, house finch, and zebra dove are among the most common. The State threatened white tern (*Gygis alba rothschildi*) and the State-endangered pueo are occasionally found in the Pearl Harbor vicinity. (U.S. Department of the Navy, Commander Navy Region Hawaii, 2001)

One resident indigenous bird, the black-crowned night heron (‘auku’u), and 46 migratory species occur in the Pearl Harbor area. The migratory birds are dominated by wading birds including the wandering tattler, ruddy turnstone, and Pacific golden plover. (U.S. Department of the Navy, Commander Navy Region Hawaii, 2001)

Introduced species of crustaceans, insects, fish, amphibians, and birds dominate the wildlife of Pearl Harbor’s wetlands, estuaries, springs, and the lowest reaches of streams. The numbers of native *Megalagrion* damselflies and the native o’opu nakea (goby) have been declining. Approximately 90 percent of the sea floor of the harbor is considered soft bottom with a layer of terrigenous (derived primarily from erosive action on land) mud and/or calcareous (composed of, containing, or resembling calcium carbonate, calcite, or chalk) sand. The remaining 10 percent is considered hard bottom, the limestone platform (Figure 3.4.1.1.1-1). (U.S. Department of the Navy, Commander Navy Region Hawaii, 2001)

The following information on corals is summarized from the more extensive data provided in Appendix G. Considerable reef development occurs in embayments and sheltered areas on Oahu including Kaneohe Bay and Hanauma Bay (Figure 3.4.1.1.1-1). Sediment-laden runoff and polluted runoff have impacted reefs of Oahu, specifically Pearl Harbor and Kaneohe Bay.



Offshore Hardbottom Habitats of the Pearl Harbor Area

Oahu, Hawaii

Figure 3.4.1.1.1-1

The National Centers for Coastal Ocean Science/National Oceanic and Atmospheric Administration benthic habitat maps show no coral reefs along the western side of Oahu from the Naval Reservation to the Makua Valley Military Reservation. Also, no reefs are shown along the southeastern end of the island (Kaloko to Wailea Point) (Figure 3.4.1.1.1-1). Fringing reefs are well developed on the southern side of Oahu from the Wailupe Peninsula to Kawaihoa Point and Hanauma Bay, while west of Kawaihoa Point, fringing reefs as well as spur-and-groove reefs are well developed.

Other spur-and-groove reefs are found along the northern shoreline of Oahu (from Dillingham Airfield to Kahuku Point) (Figure 3.4.1.1.1-1), in Kailua Bay and along the southern coastline (Wailupe Peninsula to Honolulu International Airport). North of Waimea Bay on the north coast, limited coral communities have developed in two locations known as Shark's Cove and The Tables. The most common corals at these sites are *Porites lobata* and *Pocillopora meandrina*. In addition, the encrusting corals *Leptastrea purpurea*, *Pavona varians*, and *Montipora flabellata* are known to occur. Coral reef development is limited in this area due to exposure to the North Pacific swell.

According to the National Centers for Coastal Ocean Science/National Oceanic and Atmospheric Administration, no coral reefs occur to the west of the airport runway, along the shoreline of the Fort Kamehameha Military Reservation, Hickam AFB, the Naval Reservation, or within Pearl Harbor (Figure 3.4.1.1.1-1). Contrary to the National Centers for Coastal Ocean Science data, moderately developed spur and groove reefs do occur on either side of the Pearl Harbor entrance channel, including Tripod Reef and Ahua Reef. Tripod Reef is a spur-and-groove system where average coral cover is approximately 40 percent, and live coral cover on Ahua Reef is 40 percent, but in some parts of the reef, coral cover reaches 80 percent.

Five species of stony corals occur within Pearl Harbor: *Pocillopora damicornis*, *P. meandrina*, *Porites compressa*, *Leptastrea purpurea*, and *Montipora patula*. In 1996, the most common coral in Pearl Harbor was *L. purpurea,* and corals were most abundant at the entrance of the West Loch Channel.

A detailed study in 1974 found 90 species of fish in Pearl Harbor. Some of the commercially important species are ama'ama (grey mullet), awa (milkfish), o'io (bonefish), kaku (barracuda), nenue (chub), menpachi (soldierfish), and papio (jacks). Pearl Harbor appears to be very important in the life cycle of the scalloped hammerhead shark. All waters around Pearl Harbor have been designated as essential fish habitat for eggs and larvae of a number of species. The harbor has not been designated as a habitat area of particular concern. (U.S. Department of the Navy, Commander Navy Region Hawaii, 2001) A detailed description, including status, distribution, and habitat preference of managed fisheries is provided in Appendix G.

<u>Threatened and Endangered Wildlife Species</u>

Four Federally endangered waterbirds (Table 3.4.1.1.1-1) are recognized as occurring on Pearl Harbor: koloa maoli (Hawaiian duck), 'alae ke'ok'o (Hawaiian coot), alae ula (Hawaiian common moorhen), and ae'o (Hawaiian black-necked stilt).

Table 3.4.1.1.1-1. Threatened and Endangered Terrestrial Wildlife at Pearl Harbor

Scientific Name	Common Name (Hawaiian Name)	Federal Status
Birds		
Anas wyvilliana	Koloa maoli (Hawaiian duck)	E
Fulica americana alai	'Alae ke'oke'o (Hawaiian coot)	E
Gallinula chloropus sandvicensis	Alae ula (Hawaiian common moorhen)	E
Himantopus mexicanus knudseni	Ae'o (Hawaiian black-necked stilt)	E
Reptiles/Mammals		
Chelonia mydas	Green sea turtle	T
Monachus schauinslandi	Hawaiian monk seal	E
Megaptera novaeangliae	Humpback whale	E

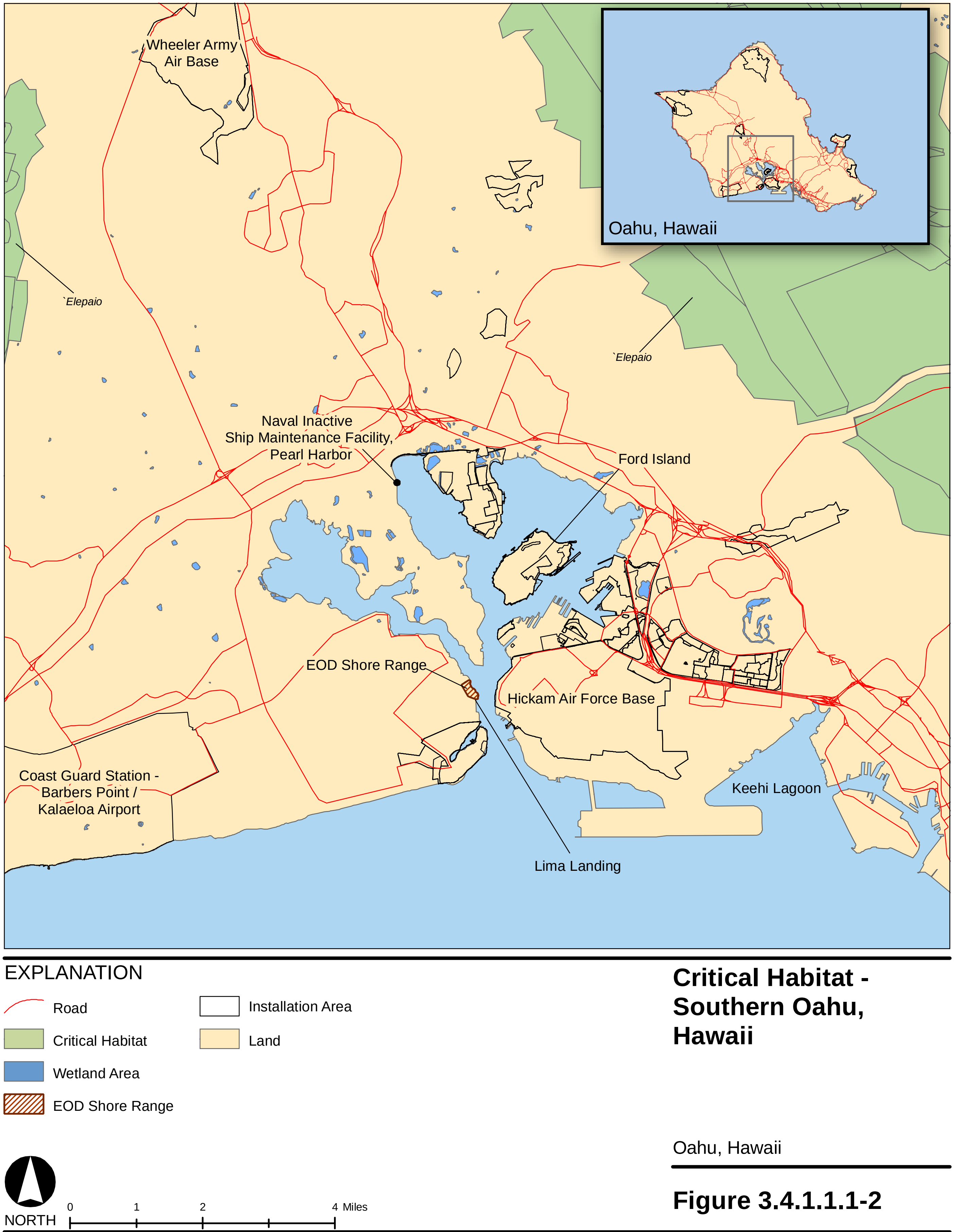
Source: U.S. Department of the Navy, Commander Navy Region Hawaii, 2001; U.S. Department of the Navy, Commander THIRD Fleet, 2002; U.S. Fish and Wildlife Service, 2006.
Key to Federal Status:
E Endangered
T Threatened

The green sea turtle has rarely been seen in the harbor, and no sandy beaches suitable for nesting exist inside the harbor. They have been seen routinely in the outer reaches of the Pearl Harbor entrance channel (Smith et al., 2006). Although the Hawaiian monk seal has never been reported in the harbor, it has been recorded at Iroquois Point at the Pearl Harbor entrance channel (Smith et al., 2006). Populations of the humpback whale are known to winter in the Hawaiian waters from December to April. An adult humpback and calf were once reported to have entered East Loch, but this was an unusual event. The pair voluntarily left the harbor unharmed. (U.S. Department of the Navy, Commander Navy Region Hawaii, 2001)

Environmentally Sensitive Habitat

The Pearl Harbor National Wildlife Refuge is currently made up of Honouliuli Unit (located on West Loch) and the Waiawa Unit (located on Pearl City Peninsula). The refuge provides primary wetland habitat for threatened and endangered waterbirds and other bird species in Pearl Harbor. Mangrove wetlands are the most common type of wetland. (U.S. Department of the Navy, Commander Navy Region Hawaii, 2001)

No critical habitat has been designated within Pearl Harbor (Figure 3.4.1.1.1-2). Approximately 127 acres of jurisdictional wetlands are located on Navy properties in Pearl Harbor. Wetland areas adjacent to Pearl Harbor include mudflats, shallow ponds, small streams, pickleweed beds, kiawe forests, cattails, and watercress and provide habitat for waterbirds (U.S. Department of the Navy, Commander Navy Region Hawaii, 2001).



Critical Habitat - Southern Oahu, Hawaii

Oahu, Hawaii

Figure 3.4.1.1.1-2

3.4.1.1.2 Cultural Resources—Naval Station Pearl Harbor

Appendix C includes a description of cultural resources and the laws and regulations pertaining to them.

Region of Influence

The region of influence for proposed or ongoing operations within Pearl Harbor would include any location where salvage operations would occur. Explosives demolition and mine neutralization is analyzed within the various underwater ranges described in later sections of this EIS/OEIS.

Affected Environment

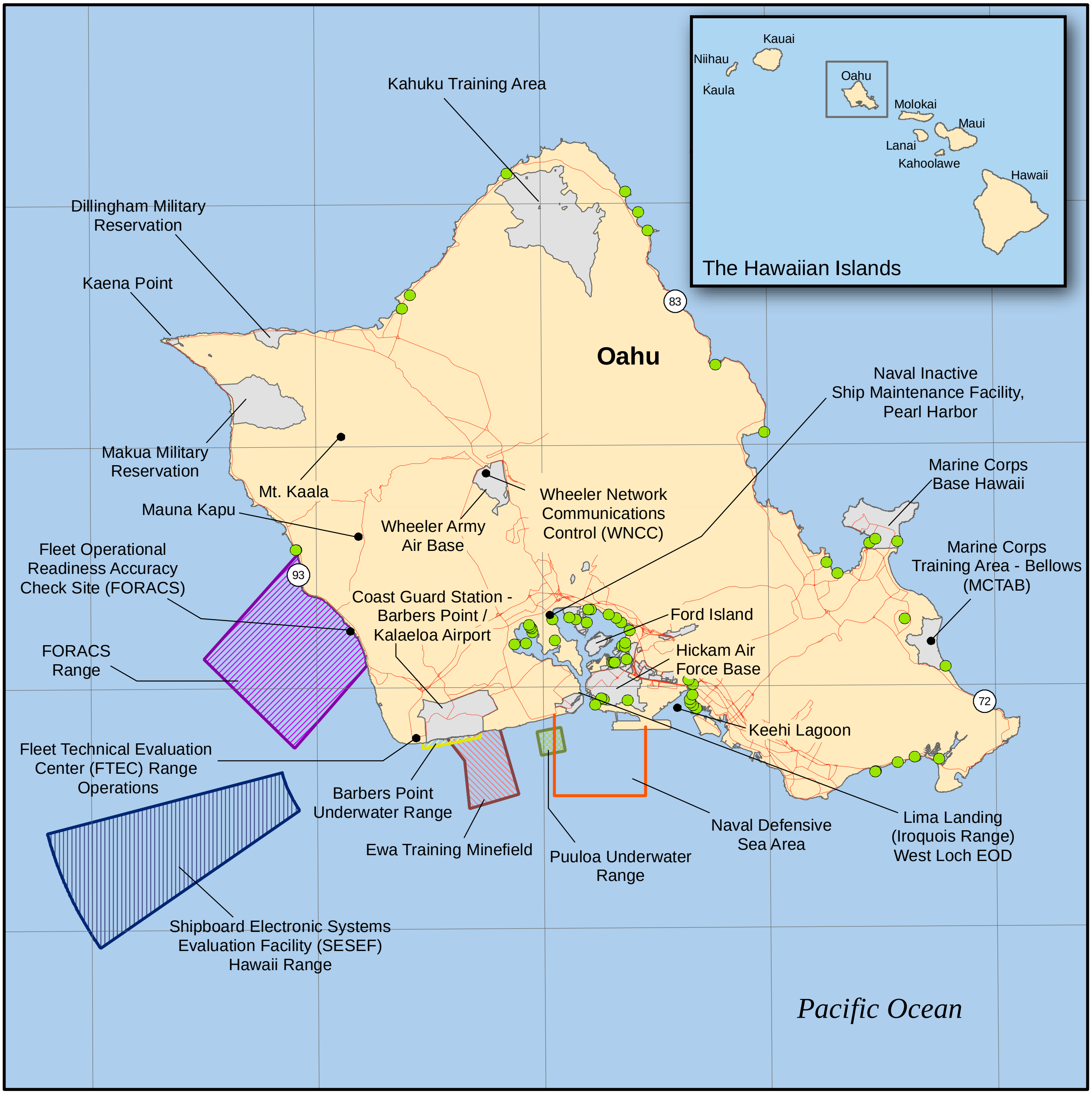
Underwater Cultural Resources

Submerged cultural resources surrounding Oahu include numerous shipwrecks (see Figure 3.1.3-2), many of which, including *USS Arizona* and *USS Utah,* are within Pearl Harbor and are individual National Historic Landmarks. *USS Arizona* lies in 40 feet (ft) of water and is the final resting place for many of the ship's 1,177 crewmen who lost their lives during the Japanese attack on December 7, 1941. The *USS Arizona* Memorial became a National Park Service unit in 1980, and the National Park Service conducts approximately 50 research and cultural preservation dives per year (National Park Service, 2006). *USS Utah* lies where she fell on the north side of Ford Island. Pearl Harbor contains the wrecks of other U.S. Warships debris fields, Japanese midget submarines, and Japanese aircraft as well (Rosendahl, 2000).

Other wrecks surrounding Oahu include the largely intact wreck of the Sea Tiger, which was sunk in 1996 by a submarine company; a World War II-era Japanese midget submarine located in 2002; *Mahi*, a scuttled Navy minesweeper/cable layer located off the Waianae Coast, which now serves as an artificial reef; and the YO-257, which was a Navy yard oiler built in the 1940s and sunk off Waikiki in 1989 to create an artificial reef. There is also an aircraft crash site, which resulted from a Corsair ditching when it ran out of fuel along the south shore.

Only a few of the roughly 100 fishponds that once existed in the waters surrounding Oahu still remain (see Figure 3.4.1.1.2-1); however, four of them are located within Pearl Harbor. These include Loko Paaiau near McGrew Point in the East Loch; Loko Okiokiolepe, located northwest of the EOD Shore Range; Loko Pamoku near the Naval Magazine (NAVMAG) in West Loch, and Loko Laulaunui on Laulaunui Island in West Loch (see also Section 3.4.1.4.2) (Helber Hastert & Fee, Planners, 2002).

Loko Okiokiolep Fishpond—The areas around the lochs of Pearl Harbor were once used extensively for aquaculture. Historical maps and other sources indicate that there were as many as 25 fishponds, fish traps, and other kinds of aquacultural features along the shoreline of Pearl Harbor. Based on an overlay of historical maps with current facilities, 20 of these features were located wholly or partially within the boundaries of the Pearl Harbor Naval Complex. Although most of the original fishponds have been buried beneath fill and subsequently developed, archaeological and paleoenvironmental studies have shown that in some areas intact fishpond sediments are still present. Among the four extant fishponds listed above, Loko Okiokiolepe was officially listed in the National Register on March 14, 1973 (Hawaii State Historic



EXPLANATION

- Fishpond
- 93 State Highway
- Road
- Barbers Point Underwater Range
- Puuloa Underwater Range
- Shipboard Electronic Systems Evaluation Facility (SESEF) Hawaii Range
- Ewa Training Minefield
- Fleet Operational Readiness Accuracy Check Site (FORACS) Range
- Naval Defensive Sea Area
- Installation Area
- Land

NORTH

0 2.5 5 10 Nautical Miles

Hawaiian Fishpond Locations in the Vicinity of Oahu

Oahu, Hawaii

Figure 3.4.1.1.2-1

Preservation Office, 2006; Helber Hastert & Fee, Planners, 2002). Most of the interior of the fishpond has been filled, but the seaward coral wall still remains intact (Naval Facilities Engineering Command, 2006).

3.4.1.1.3 Socioeconomics—Naval Station Pearl Harbor

Appendix C includes a general definition of socioeconomics.

See Section 3.1.7 of the Open Ocean Areas for a description of existing condition of commercial and recreational fishing within the HRC, which includes Pearl Harbor.

Region of Influence

The region of influence for socioeconomic analysis is the island of Oahu. The County of Honolulu comprises the entire island of Oahu.

Affected Environment

Population and Income

In 2000, the population of Oahu was 876,156. The 2005 Bureau of Census Counties Profile estimates that the population for the County rose to 912,900 in 2005 (equal to 71 percent of the population of Hawaii), a change of almost 4.0 percent over the 5-year period. The projected population for 5 and 10 years out is 952,650 people in 2010 and 995,550 people in 2015, which would be an increase of 4.5 percent (Hawaii, State of, 2004b). Table 3.4.1.1.3-1 summarizes the demographics of the population of Oahu in 2000. Table 3.4.1.1.3-2 illustrates the age profile of those living in Honolulu County in 2000.

Table 3.4.1.1.3-1. Demographics of the Population of Oahu in 2000

Persons		**876,156**
	Male	440,518
	Female	435,638
Race	Asian	403,371
	White	186,484
	Native Hawaiian & Other Pacific Islander	77,680
	Hispanic/Latino	58,729
	Other	149,892
Households		**286,450**
Families		**205,672**

Source: U.S. Counties 2000, U.S. Census Bureau.

Table 3.4.1.1.3-2. Age Profile of Honolulu County Residents in 2000

	Honolulu County		Hawaii	
Age group (years)	**Population**	**Percentage**	**Population**	**Percentage**
17 and younger	208,525	23.8	295,615	24.4
18-24	88,492	10.1	115,096	9.5
25-44	268,104	30.6	362,249	29.9
45-64	192,754	22.0	277,441	22.9
65 and over	117,404	13.4	161,134	13.3

Source: U.S. Counties 2000, U.S. Census Bureau.

The Department of Defense (DoD) is the second major source of revenue to the State of Hawaii; second only to tourism (Military Affairs Council, 2006). In fiscal year (FY) 2005 total defense expenditures and appropriations for Hawaii were $5.6 billion, an increase of 8.7 percent over FY 2004 and appropriations for FY 2006 defense projects totaled $767 million (Hawaii Dept of Business, ED & Tourism, 2007). In January 2006, Congressman Neil Abercrombie announced that the Navy awarded $30 million to two Hawaii firms located on Oahu for repair, maintenance, and alterations to Navy ships. See Table 3.3.1.1.10-3 for the economic impact of the military in Hawaii.

Personal income in Oahu was estimated by the Department of Business, Economic Development and Tourism to be $30.4 billion in 2005, which represented 77 percent of the total personal income of Hawaii. The average per capita income in Honolulu County, in 2004 was $34,911.00, while in the same year the average per capita income for the state was $32,625.00 (6.5 percent less) (Fedstats, 2007)

Housing

In the fall of 2006, housing supply was 2,005 single-family homes and 2,750 available condominiums available. At the same time prices have remained fairly level with interest rates at a 6-month low (Honolulu Board of REALTORS®, 2006). The number of owner-occupied homes has grown from 156,290 in 2000, to 173,182 in 2005 (Hawaii, State of, 2004b, U.S. Census Bureau, 2000). This change represents a 9.8 percent increase in the stock of owner-occupied homes, compared to a 6.7 percent growth in the State as a whole. Additionally, as shown in Table 3.4.1.1.3-3, renter-occupied homes increased 2.4 percent over a 10-year period.

Employment

In 2001, the U.S. military employed 64,074 people in the State of Hawaii. The number employed by the Navy and Marine Corps was 24,654 (38 percent of military). Major locations for the active duty military and civilian personnel on Oahu in 2001 were: Schofield Barracks (12,699 jobs), Pearl Harbor (12,407 jobs), Kaneohe (6,847 jobs), Hickam AFB (5,374 jobs), Tripler Army Medical Center (2,826 jobs), Fort Shafter (2,337 jobs), Honolulu (1,879 jobs), Wheeler AFB (1,816), Kunia (1,495 jobs) and Camp H.M. Smith (1,045). Pearl Harbor Naval Shipyard is the largest industrial employer in Hawaii (Enterprise Honolulu, 2007). Table 3.4.1.1.3-4 shows the number of individuals employed in the main sectors of the economy of Oahu, and within Hawaii as a whole.

Table 3.4.1.1.3-3. Renter Occupied Housing Units

Gross Rent	Number of Units, 1990	Number of Units, 2000
Less than $200	5,764	4,501
$200 to $299	5,276	3,324
$300 to $499	21,009	9,265
$500 to $749	35,028	30,991
$750 to $999	24,617	28,973
$1000 or more	16,568	33,801
No cash rent	18,477	19,052
Total	126,739	129,907
Median	663	802

Source: U.S. Counties, 1990, 2000, U.S. Census Bureau

Table 3.4.1.1.3-4. Employment in Oahu and Hawaii

Employment Sector	Oahu		State of Hawaii	
	Number of Employees	Percent of Total	Number of Employees	Percent of Total
Agriculture, forestry, fishing, hunting, and mining	4,046	1.1	12,119	2.3
Construction	20,657	5.4	32,180	6.0
Manufacturing	14,494	3.8	18,979	3.5
Transportation and public utilities	24,877	6.5	33,559	6.2
Wholesale trade	13,211	3.4	17,188	3.2
Retail trade	46,914	12.2	65,693	12.2
Finance, insurance and real estate	28,643	7.5	37,867	7.0
Services	230,306	60.1	320,324	59.5
Total	**383,148**	**100**	**537,909**	**100**

Source: U.S. Counties 2000, U.S. Census Bureau.

Tourism, tourism-related services, and government continue to be the main employment generators (U.S. Department of the Navy, 1998). Natural resources and mining, mainly consisting of the agriculture, forestry, and fishing industry will add the fewest number of jobs and will continue to employ only 1 percent of the workforce (Department of Labor and Industrial Relations, 2006).

Unemployment on Oahu has fluctuated from a low of 2.0 percent in 1991 to a high of 4.9 percent reached in 1996 and 1998. In 2001, the rate was 4.1 and has steadily declined to 2.7 percent in 2005. This is the lowest the rate has been in over 12 years. During the same time period the total labor force has increased from 435,300 in 2001 to 445,150 in 2005—a 2.2 percent increase. In the last 5 years Honolulu County's unemployment rate has been within 0.1 to 0.2 percentage points of the State-wide rate (Hawaii, State of, 2005a).

Agriculture

The number of farms on Oahu has decreased from 900 in 1994 to 800 in 2004. Farm acreage has declined by about 28 percent over the same period. The number of self-employed farm operators and their unpaid family members stood at 2,300 persons in 2002. These operators and others employed 2,450 hired workers on Oahu (Hawaii, State of, 2005b).

Corresponding to the decline in farm land, sales of all crops decreased 10 percent from 2002 to 2004. Sugar cane (unprocessed cane) and pineapple accounted for 70.3 percent of all crop sales in 1994 at $84.3 million. By 2004, however, sugarcane was no longer a crop and pineapple only accounted for 37.6 percent of all crop sales, at $51.96 million. Livestock sales have declined by 38.4 percent over the 10-year period of from 1994 to 2004. The reduction in sugar, pineapple, and livestock sales have been offset by increases in other crops with sales of $86.1 million in 2004, a 41 percent increase from 1994. The diversification of crops includes the production of coffee, seed corn, vegetables and melons, fruits, macadamia nuts, taro, field crops, and flowers and nursery products. This diversification of crops has been, and still is, a goal of Oahu in order to strengthen, sustain, and maintain the agricultural segment of the economy, thus making it less susceptible to short-term conditions which could negatively impact agriculture (Hawaii, State of, 2005b). Additionally, the aquaculture industry is on the rise as well, increasing from 40 operations with $4.67 million in sales in 2003 to 46 operations with $5.20 million in sales in 2004, which is an 11 percent increase (Hawaii, State of, 2005b).

Subsistence Fishing

The overall level of subsistence fishing activity on Oahu and all other islands is difficult to assess, due to a lack of detailed catch data. There has been no attempt to formally assess the subsistence fishing contribution to island economies, but the value to consumers is known to be substantial. In particular, subsistence fishing is an important supplement to cash income in many rural communities despite increasing commercialization of the catch in these areas (Western Pacific Regional Fishery Management Council, 1999). See Section 3.3.1.1.10 for a detailed discussion on subsistence fishing.

Tourism

The tourism industry has been the economic mainstay of the Hawaiian Islands since statehood in 1959. The industry accounts for 22.3 percent of all jobs in Hawaii (Kaua'i, County of, 2006). Oahu's share of the Hawaii visitor market was 64.6 percent in 2004. Despite terrorism threats and periodic economic slumps, the tourism industry on Oahu has remained strong, with the number of visitors consistently over 4 million per year over the past 5 years (Department of Business, Economic Development & Tourism, 2006). Estimated visitor expenditures in 2005 were $11.9 billion, a 9.6 increase from 2004 (Department of Business, Economic Development & Tourism, 2006). The numbers of visitors to Oahu from 2000 through 2004 are shown in Table 3.4.1.1.3-5.

Table 3.4.1.1.3-5. Visitors to Oahu (2000–2004)

Year	Oahu Visitors	State of Hawaii Visitors
2000	4,719,244	6,948,594
2001	4,257,536	6,303,790
2002	4,276,077	6,389,058
2003	4,090,483	6,380,439
2004	4,469,278	6,917,166

Source: Department of Business, Economic Development & Tourism, 2006.

The accommodation inventory for Oahu declined 5.9 percent between 2000 and 2005, with 222 properties providing 34,167 rooms. This is 12 percent less than the peak capacity in 1986 of 39,010 rooms. Despite this short-term trend, the capacity is projected to increase 1.2 percent annually, which translates into 2,100 additional units by 2010 (Department of Planning and Permitting, 2006).

3.4.1.2 FORD ISLAND

Ford Island is a 450-acre site in the heart of Pearl Harbor. Of the 14 environmental resources considered for analysis, air quality, airspace, geology and soils, hazardous materials and hazardous waste, health and safety, land use, noise, socioeconomics, transportation, utilities, and visual and aesthetics resources are not addressed. Under the No-action Alternative, Alternative 1, or Alternative 2, there would be no air emissions generated other than that from an occasional aircraft operation. The aircraft operations would not change regional air quality. Any minimal air support operations at Ford Island would be limited to the types and number of aircraft that currently operate there. Operations associated with Ford Island adhere to policies and regulations governing hazardous materials and hazardous waste, health and safety and noise, as discussed in Appendix C. There are no current or proposed operations that could affect land use, land forms, geology, and associated soils development on the site. The proposed operations associated with Alternative 1 or Alternative 2 would not adversely affect socioeconomic characteristics, modes of transportation, and utility demands on Oahu. There is no planned construction or alteration associated with the Navy that would affect the visual quality or any cultural resources in the vicinity. Operations at the site would not generate any waste streams that could impact local water quality.

3.4.1.2.1 Biological Resources (Terrestrial and Offshore)—Ford Island

Appendix C includes a detailed description of biological resources.

Region of Influence

The region of influence is Ford Island and its adjacent waters.

Affected Environment

Vegetation

Vegetation on Ford Island consists mainly of non-native grasses, shrubs, and trees such as kiawe, mangrove, koa haole, Cuban jute, and pitted beardgrass. Non-native ornamental plants are used in housing area landscaping. There are a small number of native plants on the island such as ‘ilima, milo, and ‘uhaloa. (National Oceanic and Atmospheric Administration Pacific Region Center, 2006)

<u>Threatened and Endangered Plant Species</u>

No threatened and endangered plant species have been reported on Ford Island. (National Oceanic and Atmospheric Administration Pacific Region Center, 2006)

Wildlife

Wildlife similar to that described at Pearl Harbor is likely to be found on Ford Island. Two indigenous bird species are found on Ford Island: the black-crowned night heron (‘auku’u) and the Pacific golden plover. (National Oceanic and Atmospheric Administration Pacific Region Center, 2006) Non-native birds such as the myna, house finch, and zebra dove are also found on the island. Mongoose and rodents are present in the region of influence.

Ghost shrimp, mantis shrimp, Samoan and Hawaiian crabs, and clams are members of the soft bottom community. These species are eaten by fish such as the weke pueo (bandtail goatfish), hailepo (spotted eagle ray), and pakii (panther flounder). Piers and pilings around Ford Island are habitat for species such as pualo and manini (surgeonfish), butterflyfish, and goby. The largest concentrations of fish are found around the seaplane ramps along the southeastern corner of the island and around *USS Utah*. The region of influence contains essential fish habitat for juvenile, adult, egg, and larvae life stages for all pelagic and bottom fish and crustaceans. However, no habitat area of particular concern has been designated. (National Oceanic and Atmospheric Administration Pacific Region Center, 2006) Appendix G provides a detailed description, including status, distribution, and habitat preference of managed fisheries.

During surveys conducted in 1999 and 2000, colonies of *Montipora* spp., *Pocillopora damicornis,* and *Leptastrea purpurea* were found at a few scattered locations in the region of influence. While these corals do not constitute a coral reef, they are indicative of improved water quality within the harbor. (National Oceanic and Atmospheric Administration Pacific Region Center, 2006)

<u>Threatened and Endangered Wildlife Species</u>

There is no threatened or endangered terrestrial wildlife on the island. In the past 10 years, there have been four documented green sea turtle sightings within Pearl Harbor. There are no reported sightings of the hawksbill sea turtle and no suitable sea turtle nesting habitat within the region of influence (Smith et al., 2006). There has only been one case of humpback whales in the region of influence, which is discussed in Section 3.4.1.1.1, Naval Station Pearl Harbor. (National Oceanic and Atmospheric Administration Pacific Region Center, 2006)

Environmentally Sensitive Habitat

No critical habitat has been designated in the region of influence.

3.4.1.2.2 Cultural Resources—Ford Island

Appendix C includes a description of cultural resources and the laws and regulations pertaining to them.

Region of Influence

The cultural resources region of influence for Ford Island encompasses the area where a new open-water Acoustic Test Facility would be constructed.

Affected Environment

Underwater Cultural Resources

Ford Island is one of Pearl Harbor's Historic Management Zones. Historically, the development and use of Ford Island served one military purpose: aviation. The island is the only area at the Pearl Harbor Naval Base specifically associated with that "theme" or activity. As a result, the Ford Island Management Zone encompasses all of Ford Island, including the shallow reef areas and coral islets at the north end of the island, and the associated wharves and docks that are attached to the island. It also includes the mooring quays just offshore from the island and the submerged resources near the island such as *USS Utah* and *USS Arizona*. (Helber Hastert & Fee, Planners, 2002)

Archaeological Resources

There is very little specific archival or archaeological information concerning traditional land use or pre-contact events on the island, although some inferences can be made. Given the island's lack of water, there was probably little pre-contact habitation, except short-term occupation for fishing, collecting pili grass, and possible seasonal cultivation of dryland crops, such as gourd and sweet potato. Fisheries adjacent to the island were probably associated with land units on the island, which at the time of the Mahele, was divided between the ahupua'a of Waimalu and Kalauao (Helber Hastert & Fee, Planners, 2002).

Based on previous land use and/or historical information, three areas within the Pearl Harbor Naval Complex may contain intact subsurface deposits beneath historically deposited fill. Although the presence of intact deposits at these locations has not been confirmed through archaeological testing, the three areas include the original lands of Ford Island (including the area where the new Acoustic Test Facility would be constructed), the northwest portion of Pearl City Peninsula, and the Navy's Bishop Point parcel (Helber Hastert & Fee, Planners, 2002).

Historic Buildings and Structures. Within the Ford Island Management Zone there are numerous historic buildings and structures. The facilities are associated with aviation, housing, and recreation. Subtypes include airfield facilities (e.g., control tower, hangars), Officer's Quarters, barracks, a theater, and a Plantation-era seawall in the vicinity of the planned Acoustic Test Facility.

Traditional Resources. Ethnographic information identifies the Pearl Harbor lagoon as a place that was rich in resources and a place associated with sharks; as deities, as a food source, and as a family 'aumakua (family or personal god). Several contemporary Hawaiian sources characterize the lagoon as a "breadbasket" in ancient times, and one source describes Mokuumeume (Ford Island) as the piko or umbilical cord located in the middle of Ka-awa-lau-o-pu'uloa, transferring mana (supernatural or divine power) from one generation to the next. There is one historical reference to the use of the island as a burial place (Helber Hastert & Fee, Planners, 2002)

3.4.1.2.3 Water Resources—Ford Island

Appendix C includes a description of the primary laws and regulations regarding water resources.

Region of Influence

The region of influence for water resources includes Ford Island and the adjacent waters.

Affected Environment

Ford Island is located within Pearl Harbor, which differs from most industrialized harbors in that the surface waters are entirely under the jurisdiction of the Navy, and are dominated by a significant homeport presence of surface ships, submarines, and inactive and reserve vessels. A large shore-based infrastructure has developed around the harbor in response to a historical build-up of the area as a major support base for fleet operations (U.S. Department of the Navy, 1998).

Water temperatures in Pearl Harbor range from an average low of 76°F in the winter to 81°F in September and October (National Oceanographic and Atmospheric Administration, 2006a). The mean tidal range in the harbor is 1.28 ft. The relatively high water temperatures and low volume of tidal exchange combine to result in low dissolved oxygen concentrations within the harbor.

The Department of Health has classified Pearl Harbor as a "Water Quality Limited Segment" due to its high levels of nutrients, suspended solids, and turbidity (Department of Health, 2004) and its chronic inability to meet the State's Water Quality Standards.

3.4.1.3 NAVAL INACTIVE SHIP MAINTENANCE FACILITY, PEARL HARBOR

The Naval Inactive Ship Maintenance Facility, Pearl Harbor inactivates, performs custodial and maintenance duties, and disposes of Naval vessels in the Pacific. Its ship moorings are located in Middle Loch, Pearl Harbor. Middle Loch is bounded by Pearl City Peninsula to the east and Waipio Peninsula to the south and west. Land uses on Pearl City Peninsula include a former sewage treatment plant; the Waiawa Unit of the Pearl Harbor National Wildlife Refuge; Navy family housing; Marine Corps warehouses; and the United States Sea, Air and Land Delivery Vehicle Team ONE (SDVT-One) compound. Other land uses on Waipio Peninsula include a public golf course and soccer park. Figure 2.2.3.5.1-1 shows the location of Naval Inactive Ship Maintenance Facility, Pearl Harbor. The proposed demolition location in Middle Loch is approximately 1,100 ft from the nearest shoreline (Waipio Peninsula). The Navy controls access to the waters of Pearl Harbor, including Middle Loch and the Waipio Peninsula shoreline adjacent to the exercise location. Of the 14 environmental resources considered for analysis, air quality, airspace, cultural resources, geology and soils, health and safety, land use, noise, socioeconomics, transportation, utilities, visual and aesthetics, and water resources are not addressed. Use of this site does not require control of the airspace above this land area. There are no air emission issues from HRC operations associated with this facility. Operations associated with this site adhere to policies and regulations governing health and safety and noise, as discussed in Appendix C. There are no current or proposed operations that could affect, land use, land forms, geology, and associated soils development. The proposed operations associated with Alternative 1 or Alternative 2 would not affect socioeconomic characteristics, modes of transportation, or utilities demand on Oahu. Additionally, there is no planned construction or alteration associated with the Navy that would affect the scenic and visual quality or cultural resources in the area. Operations at the site would not generate any waste streams that could impact local water quality.

3.4.1.3.1 Biological Resources (Offshore)—Naval Inactive Ship Maintenance Facility, Pearl Harbor

Appendix C includes a detailed description of biological resources.

Region of Influence

The region of influence includes Naval Inactive Ship Maintenance Facility, Pearl Harbor and its adjacent waters.

Affected Environment

The Waiawa Unit of the Pearl Harbor National Wildlife Refuge is located on the western boundary of Pearl City Peninsula, adjacent to Middle Loch. The Waiawa Unit is located approximately 2,360 ft northeast of the proposed demolition location (see Figure 2.1-2). The Honouliuli Unit of the Pearl Harbor National Wildlife Refuge is located along the western shoreline of West Loch, over 2 mi from the location of the proposed demolition at Naval Inactive Ship Maintenance Facility, Pearl Harbor. Waipio Peninsula is located between the proposed demolition location and the Honouliuli Unit. Both the Waiawa and Honouliuli Units are managed under a cooperative use agreement between the U.S. Fish and Wildlife Service (USFWS) and the Navy for enhancement of endangered waterbirds. The affected environment of the Naval Inactive Ship Maintenance Facility is similar to that described for Pearl Harbor.

3.4.1.3.2 Hazardous Materials and Waste—Naval Inactive Ship Maintenance Facility, Pearl Harbor

Appendix C includes a discussion of hazardous materials and waste resource laws and regulations.

Region of Influence

The region of influence for hazardous materials and wastes includes the Naval Inactive Ship Maintenance Facility, and the waters adjacent to the facility.

Affected Environment

Naval Inactive Ship Maintenance Facility, Pearl Harbor inactivates, performs custodial and maintenance duties, and disposes of U.S. Naval vessels in the Pacific. Its ship moorings are located in Middle Loch, Pearl Harbor. Navy ships brought to the Naval Inactive Ship Maintenance Facility, Pearl Harbor are defueled upon decommissioning and towed in. Residual fuels remain in the tanks of the ships, with the exception of those that are to be used in sink exercises or artificial reefs. The residual fuel in the tanks and pipes of these ships are removed and disposed of in accordance with Naval Station Pearl Harbor Standard Operating Procedures. In addition, some decommissioned ships contain hazardous materials that are part of the structure of the ship. These materials are also removed and disposed of in accordance with Pearl Harbor. The demolition location in Middle Loch is approximately 1,100 ft from the nearest shoreline (Waipio Peninsula).

3.4.1.3.3 Water Resources—Naval Inactive Ship Maintenance Facility, Pearl Harbor

Appendix C includes a description of the primary laws and regulations regarding water resources.

Region of Influence

The region of influence for water resources includes the Naval Inactive Ship Maintenance Facility, and the waters adjacent to the facility.

Affected Environment

Pearl Harbor is a natural marine water body located on the southern shore of the island of Oahu. It is divided into three lobes or bays, East Loch, Middle Loch, and West Loch. The Naval Inactive Ship Maintenance Facility is located in the Middle Loch, and the demolition location is approximately 1,100 ft from the nearest shoreline.

Pearl Harbor receives inflow from eight streams that enter the harbor from the highly urbanized areas of Honolulu and its suburban areas. The upstream reaches of these streams include multiple uses: agriculture, residential development, commercial and industrial, and storm water discharge. Each of these streams carries a load of sediment, nutrients, and pollutants, depending on the land use and storm water management activities that occur in the watershed. In addition, Pearl Harbor is affected by releases of partially treated sewage effluent.

The Department of Health has classified Pearl Harbor as a "Water Quality Limited Segment" due to its high levels of nutrients, suspended solids, and turbidity (Department of Health, 2004) and its chronic inability to meet the State's Water Quality Standards. The Department of Health lists several locations within Pearl Harbor as impaired waters due to high concentrations of nutrients (nitrogen and phosphorus), turbidity (suspended sediment), and polychlorinated biphenyls. The Navy reported in 1998 and 2001 that copper and nutrient loading were of concern in the harbor, in addition to leachate from anti-fouling paint widely used on ship hulls. The presence of these pollutants can be directly linked to the Navy's long-term use of the harbor and nearby shore facilities (U.S. Department of the Navy, 1998, 2001).

Groundwater

Groundwater aquifers on the island typically consist of deep lenses of fresh water within the basalt bedrock that float on top of a saltwater lens. The two layers remain separate due to the difference in density between fresh water and seawater. Aquifer recharge occurs through infiltration of precipitation, return of irrigation water, and exchange between the underground aquifers.

Groundwater accounts for about 90 percent of the water consumed on Oahu for municipal, industrial, agricultural, and military uses. The numerous hydrogeologic units and aquifer basins yield over 635 million gallons per day. Oahu is more dependent on groundwater than the other Hawaiian Islands (Department of the Army, 2003). There are no groundwater resources in Pearl Harbor.

3.4.1.4 EOD SHORE RANGE—NAVMAG PEARL HARBOR WEST LOCH

The EOD Shore Range is a 2.75-acre facility located within NAVMAG, West Loch, Pearl Harbor. Of the 14 environmental resources considered for analysis, air quality, airspace, hazardous materials and hazardous waste, land use, noise, socioeconomics, transportation, utilities, and visual and aesthetics resources are not addressed. Use of this site does not require control of the airspace above this land area. There are no air emission issues from HRC operations associated with EOD Shore Range. Operations associated with this site adhere to policies and regulations governing hazardous materials and hazardous waste, and noise, as discussed in Appendix C. There are no current or proposed operations that could affect land use, land forms, geology, and associated soils development. The proposed operations associated with Alternative 1 or Alternative 2 would not affect socioeconomic characteristics, modes of transportation, and utility demands on Oahu. Additionally, there is no planned construction or alteration associated with the Navy that would affect the scenic and visual quality in the area.

3.4.1.4.1 Biological Resources (Terrestrial and Offshore)—EOD Shore Range—NAVMAG Pearl Harbor West Loch

Appendix C includes a detailed description of biological resources.

Region of Influence

The region of influence is within and adjacent to the EOD Shore Range.

Affected Environment

This flat, 2.75-acre tract of land is located at an elevation of about 0 to 10 ft above mean sea level, adjacent to the Pearl Harbor Naval Complex. Portions of the site are paved or disturbed.

Vegetation

The vegetation consists of an overstory primarily of non-native kiawe trees (*Prosopis pallida*) with an understory of non-native grasses, primarily buffel grass. Other introduced species in this plant community include koa haole (*Leucaena leucocepala*), panic grasses (*Panicum* sp.), and other non-native grasses such as hurricane grass (*Dicanthium pertusum*) and natal redtop (*Melinus repens*).

Threatened and Endangered Plant Species

The property has been well-surveyed, and no plants listed as threatened or endangered under the Federal Endangered Species Act have ever been reported for the site (U.S. Department of the Navy, 2001).

Wildlife

The wildlife community at West Loch is typical of disturbed vacant lands in Hawaii. A comprehensive bird survey in 1985 identified 21 species on the site, of which only two (Pacific golden plover (*Pluvialis fulva*) and Hawaiian short-eared owl (*Asio flammeus sandwichensis*), or pueo, are native species. Mammals found on the property include the mongoose, rat, house mouse, feral dog, and feral cat, all of which are non-native pests.

Threatened and Endangered Wildlife Species

No animal species listed as threatened or endangered under the Federal Endangered Species Act are known to inhabit the site. The Oahu population of pueo is listed by the State of Hawaii as endangered.

Environmentally Sensitive Habitat

No critical habitat has been designated in the region of influence (Figure 3.4.1.1.1-2).

3.4.1.4.2 Cultural Resources—EOD Shore Range—NAVMAG Pearl Harbor West Loch

Appendix C includes a description of cultural resources and the laws and regulations pertaining to them.

Region of Influence

The region of influence for the EOD Shore Range encompasses a 2.75-acre area where land demolition of ordnance occurs (see Figure 2.2.3.5.1-1). The range falls within the boundary of the Pearl Harbor National Historic Landmark Boundary (International Archaeological Resources Institute, Inc., 2003).

Affected Environment

Archaeological Resources (Prehistoric and Historic)

The EOD Shore Range encompasses approximately 2.75 acres within the greater NAVMAG, West Loch, Pearl Harbor area. The NAVMAG area was surveyed for archaeological resources in 1997 (Jensen, et al., 1997). Undeveloped lands at West Loch contain a wide range of archaeological sites including stone walls, enclosures, mounds, platforms, and modified outcrops and sinkholes. The area of the EOD Shore Range was determined to be devoid of archaeological sites. (International Archaeological Resources Institute, Inc., 2003; Jensen, et al., 1997)

Historic Buildings and Structures

The EOD Shore Range consists of two concrete blast chambers and one concrete safety bunker. Although historic buildings and structures have been identified within the greater NAVMAG area, which is managed as a Pearl Harbor World War II-era Historic Management Zone (International Archaeological Resources Institute, Inc., 2003), the three EOD Shore Range facilities are south of the Management Zone and are not among the identified historic properties (International Archaeological Resources Institute, Inc., 2003).

Traditional Resources

Archaeological, historical, and paleoenvironmental studies conducted within Pearl Harbor Naval Complex have documented sites associated with traditional Hawaiian aquaculture, agriculture, and habitation-related activities; early historic land use activities; and historic military activities (International Archaeological Resources Institute, Inc., 2003). In addition to the types of archaeological sites described above (which could also be considered traditional Hawaiian resources), identified site types include fishponds and former taro/rice fields. The closest identified traditional Hawaiian site is the Okiokiolepe fishpond located along the shoreline approximately 0.5 mi northwest of the EOD Shore Range. The fishpond is individually listed on the National Register (International Archaeological Resources Institute, Inc., 2003).

3.4.1.4.3 Geology and Soils—EOD Shore Range—NAVMAG Pearl Harbor West Loch

Appendix C includes a description of geology and soils.

Region of Influence

The region of influence for the EOD Shore Range includes the surface soils and subsurface geology of the site.

Affected Environment

The ground surface at West Loch is the top of a fossil reef, which has consolidated into limestone. The fossil reef is highly permeable and serves as an aquifer. Below the reef, caprock consisting of terrestrial and marine sediments extend to the top of the basement rock, Koolau basalt. The overall permeability of the caprock is very low, preventing upward seepage of groundwater. The Koolau basalt is composed of layered lava flows. The Hawaiian Agronomics' 1986 report identifies the predominant soils of the West Loch area as Mamala series, or Coral outcrop.

Surface soils on the EOD Range have not been tested. Soils within the EOD pit itself are assumed to be contaminated with detectable concentrations of typical explosives such as RDX (cyclotrimethylenetrinitramine) and TNT (trinitrotoluene) (and their degradation products), and perhaps with other ordnance constituents or byproducts such as heavy metals or perchlorate. The surface topography is such that surface flows are unlikely to convey constituents of concern to nearby surface waters. The caprock under the site limits downward migration of contaminants, effectively containing any such materials in the surface soils.

3.4.1.4.4 Health and Safety—EOD Shore Range— NAVMAG Pearl Harbor West Loch

Appendix C includes a detailed discussion of health and safety resources laws and regulations.

Region of Influence

The region of influence for public health and safety of the EOD Shore Range includes the range and adjacent land and water (Pearl Harbor) areas.

Affected Environment

Navy training operations at the EOD Shore Range could affect public health through releases to the environment (e.g., air, soil, or water) of hazardous constituents. EOD training could affect public safety through inappropriate public proximity to EOD operations. The EOD Shore Range is located within NAVMAG Pearl Harbor, West Loch; however, the public already is excluded due to larger safety concerns associated with the bulk storage of munitions. At present, about 85 training operations are held on this range, or about one to two events per week.

Explosive Safety Quantity Distance Arcs and Explosives

The types and amounts of explosives materials that may be stored in an area are determined by the quantity-distance requirements established by the DoD Explosives Safety Board. Explosive safety quantity-distance (ESQD) arcs, defined by the Naval Sea Systems Command, are used to establish the minimum safe distance between munitions storage areas and habitable structures. To ensure safety, personnel movements are restricted in areas surrounding a magazine or group of magazines. ESQD arcs have been developed for the Navy's munitions storage facilities at NAVMAG Pearl Harbor.

Baseline Conditions

NAVMAG West Loch Branch constrains large land and water areas because its ordnance storage and transfer activities require large ESQD arcs. Land use and personnel occupancy of the lands encumbered by the arcs are strictly limited, particularly around West Loch (U.S. Department of the Navy, 2001). During land operations, gates are locked to secure the area, and warning flags are raised.

The EOD Shore Range is within NAVMAG Lualualei, West Loch. Land demolition training takes place on this range. Training materials, including small quantities of explosives, are brought to the facility, as needed, for each training session. The demolition pit consists of two concrete blast chambers and one concrete safety bunker. The safety arc for the demolition pit is contained entirely within the Shore Range and adjacent, Navy-controlled waters of Pearl Harbor. Current EOD operations thus have no effect on public safety in the nearest public use areas.

3.4.1.4.5 Water Resources—EOD Shore Range—NAVMAG Pearl Harbor West Loch

Appendix C includes a description of the primary laws and regulations regarding water resources.

Region of Influence

The region of influence for public health and safety of the EOD Shore Range includes the range and adjacent land and water (Pearl Harbor) areas.

Affected Environment

Water resources at the EOD Shore Range consist primarily of storm water infiltration and runoff from the site. No streams or other surface water features are present at the site, no well-defined surface hydrology features (e.g., drainage swales) exist, and no potable groundwater aquifer is known to exist there. Rainfall in the Honolulu–Pearl Harbor area averages about 32 inches per year. In an average year, about 7.3 acre-ft of rain water (2.5 ft of rainfall x 2.75 acres) falls on the site. Surface water which does not evaporate or get taken up by vegetation either percolates into the soil or flows off the site into Pearl Harbor. Surface water flows from the site drain into Pearl Harbor. An impermeable capstone limits the downward movement of groundwater, so storm water entering the shallow aquifer under the site tends to move horizontally into Pearl Harbor.

3.4.1.5 LIMA LANDING

Of the 14 environmental resources considered for analysis, air space, air quality, geology and soils, land use, noise, socioeconomics, transportation, utilities, visual and aesthetic, and water resources are not addressed. Use of this site does not require control of the airspace above this land area. There are no air emission issues from HRC operations associated with Lima Landing. Operations associated with this site adhere to policies and regulations governing noise, as discussed in Appendix C. There are no current or proposed operations that could affect land use, land forms, geology, and associated soils development. The proposed operations associated with Alternative 1 or Alternative 2 would not affect socioeconomic characteristics, modes of transportation, and utility demands on Oahu. Additionally, there is no planned construction or alteration associated with the Navy that would affect the scenic and visual quality in the area. Operations at the site would not generate any waste streams that could impact local water quality.

3.4.1.5.1 Biological Resources (Terrestrial and Offshore)—Lima Landing

Appendix C includes a detailed description of biological resources.

Region of Influence

The region of influence for Lima Landing encompasses areas where explosive ordnance disposal would occur.

Affected Environment

Vegetation

Exotic imported grasses and trees maintained by intensive landscaping efforts make up the majority of the vegetative community in the vicinity of Pearl Harbor. Native vegetation, including grasses, trees, and shrubs are present only in small areas. These areas of native vegetation provide control for erosion except under the heaviest rainfall conditions. (U.S. Department of the Navy, Commander THIRD Fleet, 2002)

<u>Threatened and Endangered Plant Species</u>

No threatened or endangered plant species have been identified in the region of influence.

Wildlife

A cooperative agreement for the conservation and management of terrestrial and aquatic resources within Pearl Harbor has been developed with the Navy, USFWS, National Marine Fisheries Service, and the Hawaii Department of Land and Natural Resources. There are no Habitat Areas of Particular Concern in Pearl Harbor. (U.S. Department of the Navy, Commander THIRD Fleet, 2002) Appendix G provides a detailed description, including status, distribution, and habitat preference of managed fisheries.

Threatened and Endangered Wildlife Species

Green sea turtles have been seen in the entrance to Pearl Harbor (Smith et al., 2006). Monk seals have been reported hauled-out on the beach at Iroquois Point housing area. There was a report of a humpback whale and calf entering Pearl Harbor in 1998, which is described in Section 3.4.1.1.1. (U.S. Department of the Navy, Commander THIRD Fleet, 2002)

Threatened and endangered terrestrial species that may occur in the region are similar to those provided in Table 3.4.1.1.1-1.

Environmentally Sensitive Habitat

No environmentally sensitive habitat has been identified in the region of influence.

3.4.1.5.2 Cultural Resources—Lima Landing

Appendix C includes a description of cultural resources and the laws and regulations pertaining to them.

Region of Influence

The region of influence for Lima Landing encompasses areas where explosive ordnance disposal would occur. The range is at the southernmost tip of the EOD Shore Range and within the Pearl Harbor National Historic Landmark Boundary (see Figure 2.2.3.5.1-1).

Affected Environment

Underwater Cultural Resources

There are no known submerged cultural resources within the Lima Landing region of influence.

3.4.1.5.3 Hazardous Materials and Waste—Lima Landing

Appendix C includes a discussion of hazardous materials and waste resource laws and regulations.

Region of Influence

The region of influence for hazardous materials and wastes includes Lima Landing, and the waters adjacent to the range.

Affected Environment

Hazardous Materials

Lima Landing is a small underwater area used for underwater demolition training using small underwater detonations. Training operations at Lima Landing involve transporting (by vehicle and boat), handling, and using small quantities of hazardous materials (e.g., explosives). Explosives charges up to 20 pounds (lb) (net explosive weight) may be detonated on this range. Baseline operations consist of about five training operations per year, resulting in the detonation of up to about 100 lb per year.

Hazardous Waste

The detonations of explosives generate small quantities of explosives residues, metals, and inorganic salts. These hazardous constituents generally disperse into the water column, but some may remain in bottom sediments. The annual quantities of hazardous materials consumed on this range are minute, however, and have no known offsite effects.

3.4.1.5.4 Health and Safety—Lima Landing

Appendix C includes a detailed discussion of health and safety resources laws and regulations.

Region of Influence

The region of influence for Lima Landing for public health and safety includes the range and adjacent portions of Pearl Harbor.

Affected Environment

Lima Landing is a small underwater area just off an abandoned concrete pier at the approach to Pearl Harbor near the entrance of West Loch. Access to the range is via small boats. Underwater demolition training on this range uses small underwater detonations. At present, about five training operations per year occur on this range, or about one every other month.

Procedures for approving an underwater detonation include filing a ”Request for Detonation of Underwater Ordnance” with Commander, Naval Base Pearl Harbor to determine whether the proposed detonation would constitute any danger. Upon concurrence by appropriate commands, Commander, Naval Surface Force, Pacific grants permission to conduct the underwater detonations and concurrently requests issuance of a local Notice to Mariners by the appropriate U.S. Coast Guard District.

Public health and safety risks associated with this training activity include the possible dispersal of hazardous explosives residues in the bay waters, re-suspension of bay sediment contaminants, and possible public proximity to an underwater detonation. The Navy regulates recreational fishing and boating in Pearl Harbor, and allows active duty and retired military personnel in specified areas of the harbor for such purposes. In addition, eligible DoD personnel may launch their own boats from Rainbow Bay, Iroquois Point, or Hickam Marinas, with a permit from the Navy's Pass and Identification office. The Navy permits shore fishing from Navy property by authorized personnel (military and civilian employees of the DoD and their dependents, relatives and guests) from sunrise to sunset. Fishing from boats is limited to permitted vessels and to non-prohibited areas within Pearl Harbor. Prohibited areas identified in the instruction include West Loch (U.S. Department of the Navy, 2001).

Current underwater EOD training operations at Lima Landing thus pose no risk to public safety. Public uses are not permitted within or adjacent to the range, the proximity of authorized personnel is managed and restricted, and range activities are planned and executed so as to contain all effects within the boundaries of the range.

3.4.1.6 PUULOA UNDERWATER RANGE

Of the 14 environmental resources considered for analysis, air quality, airspace, geology and soils, land use, noise, socioeconomics, transportation, utilities, and visual and aesthetics, and water resources are not addressed. Use of this site does not require control of the airspace above this land area. There are no air emission issues from HRC operations associated with Puuloa. Operations associated with this site adhere to policies and regulations governing noise, as discussed in Appendix C. The proposed operations associated with Alternative 1 or Alternative 2 would not affect socioeconomic characteristics, modes of transportation, or utilities demand on Oahu. Operations at the site would not generate any waste streams that could impact local water quality. Additionally, there is no planned construction or alteration associated with the Navy that would affect the scenic and visual quality of the site, land forms, geology, and associated soils development.

3.4.1.6.1 Biological Resources (Offshore)—Puuloa Underwater Range

Appendix C includes a detailed description of biological resources.

Region of Influence

The region of influence includes the underwater range and adjacent waters.

Affected Environment

Vegetation

Seaweed is very abundant in the offshore areas (U.S. Department of the Navy, Commander THIRD Fleet, 2002).

<u>Threatened and Endangered Plant Species</u>

No threatened or endangered plant species have been observed in the region of influence.

Wildlife

Humpback whales and Hawaiian monk seals are occasionally reported in the area outside of the Pearl Harbor Entrance Channel but are not resident in the area (Smith et al., 2006). The green sea turtle is commonly sighted in this area (Smith et al., 2006).

A benthic survey conducted in 2001 in proximity and depth range to the Puuloa Underwater Range indicated that corals ranged from locally abundant on the northern inshore reef slope at Ewa Beach (Figure 3.4.1.1.1-1) to uncommon on the broad sandy slopes on the south (seaward) side of the surveyed area. Coral coverage ranged from 80 to 90 percent at depths between 9.7 and 13 fathoms to less than 1 percent in water depths from 13 to 20 fathoms. The coral community was dominated by *Pocillopora meandrina*, *Porites lobata,* and *Porites compressa* (U.S. Department of the Navy, Commander THIRD Fleet, 2002).

Coastal waters of the Ewa Plain receive nutrient rich water from springs below sea level. The nutrients in this water come from upland agricultural fertilization, leaching from cesspools and septic tanks, domestic waste injection wells, and urban application of fertilizers. These extra nutrients promote the growth of benthic algae (limu). A few species of reef fish are present in low numbers in the littoral waters (U.S. Department of the Navy, Commander THIRD Fleet, 2002).

Fish species are diverse and abundant and generally associated with the deeper (greater than 20 fathoms) areas containing coral coverage and vertical relief. This type of area has been designated by the National Oceanic and Atmospheric Administration as Habitat Areas of Particular Concern. The most common families represented are surgeonfishes (acanthurids), butterflyfishes (chaetodontids), damselfishes (pomacentrids), wrasses (labrids), triggerfishes (balistids) and moorish idols (zanclidae) (U.S. Department of the Navy, Commander THIRD Fleet, 2002). Appendix G provides a detailed description, including status, distribution, and habitat preference of managed fisheries.

<u>Threatened and Endangered Species</u>

Nine marine wildlife species listed as Federal and State threatened or endangered species are known or suspected to exist in Hawaiian waters, although the offshore environment at Puuloa may be too shallow for frequent use. These species include the Hawaiian monk seal, blue whale, fin whale, humpback whale, sei whale, sperm whale, hawksbill turtle, green sea turtle, and loggerhead sea turtle. Section 3.1.2 includes a description of these listed species. (U.S. Department of the Navy, Commander THIRD Fleet, 2002)

Environmentally Sensitive Habitat

No environmentally sensitive habitat has been identified.

3.4.1.6.2 Cultural Resources—Puuloa Underwater Range

Appendix C includes a description of cultural resources and the laws and regulations pertaining to them.

Region of Influence

The region of influence for the Puuloa Underwater Range encompasses areas where explosive ordnance disposal would occur.

Affected Environment

Underwater Cultural Resources

There are no known submerged cultural resources within the Puuloa Underwater Range region of influence.

3.4.1.6.3 Hazardous Materials and Waste—Puuloa Underwater Range

Appendix C includes a discussion of hazardous materials and waste resource laws and regulations.

Region of Influence

The region of influence for hazardous materials and wastes includes the range and adjacent ocean waters.

Affected Environment

Hazardous Materials

Puuloa Underwater Range is used for underwater demolition training using small underwater detonations. Training operations on Puuloa Underwater Range involve transporting (by vehicle and boat), handling, and using small quantities of hazardous materials (e.g., explosives). Explosives charges up to 20 lb (net explosive weight) may be detonated on this range.

Hazardous Waste

The detonations of explosives generate small quantities of explosives residues, metals, and inorganic salts. These hazardous constituents generally disperse into the water column, but some may remain in bottom sediments. The annual quantities of hazardous materials consumed on this range are very small, however, and have no known offsite effects.

3.4.1.6.4 Health and Safety—Puuloa Underwater Range

Appendix C includes a detailed discussion of health and safety resources laws and regulations.

Region of Influence

The region of influence for public health and safety includes the footprint of the range and adjacent ocean areas.

Affected Environment

Puuloa Underwater Range is a 1 square nautical mile (nm^2) area in the open ocean outside and to the west of the entrance to Pearl Harbor. The range lies well offshore under the Surface Danger Zone of the Marine Corps' Puuloa Firing Range. The range is used for training in underwater demolition and special warfare operations.

Public health and safety risks associated with this training activity include the possible dispersal of hazardous explosives residues in ocean waters, re-suspension of bottom sediment contaminants, and possible public proximity to an underwater detonation.

Public uses are not permitted within the range, and range activities are planned and executed so as to contain all effects within the boundaries of the range. Underwater detonations must be approved through the Navy chain-of-command, as described above for Lima Landing, with the issuance of a local Notice to Mariners. Thus, current underwater EOD training operations at Puuloa Underwater Range pose no risk to public safety.

3.4.1.7 NAVAL DEFENSIVE SEA AREA

Of the 14 environmental resources considered for analysis, air quality, airspace, geology and soils, land use, noise, socioeconomics, transportation, utilities, and visual and aesthetics, and water resources are not addressed. Use of this site does not require control of the airspace above this land area. There are no air emission issues from HRC operations associated with the Naval Defensive Sea Area. Operations associated with this site adhere to policies and regulations governing noise, as discussed in Appendix C. The proposed operations associated with Alternative 1 or Alternative 2 would not affect socioeconomic characteristics, modes of transportation, or utilities demand on Oahu. Operations at the site would not generate any waste streams that could impact local water quality. Additionally, there is no planned construction or alteration associated with the Navy that would affect the scenic and visual quality of the site, land forms, geology, and associated soils development.

3.4.1.7.1 Biological Resources (Offshore)—Naval Defensive Sea Area

Appendix C includes a detailed description of biological resources.

Region of Influence

The region of influence includes the Naval Defensive Sea Area and its adjacent waters.

Affected Environment

Vegetation

Seaweed is very abundant in the offshore areas (U.S. Department of the Navy, Commander THIRD Fleet, 2002).

<u>Threatened and Endangered Plant Species</u>

No threatened or endangered plant species have been observed in the region of influence.

Wildlife

Humpback whales and Hawaiian monk seals are occasionally reported in the Naval Defensive Sea Area but are not resident in the area (Smith et al., 2006). The green sea turtle is commonly sighted in this area (Smith et al., 2006).

A fairly large spur-and-groove reef is found adjacent to the runway of the Honolulu International Airport and on the insular shelf beyond the fore reef. The reef is oriented east-west and is approximately 9,190 ft long and 1,770 ft wide (NOAA 2003). This reef extends further eastward from the airport area toward Waikiki Beach covering an approximate distance of 5.4 miles. Contrary to the NOAA (2003) data, moderately developed spur and groove reefs do occur on either side of the Pearl Harbor entrance channel, including Tripod Reef and Ahua Reef (Smith, personal communication).

Coastal waters of the Ewa Plain receive nutrient rich water from springs below sea level. The nutrients in this water come from upland agricultural fertilization, leaching from cesspools and septic tanks, domestic waste injection wells, and urban application of fertilizers. These extra nutrients promote the growth of benthic algae (limu). A few species of reef fish are present in low numbers in the littoral waters (U.S. Department of the Navy, Commander THIRD Fleet, 2002).

Fish species are diverse and abundant and generally associated with the deeper (greater than 20 fathoms) areas containing coral coverage and vertical relief. This type of area has been designated by the National Oceanic and Atmospheric Administration as Habitat Areas of Particular Concern. The most common families represented are surgeonfishes (acanthurids), butterflyfishes (chaetodontids), damselfishes (pomacentrids), wrasses (labrids), triggerfishes (balistids) and moorish idols (zanclidae) (U.S. Department of the Navy, Commander THIRD Fleet, 2002). Appendix G provides a detailed description, including status, distribution, and habitat preference of managed fisheries.

Threatened and Endangered Species

Nine marine wildlife species listed as Federal and State threatened or endangered species are known or suspected to exist in Hawaiian waters. These species include the Hawaiian monk seal, blue whale, fin whale, humpback whale, sei whale, sperm whale, hawksbill turtle, green sea turtle, and loggerhead sea turtle. Section 3.1.2 includes a description of these listed species. (U.S. Department of the Navy, Commander THIRD Fleet, 2002)

Environmentally Sensitive Habitat

No environmentally sensitive habitat has been identified.

3.4.1.7.2 Cultural Resources—Naval Defensive Sea Area

Appendix C includes a description of cultural resources and the laws and regulations pertaining to them.

Region of Influence

The region of influence for the Naval Defensive Sea Area encompasses areas where an underwater training area in which Mobile Diving and Salvage Unit ONE can conduct military diving and salvage training.

Affected Environment

Underwater Cultural Resources

There are no known submerged cultural resources within the Naval defensive Sea Area region of influence.

3.4.1.7.3 Health and Safety—Naval Defensive Sea Area

Appendix C includes a detailed discussion of health and safety resources laws and regulations.

Region of Influence

The region of influence for public health and safety includes the footprint of the Naval Defensive Sea Area and adjacent ocean areas.

Affected Environment

Pearl Harbor is a restricted area. No vessels are allowed into Pearl Harbor without permission of Commander Naval Region Hawaii. The restricted area extends outward from the mouth of the harbor and is defined by a rectangular-shaped boundary known as the Naval Defensive Sea Area. The Navy regulates recreational fishing and boating in Pearl Harbor, and allows active duty and retired military personnel in specified areas of the harbor for such purposes. Fishing from boats is limited to permitted vessels and to non-prohibited areas within Pearl Harbor. Permission to enter Pearl Harbor must be obtained in advance from Commander, Naval Base, Pearl Harbor, Hawaii

3.4.2 U.S. COAST GUARD AIR STATION BARBERS POINT/KALAELOA AIRPORT

Of the 14 environmental resources considered for analysis, air quality, cultural resources, geology and soils, hazardous materials and hazardous waste, health and safety, land use, socioeconomics, transportation, utilities, visual and aesthetics and water resources are not addressed. There are no air emission issues from HRC operations associated with Coast Guard Air Station Barbers Point/Kalaeloa Airport. Operations associated with this site adhere to policies and regulations governing hazardous materials and hazardous waste, and health and safety, as discussed in Appendix C. There are no current or proposed operations that could affect land use, land forms, geology, and associated soils development. The proposed operations associated with Alternative 1 or Alternative 2 would not affect socioeconomic characteristics, modes of transportation, or utilities demand on Oahu. There is no planned construction or alteration associated with the Navy that would affect the visual quality or any cultural resources in the vicinity. Operations at the site would not generate any waste streams that could impact local water quality.

3.4.2.1 AIRSPACE—U.S. COAST GUARD AIR STATION BARBERS POINT/KALAELOA AIRPORT

Appendix C includes a detailed description of airspace.

Region of Influence

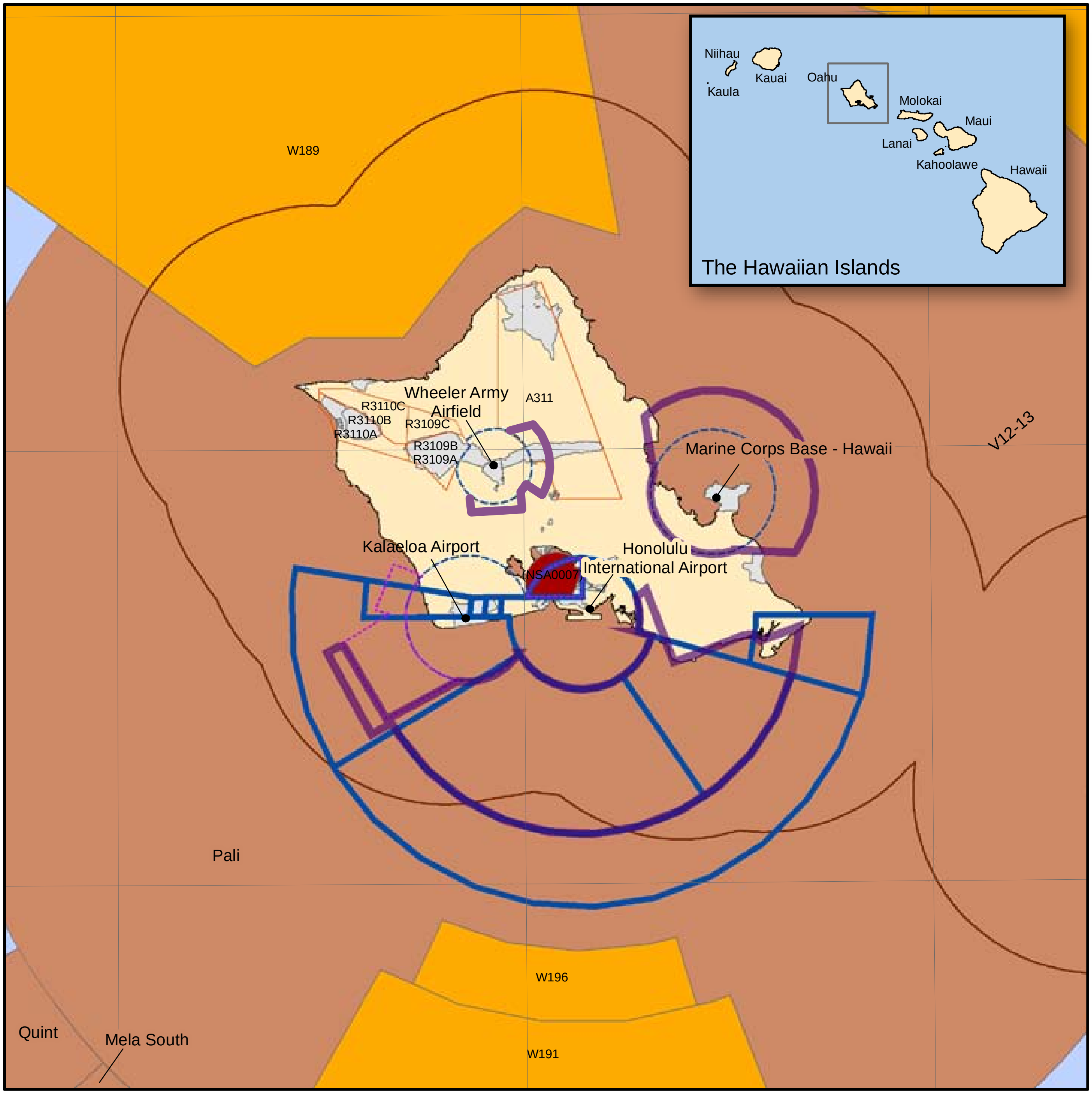
Based on the Rim of the Pacific Exercise (RIMPAC), aircraft operations include space for the various types of aircraft, equipment for refueling and maintenance. The use of U.S. Coast Guard Air Station Barbers Point by aircraft during RIMPAC would be secondary and would fall within the day-to-day coordination for the movement of equipment and supplies.

The use of U.S. Coast Guard Air Station Barbers Point by aircraft during RIMPAC would be coordinated as part of the biennial planning process during three planning conferences leading up to the RIMPAC exercise. Due to the level and extent of planning involved, and the minimal potential for significant impacts, airspace has not been evaluated under the RIMPAC EAs (U.S. Department of the Navy, 2006; 2004; 2002; 2000).

The region of influence is the airspace above U.S. Coast Guard Air Station Barbers Point and Kalaeloa Airport. This area is within the area described for Hickam AFB. Figure 3.4.2.1-1 shows a view of the airspace above Oahu including U.S. Coast Guard Air Station Barbers Point.

Affected Environment

Search and rescue is the primary mission of U.S. Coast Guard Air Station Barbers Point within the Pacific Maritime Region. As the sole U.S. Coast Guard Air unit in this area of the Pacific, U.S. Coast Guard Air Station Barbers Point is responsible for a vast area including such island chains as the Hawaiian, Marianas, Carolines, and Marshalls. To accomplish its assigned missions, the U.S. Coast Guard uses four Aerospatiale HH-65A “Dolphin” short range recovery helicopters and four Lockheed HC-130H “Hercules” long range search aircraft.



EXPLANATION

Airway	Restricted Airspace
Class E Airspace with Floor at the Surface	12-Nautical Mile Territorial Limit
Class E Airspace with Floor 700-Feet Above Surface	National Security Area
Class B Airspace	Air Traffic Control Assigned Airspace (ATCAA)
Class D Airspace	Pacific Missile Range Facility (PMRF) Warning Area
Oahu Warning Area	
Installation Area	
Land	

NORTH

0 5 10 20 Nautical Miles

Airspace Use Surrounding Oahu, Hawaii

Oahu, Hawaii

Figure 3.4.2.1-1

The affected airspace use environment in the U.S. Coast Guard Air Station Barbers Point region of influence is described below in terms of its principal attributes: controlled and uncontrolled airspace, special use airspace, en route airways and jet routes, and airports and airfields. There are no military training routes in the region of influence.

Controlled and Uncontrolled Airspace

The airspace within the region of influence consists of the airspace above Kalaeloa Airport which includes Class D, surface Class E, and Class E airspace with a floor 700 ft above the surface (see Figure 3.4.2.1-1). Honolulu International Airport Class B airspace is located partially within and above the Kalaeloa airport airspace.

Special Use Airspace

The only special use airspace in the region of influence (see Figure 3.4.2.1-1) is the Pali Air Traffic Control Assigned Airspace that is in effect above the entire Oahu area from flight level (FL) 250 (25,000 ft) to unlimited. The Pali airspace is scheduled through the Navy FACSFAC Pearl Harbor who then coordinates with the FAA Honolulu Combined Facility.

En Route Airways and Jet Routes

The closest IFR en route low altitude airways are V-12 and V-15, which passes directly over the airfield and V-4, which passes above the Kalaeloa Class D and E airspace.

Airports and Airfields

Wheeler Army Airfield is located 10 nautical miles (nm) to the north and Honolulu International Airport is located 8 nm to the east.

3.4.2.2 BIOLOGICAL RESOURCES (TERRESTRIAL AND OFFSHORE)—U.S. COAST GUARD AIR STATION BARBERS POINT/KALAELOA AIRPORT

Appendix C includes a detailed description of biological resources.

Region of Influence

The region of influence includes the installation and its offshore waters.

Affected Environment

Vegetation

U.S. Coast Guard Air Station Barbers Point occupies a portion of the 750-acre Kalaeola Airport. As such, there are few biological resources associated directly with the facility. Open areas are grassed and maintained. Pua pilo (*Capparis sandwichiana* var. *zoharyi*), a Federal species of concern endemic shrub is located in the southwestern corner of Kalaeloa (State of Hawaii, 2006).

Threatened and Endangered Plant Species

The endemic, endangered ‘akoko shrub (*Chamaesysce skottsbergii*) occurs in at least three locations, including east of the airfield. The endangered round-leafed chaff-flower (*Achyranthes splendens* var. *rotundata*) is located in the southwest corner of Kalaeloa. (State of Hawaii, 2006)

Wildlife

The Kalaeloa Airport is used by birds, feral dogs and cats, rodents, and mongoose. Birds are the most common form of wildlife on the site and include the black-crowned night heron, great frigate bird, Pacific golden plover, sanderling, wandering tattler, ruddy turnstone, zebra dove, Japanese white-eye, northern cardinal, red-crested cardinal, and vented bulbul. (U.S. Department of the Navy, Commander THIRD Fleet, 2002; State of Hawaii, 2001)

The State endangered Hawaiian short-eared owl, which is Federally listed as a Species of Concern may occur over the range (State of Hawaii, 2006).

Threatened and Endangered Wildlife Species

Ordy Pond, an anchialine (marine) pond east of the airfield; the coastal salt flats between Runway 4R-22L and Taxiway K; and also the western boundary of Kalaeloa are frequented by the endangered Hawaiian black-necked stilt and migratory birds. (State of Hawaii, 2006)

The threatened green sea turtle is known to frequent the area immediately offshore (State of Hawaii, 2006).

Environmentally Sensitive Habitat

No environmentally sensitive habitat has been identified in the region of influence.

3.4.3 MARINE CORPS BASE HAWAII (MCBH)

Of the 14 environmental resources considered for analysis, air quality, geology and soils, hazardous materials and hazardous waste, health and safety, land use, socioeconomics, transportation, utilities, visual and aesthetics and water resources are not addressed. Under the No-action Alternative, Alternative 1, or Alternative 2, there would be no air emissions generated at MCBH other than that from an occasional aircraft operation. The aircraft operations would not change regional air quality. The site does not affect the existing airspace structure in the region. Operations associated with MCBH adhere to policies and regulations governing hazardous materials and waste, and health and safety, as discussed in Appendix C. Geology and soils impacts would be limited to short-term minor disturbance of beach sand and near-shore ocean floor along existing Expeditionary Assault access routes. Water resources would not be affected by the training exercises which, after moving from the beach would primarily occur in developed areas on MCBH. The proposed operations associated with Alternative 1 or Alternative 2 would not affect socioeconomic characteristics, modes of transportation, and utility demands on Oahu. There are no current or proposed operations that could affect land use. There is no planned construction or alteration associated with the Navy that would affect the visual quality of the area.

3.4.3.1 AIRSPACE—MCBH

Appendix C includes a detailed description of airspace.

Region of Influence

Based on RIMPAC, aircraft support includes space for the various types of aircraft, equipment for refueling and maintenance. U.S. and foreign aircraft (fixed wing, rotary, and airship) would be supported from several locations. For a typical RIMPAC, approximately 20 aircraft would be supported at MCBH. Housing would be provided at the installation.

The use of MCBH by aircraft during RIMPAC would be coordinated as part of the biennial planning process during three planning conferences leading up to the RIMPAC exercise. Due to the level and extent of planning involved, and the minimal potential for significant impacts, airspace has not been evaluated under the RIMPAC Environmental Assessments (EAs) (U.S. Department of the Navy, 2006; 2004; 2002; 2000).

The MCBH region of influence includes the Class D and Class E airspace (defined in Appendix C) above MCBH. Figure 3.4.2.1-1 shows a view of the airspace above Oahu including MCBH.

Affected Environment

The affected airspace use environment in the MCBH region of influence is described below in terms of its principal attributes: controlled and uncontrolled airspace, special use airspace, en route airways and jet routes, and airports and airfields. There are no military training routes in the region of influence.

Controlled and Uncontrolled Airspace

The airspace within the region of influence consists of the airspace above MCBH which includes Class D, and Class E airspace with a floor 700 ft above the surface. No Class B (U.S. terminal control areas) airspace, which usually surrounds the nation's busiest airports, or Class C airspace is found in the MCBH region of influence.

Special Use Airspace

The only special use airspace in the region of influence (see Figure 3.4.2.1-1) is the Pali Air Traffic Control Assigned Airspace that is in effect above the entire Oahu area from FL 250 (25,000 ft) to unlimited. The Pali airspace is scheduled through the Navy Fleet Area Control and Surveillance Facility (FACSFAC) Pearl Harbor who then coordinates with the Federal Aviation Administration (FAA) Honolulu Combined Facility.

En Route Airways and Jet Routes

The closest IFR en route low altitude airways are V-12-13 and V-15, which pass outside the region of influence approximately 10 nm southeast of MCBH.

Airports and Airfields

MCBH is surrounded by Class D airspace that extends from the surface to 2,500 ft. The Class E airspace extension to the north and east has a floor 700 ft above the surface. Honolulu International Airport is located southeast of MCBH, outside the region of influence.

3.4.3.2 BIOLOGICAL RESOURCES (TERRESTRIAL AND OFFSHORE)—MCBH

Appendix C includes a detailed description of biological resources.

Region of Influence

The region of influence includes the installation and adjacent waters.

Affected Environment

Vegetation

Dune vegetation consists of naupaka thickets interspersed with clusters of sea grape. Along the seaward side of the naupaka is a mat of beach dropseed grass (aki'aki) and morning glory (pohuehue). Ironwood trees are also present at the Hale Koa/West Field landing area. The terrestrial habitat typically consists of sparse ground cover composed of indigenous grasses and shrubs. Most of the vegetation on MCBH is dominated by introduced species. (U.S. Department of the Navy, Commander THIRD Fleet, 2002) Seagrass (*Halophila ovalis*) is located in the Hale Koa Beach/West field area.

Threatened and Endangered Plant Species

No threatened or endangered plants have been observed at MCBH.

Wildlife

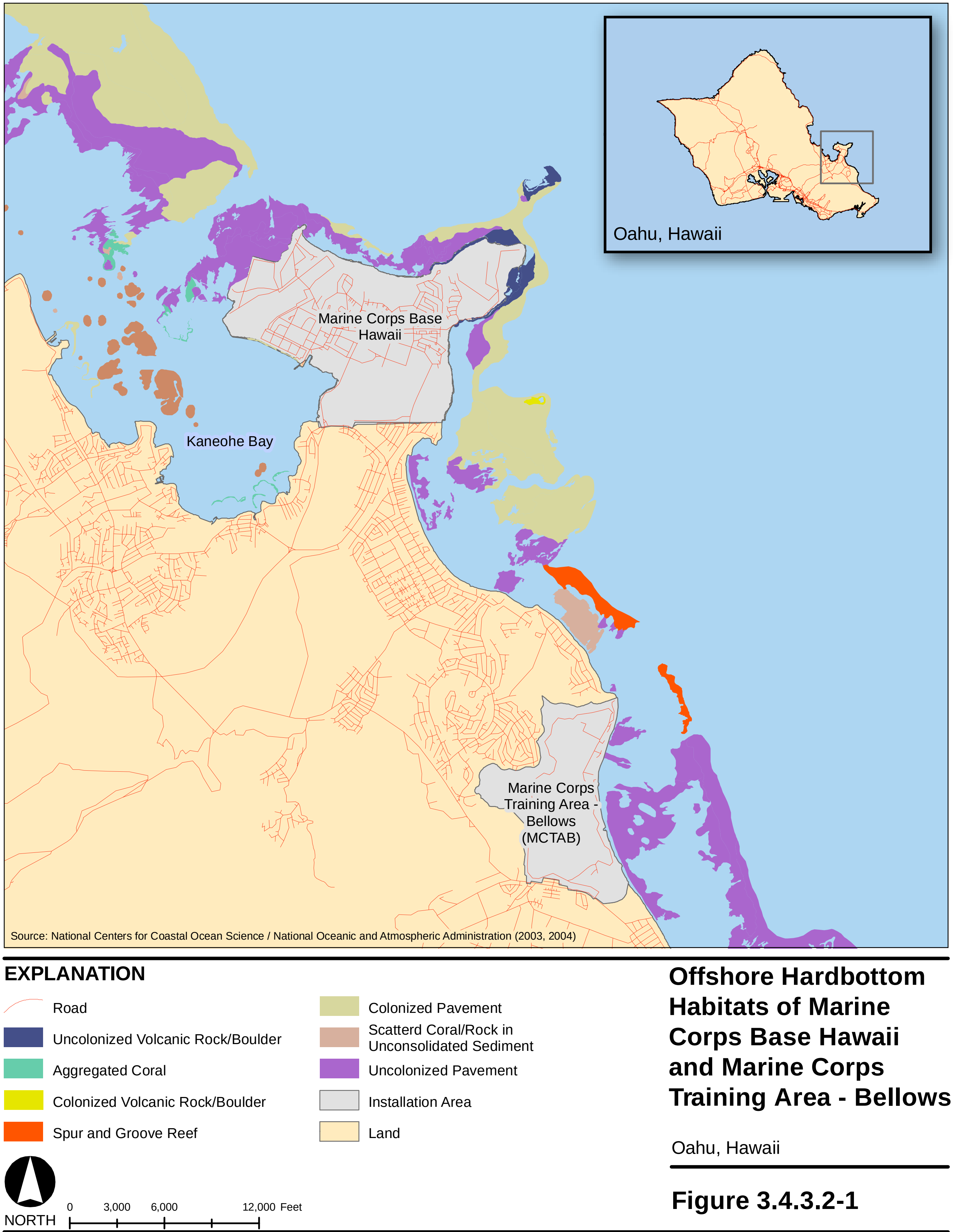
Migratory birds such as the Pacific golden-plover and ruddy turnstone have been observed foraging and resting on the landing beaches. Seabirds, including the great frigate bird (‘iwa) and brown noddy have been seen foraging offshore. (U.S. Department of the Navy, Commander THIRD Fleet, 2002)

A red-footed booby nesting colony consisting of over 3,000 birds is located on the cliffs of the 23-acre Ulupau Wildlife Management Area. Wedge-tailed shearwaters and black-crowned night herons (‘auku’u) are also found in the area. (U.S. Fish and Wildlife Service, 2005; Marine Corps Base Hawaii, 2002; Sierra Club, not dated)

The offshore area at Pyramid Rock Beach is composed primarily of sand and exposed, barren basalt with limited coral coverage by small colonies of cauliflower coral (*Pocillopora meandrina*). The Expeditionary Assault landing site is within an area with a wide sand channel that extends several hundred yards offshore. At Fort Hase Beach, the seafloor is composed of a flat limestone platform dominated by brown algae (*Distyopteris australis*). Sparse colonies of live coral (less than 10 percent coverage) occur in deeper waters offshore. (U.S. Department of the Navy, Commander THIRD Fleet, 2002)

The following information on corals is summarized from the more extensive data provided in Appendix G. In Kaneohe Bay a narrow reef crest is located approximately 0.5 nm offshore that consists of uncolonized pavement. Seaward of the reef crest a fore reef and slope are covered by colonized pavement. The colonized pavement is approximately 3.8 nm long and 1 nm wide running more or less parallel to the shoreline in a northwest to southeast direction. Aggregated coral heads are located on the back reef and isolated patch reefs occur on the reef flat shoreward of the back reef. The patch reefs range in size from 230 ft in diameter to an area of 2,953 ft by 1,968.5 ft (Figure 3.4.3.2-1). Three of the patch reefs encircle Kapapa Island, Ahu o Laka Island, and Mokuoloe Island. The largest patch reef encircles Mokuoloe Island. At the southern end of Kaneohe Bay off of Kokokahi and Keaalu, there are three narrow reefs (each approximately 131 ft wide) made of aggregated coral heads. The lengths of these reefs range from 1,148 to 2,297 ft; (Figure 3.4.3.2-1). The back reef zone to the northeast of the Kaneohe Marine Corps Airfield contains three reefs made of aggregated coral heads located approximately 2,297 to 3281 ft from the shore and the reef farthest north measures approximately 328 ft by 1,640 ft. The other two reefs are relatively narrow (less than 98 to 328 ft wide and up to 4,593 ft long) (Figure 3.4.3.2-1).

In 1998, the most common coral species within the Kaneohe Bay was *Porites compressa*, a species that since it is not wave resistant occurs in protected embayments. Other common coral species of Kaneohe Bay are *Montipora verrucosa*, *Pocillopora damicornis*, *Cyphastrea ocellina*, *Pavona varians*, and *Fungia scutaria*. The most common coral species on the seaward side of the barrier reef of Kaneohe Bay are *Porites lobata* and *Pocillopora meandrina*. Both species are resistant to high energy environments; mean coral cover on the barrier reef ranges from 5 to 10 percent. In 2002, the overall range of coral cover at six sites of Kaneohe Bay was 2.5 percent to 67.5 percent.



Offshore Hardbottom Habitats of Marine Corps Base Hawaii and Marine Corps Training Area - Bellows

Oahu, Hawaii

Figure 3.4.3.2-1

<u>Threatened and Endangered Wildlife Species</u>

Threatened and Endangered species in the MCBH region are listed in Table 3.4.3.2-1. The koloa maoli (Hawaiian duck), 'alae ke'oke'o (Hawaiian coot), and ‘alae ‘ula (Hawaiian common moorhen) have been observed at the base wetlands. The ae’o (Hawaiian stilt) nests on mud mounds in the region of influence and feeds on insects, worms, and crustaceans uncovered by Marine amphibious assault vehicles. Marines of the amphibious-assault vehicle platoon churn up the mud of wetlands in the 482-acre Nuupia Ponds Wildlife Management Area once a year. These tracked vehicles flatten invasive pickleweed that threaten to choke off the ponds, and create the same terrain that is preferred by this endangered bird. (U.S. Department of the Air Force, 2003; Sierra Club, 2006)

Table 3.4.3.2-1. Listed Species Known or Expected to Occur in the Marine Corps Base Hawaii Region

Scientific Name	Common Name	Federal Status
Reptiles		
Chelonia mydas	Green sea turtle	T
Eretmochelys imbricata	Hawksbill sea turtle	E
Birds		
Anas wyvilliana	Koloa maoli (Hawaiian duck)	E
Fulica americana alai	'Alae ke'oke'o (Hawaiian coot)	E
Gallinula chloropus sandvicensis	‘Alae ‘ula (Hawaiian common moorhen)	E
Himantopus mexicanus knudseni	Ae'o (Hawaiian black-necked stilt)	E
Pterodroma phaeopygia sandwichensis	‘Ua’u (Hawaiian dark-rumped petrel)	E
Puffinus auricularis newelli	‘A’o (Newell's Townsend’s shearwater)	T
Mammals		
Megaptera novaeangliae	Humpback whale	E
Monachus schauinslandi	Hawaiian monk seal	E
Physeter catodon	Sperm whale	E

Source: U.S. Department of the Air Force, 2003; U.S. Fish and Wildlife Service, 2006

NOTES:

T Threatened
E Endangered

Threatened green sea turtles frequent the inshore waters at all three landing beaches, and are especially abundant in the Hale Koa Beach/West field area where they forage on seagrass (*Halophila ovalis*). The endangered Hawaiian monk seal has occasionally hauled out on Pyramid Rock Beach. In 1996, a monk seal gave birth on a small beach near recreational cabins north of West Field. Migrating endangered humpback whales occur in deeper offshore waters during winter months, often coming close to shore at Pyramid Rock Beach. (U.S. Department of the Navy, Commander THIRD Fleet, 2002)

Environmentally Sensitive Habitat

No critical habitat has been designated on MCBH (Figure 3.4.3.2-2). Wetlands include the Nuupia Ponds complex at the southern boundary of the base. Approximately 22 acres of invasive mangrove stands have been removed from Nuupia Pond since the early 1980s. There

EXPLANATION

- Road
- Critical Habitat
- Wetland Area
- Installation Area
- Land

NORTH

0 0.5 1 2 Miles

Critical Habitat - Eastern Oahu, Hawaii

Oahu, Hawaii

Figure 3.4.3.2-2

are also several ephemeral ponds and marshes that provide short-lived habitat for wildlife after rainfall. (U.S. Department of the Air Force, 2003)

3.4.3.3 CULTURAL RESOURCES—MCBH

Appendix C includes a description of cultural resources and the laws and regulations pertaining to them.

Region of Influence

The region of influence for cultural resources at MCBH encompasses locations where Humanitarian Assistance/Disaster Relief (HA/DR) operations will occur. About 700 acres of MCBH's total properties are the focus of cultural resources management. Approximately 550 of the 700 acres are at Mokapu, including the Nuupia Ponds and Mokapu Burial Area (Natural Resources Conservation, 2006).

Affected Environment

Underwater Cultural Resources

Underwater cultural resources within the offshore waters of MCBH include numerous shipwrecks and several Hawaiian fishponds (see Figures 3.1.3-2 and 3.4.1.1.2-1).

Archaeological Resources (Prehistoric and Historic)

Baseline cultural resources surveys completed in 1981 and 1986 were updated and the data included in the Mokapu Cultural Resources Management Plan (1997). As part of the update, a Cultural Resources Assessment of the MCBH was performed in May 1997. The report indicated that Hale Koa/West Field Beach was created with dredged fill during World War II and contains no cultural resources or human remains. Hale Koa/West Field's additional runway was created with fill as part of the World War II base expansion and has no potential for cultural resources or the discovery of human remains. The Pyramid Rock Beach landing and staging areas contain no known cultural resources or human remains. The landing and staging areas at Fort Hase Beach are within a zone classified as having a low archaeological sensitivity. A ground-penetrating radar survey of the landing and staging areas detected no cultural deposits or burials and confirmed that the areas were previously disturbed (Yamada, 2002; U.S. Department of the Navy, Commander, Third Fleet, 2002).

Archaeological sites identified at MCBH include the Nuupia Ponds; the Mokapu Burial Area, which is listed in the National Register; approximately 27 pre-contact or early-contact Hawaiian sites; and 45 post-contact sites that cover the period from early Hawaiian through World War II (Natural Resources Conservation, 2006).

Historic Buildings and Structures

Historic buildings, structures, and other features under the control of MCBH include (Natural Resources Conservation, 2006).

- Hangar 101 and Seaplane Ramps. Located on the Kaneohe Bay shoreline, Hangar 101 and its associated seaplane ramps are a designated National Historic Landmark. The facilities once supported the Navy's PBY Catalina patrol plane fleet and were bombed minutes before the December 7, 1941 attack on Pearl Harbor.

- Aircraft Parts. Kaneohe Bay waters and Ulupau Crater ravines harbor the wreckage of aircraft downed during the December 7, 1941 attack on Pearl Harbor.
- Battery Pennsylvania at Ulupau Crater Head. Battery Pennsylvania is a World War II fortification that has been determined eligible for inclusion in the National Register. Seven stories deep, this massive reinforced concrete gun emplacement supported a turret with 14-inch guns from the sunken battleship, *USS Arizona*.

Traditional Resources

Archival research and oral histories verify Mokapu as inspiration for many Hawaiian stories, songs, dance, and religious ceremonies. The exact translation of the word Mokapu is not confirmed; however, it could be a contraction of moku (district or island) and kapu (sacred or forbidden).

3.4.3.4 NOISE—MCBH

Appendix C includes a definition of noise and the main regulations and laws that govern it.

Region of Influence

The region of influence for MCBH is the area within and surrounding MCBH in which humans and wildlife may suffer annoyance or disturbance from noise levels from the proposed operations at MCBH.

Affected Environment

The primary source of noise at MCBH is the neighboring military landing field. Helicopter and aircraft activities and amphibious training occur regularly at the landing field. During active runway use or amphibious training, noise levels typically range between 70 and 75 dBA. During periods of no runway use or training, the noise levels are equal to or less than 55 dBA during the day and fall to less than 45 dBA during the evening and night hours. The nearest sensitive noise receptor is Hale Koa Beach, approximately 328 ft southeast of helicopter landing areas and 2,198 ft northwest of an active runway. Noise levels at Hale Koa Beach are similar to the noise levels described at MCBH. (U.S. Department of the Navy, Commander THIRD Fleet, 2002)

MCBH has established noise controls to protect base personnel and the community, including establishing flight patterns and airfield operation schedules that satisfy the community and support mission operations. In addition, a community notification plan for all short-term training operations that may increase noise levels is followed.

Wildlife receptors for the MCBH area are detailed in Section 3.4.3.2, Biological Resources (Terrestrial and Offshore).

3.4.4 MARINE CORPS TRAINING AREA/BELLOWS (MCTAB)

MCTAB covers 1,078 acres on the southeastern portion of Oahu. It is downstream of Waimanalo, a rural small farm community, Native Hawaiian homesteads, and parks. Of the 14 environmental resources considered for analysis, air quality, airspace, geology and soils, hazardous materials and hazardous waste, health and safety, land use, noise, socioeconomics, transportation, utilities, visual and aesthetics, and water resources are not addressed. Under the No-action Alternative, Alternative 1, or Alternative 2, there would be no air emissions generated at MCTAB other than that from an occasional aircraft operation. The aircraft operations would not change regional air quality. The site does not affect the existing airspace structure in the region. Airspace use at MCTAB is limited to rotary wing aircraft. Operations associated with MCTAB adhere to policy and regulation for hazardous materials and hazardous waste, health and safety and noise, as discussed in Appendix C. Most operations would be within existing Takeoff Safety Zones and Approach-Departure Clearance Surfaces that are delineated over the runways and do not extend off-base. In addition, there are two water drop zones that are suitable for helicopter and parachute training. These areas are designed to avoid over-flights of inhabited areas and wildlife sanctuaries. Geology and soils impacts would be limited to short-term minor disturbance of beach sand and near-shore ocean floor along existing Expeditionary Assault access routes. Movement from the beach would also result in minor, short-term disturbance to soils along pre-defined access routes. Primary surface water features are defined as off-limits during the training exercises which do not impact groundwater. Under the proposed Alternative 1 or Alternative 2, Naval operations at MCTAB would not impact the socioeconomic characteristics, modes of transportation, or utility demands, nor led to any incompatibility with adjacent land uses. There is no planned construction or alteration associated with the Navy that would affect the visual quality of the area.

3.4.4.1 BIOLOGICAL RESOURCES (TERRESTRIAL AND OFFSHORE)—MCTAB

Appendix C includes a detailed description of biological resources.

Region of Influence

The region of influence includes those areas on or adjacent to MCTAB that could be affected by existing or proposed operations.

Affected Environment

Vegetation

Virtually all native vegetation on MCTAB has been replaced by exotic species. Extensive second-growth forest is dominated by koa haole, Christmas berry, and ironwood. (U.S. Air Force 15th Airlift Wing, 2005) Only 12 percent of the species recorded were native species (U.S. Department of the Navy, Commander THIRD Fleet, 2002). However, sea cliffs and sand dunes at MCTAB support unique strand vegetation (Defense Environmental Network & Information eXchange, 2001).

<u>Threatened and Endangered Plant Species</u>

No rare, threatened, or endangered plant species are known to occur on or near MCTAB (U.S. Air Force 15th Airlift Wing, 2005).

Wildlife

There are no live coral colonies in the offshore areas as a result of redistribution of sand and scouring caused by wave action. The seafloor out to a distance of 492 ft from the beach consists of a sand flat, beyond which a low-relief fossil reef platform becomes interspersed with the sand. The outer barrier reef crest (see Figure 3.4.3.2-1) is an actively accreting coral reef habitat comprising predominantly the genera *Pocillopora, Porites, and Montipora*. There are two well-defined sand channels that extend from the shoreline through the barrier reef to the open ocean beyond. (U.S. Department of the Navy, Commander THIRD Fleet, 2002) Appendix G provides a detailed description, including status, distribution, and habitat preference of managed fisheries.

<u>Threatened and Endangered Wildlife Species</u>

Threatened and endangered species observed or potentially occurring at MCTAB (Table 3.4.4.1-1) include the endangered koloa maoli (Hawaiian duck), ‘alae ke’ok’o (Hawaiian coot), alae ula (Hawaiian common moorhen), and ae’o (Hawaiian black-necked stilt). Forty to sixty percent of the statewide population of the ae’o (Hawaiian black-necked stilt) is found on Oahu. Oahu also has the largest population of ‘alae ke’ok’o (Hawaiian coot) in the islands. The endangered Hawaiian hoary bat may also use the habitat at MCTAB. (U.S. Air Force 15th Airlift Wing, 2005)

Table 3.4.4.1-1. Threatened and Endangered Wildlife at MCTAB

Scientific Name	Common Name	Federal Status
Birds		
Anas wyvilliana	Koloa maoli (Hawaiian duck)	E
Fulica americana alai	'Alae ke'oke'o (Hawaiian coot)	E
Gallinula chloropus sandvicensis	Alae ula (Hawaiian common moorhen)	E
Himantopus mexicanus knudseni	Ae'o (Hawaiian black-necked stilt)	E
Reptiles/Mammals		
Chelonia mydas	Green sea turtle	T (E)
Eretmochelys imbricata	Hawksbill sea turtle	E
Lasiurus cinereus semotus	Hawaiian hoary bat	E
Monachus schauinslandi	Hawaiian monk seal	E

Source: U.S. Department of the Navy, Commander THIRD Fleet, 2002; U.S. Fish and Wildlife Service, 2006
Key to Federal Status:
E Endangered
T Threatened

Green sea turtles occur frequently in the offshore water. Also occasionally feeding in these waters are hawksbill turtles (U.S. Department of the Navy, 2005). Hawaiian monk seals have been sighted in the area (U.S. Department of the Navy, 2005). Waimanalo Bay is expected to be too shallow for the presence of whales, such as the humpback whale, which winters in the Hawaiian Islands. However, it is not outside the realm of possibility that an occasional humpback whale could use Waimanalo Bay. (U.S. Pacific Command, 1995)

Environmentally Sensitive Habitat

No critical habitat has been designated on MCTAB. Critical habitat for the endangered Oahu ‘elepaio (*Chasiempis sandwichensis ibidis*) is located approximately 2 mi west of MCTAB (Figure 3.4.3.2-2). Wetland acreage on MCTAB is located along the Waimanalo stream, which provides habitat for native waterbirds and aquatic species (Defense Environmental Network & Information eXchange, 2001).

3.4.4.2 CULTURAL RESOURCES—MCTAB

Appendix C includes a description of cultural resources and the laws and regulations pertaining to them.

Region of Influence

The region of influence for terrestrial and underwater cultural resources at MCTAB includes locations where expeditionary assault (amphibious training) exercises, Mine Countermeasures, Humanitarian Assistance and Non-Combatant Evacuation Exercises, and HA/DR operations would occur (see Figure 2.1-2).

Affected Environment

Underwater Cultural Resources

Offshore features within the region of influence for MCTAB include shoreline burial complex (Site 4854) and several Hawaiian fishponds (Figure 3.4.1.1.2-1) (U.S. Army Corps of Engineers, Honolulu Engineer District, 2005). As shown on National Oceanic and Atmospheric Administration maps, there are also several shipwrecks in the MCTAB vicinity (see Figure 3.1.3-2).

Archaeological Resources (Prehistoric and Historic)

Located on the windward coast of Oahu, MCTAB has a long history of human occupation and exploitation. Archaeological studies reveal extensive prehistoric use of beach ridges and swales for campsites, tool making, and as burial areas and, in some locations (particularly along streams and near the coast), cultural deposits are relatively thick. (Desilets, 2002)

At the time of the Great Mahele (1848), most of the area now encompassed by MCTAB was in the ahupuaa of Waimanalo, which during the mid 1800s was part of the Crown Lands of Kamehameha III. In 1850, the area was leased for cattle, horse, and sheep ranching, but by the late 1870s, ranching had been replaced by sugarcane fields (in non-beach areas).

In 1917, the Waimanalo Military Reservation was established with boundaries nearly identical to those of present day MCTAB. Significant use of the area by the military did not occur until 1933 when the name of the installation was changed to Waimanalo Military Reservation, Bellows Field. At the time of the Japanese attack on Pearl Harbor, new runways were already under construction. Along with many other facilities, the runways were completed during World War II and the installation was used as an airfield. After World War II, Bellows Field transitioned from an airfield to a training, recreation, and communications facility. A Nike/Hercules missile site was added to the facility during the Cold War era, and interior areas were leased for cattle ranching. (Desilets, 2002)

Approximately 20 archaeological sites have been identified at MCTAB, several of which are located within the runway complex. There is also a high probability for additional subsurface sites to exist, particularly along stream banks and in dune areas (U.S. Air Force, 15th Airlift Wing, 2004; Commander, U.S. Pacific Fleet, 2006). Most of the archaeological sites at MCTAB are subsurface, including both identified and potential burial sites at isolated locations. Many of the identified sites, including Site 4852 (Bellows Dune Site), are eligible for inclusion in the National Register. (U.S. Pacific Command, 1995; U.S. Department of the Navy, Commander, Third Fleet, 2002; U.S. Army Corps of Engineers, Honolulu Engineer District, 2005). A list of archaeological and traditional resources sites at MCTAB is provided in Appendix I.

Historic Buildings and Structures

A complete inventory of potential historic buildings and structures was completed for MCTAB in 2002 (U.S. Army Corps of Engineers, Honolulu Engineer District, 2005). Properties were identified as eligible for inclusion in the National Register, including World War II-era aircraft revetments for the B-17 aircraft and Pursuit Planes, runways, and taxiways. (U.S. Army Corps of Engineers, Honolulu Engineer District, 2005)

Traditional Resources

Although traditional Hawaiian resources information is scant for the MCTAB area, there are several associated legend sites that have been identified and determined to be eligible for inclusion in the National Register as Traditional Cultural Properties. These include the area of the battle of Kukui (a 2-day battle between Kalanikupule [the ruler of Oahu in 1794] and his Uncle Kaeokulani [ruler of Kauai]) (Archaeological Site No. 4858); the legend of *Haunuananiho,* a small hill (puuhonua), which is said to have once been a place of refuge (Archaeological Site No. 383); and the legend of the black stone (Pohaku-paakiki), which is believed to have been a shrine built by sweet potato growers who used it to place offerings to their shark god, Kamohoalili. This same area is also associated with a legend about a stone watch tower and small house used to guard Oahu from approaching canoes. Archaeological Site No. 4852 (Bellows Dune Site) and three areas of nearby excavations have been listed in the National Register. In addition, 49 burials have been recorded. (U.S. Army Corps of Engineers, Honolulu Engineer District, 2005)

3.4.5 HICKAM AFB

Of the 14 environmental resources considered for analysis, air quality, cultural resources, geology and soils, hazardous materials and hazardous waste, health and safety, land use, noise, socioeconomics, transportation, utilities, visual and aesthetics, and water resources are not addressed. There are no air emission issues from HRC operations associated with Hickam. Operations associated with Hickam adhere to policies and regulations governing hazardous materials and hazardous waste, health and safety, and noise as discussed in Appendix C. There are no current or proposed operations that could affect land use, land forms, geology, and associated soils development at Hickam. The proposed operations associated with Alternative 1 or Alternative 2 would not affect socioeconomic characteristics, modes of transportation, or utility demands on Oahu. There is no planned construction or alteration associated with the Navy that would affect the visual quality or any cultural resources in the vicinity. Operations at the site would not generate any waste streams that could impact local water quality.

3.4.5.1 AIRSPACE—HICKAM AFB

Appendix C includes a detailed description of airspace.

Region of Influence

Based on RIMPAC, aircraft support includes space for the various types of aircraft, equipment for refueling and maintenance. U.S. and foreign aircraft (fixed wing, rotary, and airship) would be supported from several locations. For a typical RIMPAC, approximately 50 aircraft would be supported at Hickam AFB. Housing would be provided at the installation.

The use of Hickam AFB by aircraft during RIMPAC would be coordinated as part of the biennial planning process during three planning conferences leading up to the RIMPAC exercise. Due to the level and extent of planning involved, and the minimal potential for significant impacts, airspace has not been evaluated under the RIMPAC EAs (U.S. Department of the Navy, 2006; 2004; 2002; 2000).

The Hickam AFB region of influence includes the airspace above and south of Honolulu International Airport. Figure 3.4.2.1-1 shows a view of the airspace above Oahu including Hickam AFB/Honolulu International Airport.

Affected Environment

The affected airspace use environment in the Hickam AFB region of influence is described below in terms of its principal attributes: controlled and uncontrolled airspace, special use airspace, en route airways and jet routes, and airports and airfields. There are no military training routes in the region of influence.

Controlled and Uncontrolled Airspace

The airspace within the region of influence consists of the airspace above Hickam AFB/Honolulu International Airport as shown on Figure 3.4.2.1-1. Hickam AFB shares its runways with the adjacent Honolulu International Airport. Hickam AFB and the Honolulu International Airport constitute a single airport complex operated under a joint-use agreement.

The Class B airspace that lies above Hickam AFB consists of a core surface area surrounded by several layers of varying floor altitudes (FL 10, 15, 20, 30, 40) but the same ceiling altitude of FL 90. Below the Class B layers is Class E airspace with a floor 700 ft above the surface. Honolulu Combined Facility, more specifically, the Honolulu Control Tower, controls the movement of aircraft within the region of influence.

Special Use Airspace

The Pali Air Traffic Control Assigned Airspace is in effect above the entire Oahu area from FL 250 (25,000 ft) to unlimited. The Pali airspace is scheduled through the Navy FACSFAC Pearl Harbor who then coordinates with the FAA Honolulu Combined Facility.

There is also a National Security Area above a portion of Pearl Harbor as shown on Figure 3.4.2.1-1. For reasons of national security, pilots are requested not to fly below 5,000 ft in this area.

En Route Airways and Jet Routes

Several IFR en route low altitude airways enter or transect the region of influence. These airways are Class E airspace corridors with centerlines established by navigational aids.

Airports and Airfields

The Hickam AFB/Honolulu International is the primary airport within the region of influence. Kalealoa Airport is located approximately 8 nm west of Hickam AFB, Wheeler Army Airfield is located 12 nm northwest, and Kaneohe Bay Marine Corp Airfield at MCBH is located 12 nm northeast.

3.4.5.2 BIOLOGICAL RESOURCES (TERRESTRIAL)—HICKAM AFB

Region of Influence

The region of influence includes the base and adjacent waters.

Affected Environment

Vegetation

Vegetation on Hickam AFB has been disturbed or removed, and there are no significantly naturally occurring, native plant communities. Native plants are occasionally used in landscaping. Managed vegetation consists of herbaceous ruderal vegetation. Unmanaged vegetation exists in the southern part of the base and includes bufflegrass/kiawe woodland, kiawe forest, pickleweed flats, and mangrove. (U.S. Department of the Air Force, 2003)

Threatened and Endangered Plant Species

No threatened or endangered plants have been identified on base.

Wildlife

Fish and wildlife on Hickam AFB are managed through its Integrated Natural Resources Management Plan in cooperation with the USFWS and the State of Hawaii. Terrestrial wildlife on the base includes feral cats and mongoose. Shoreline wetlands provide a limited amount of cover, nesting, and feeding habitat for songbirds. Wedge-tailed shearwaters have been downed by lights on the base. The State endangered pueo (Hawaiian short-eared owl) has been observed on base. (U.S. Department of the Air Force, 2003)

Threatened and Endangered Wildlife Species

Threatened and endangered wildlife species on or in the area of Hickam AFB are listed in Table 3.4.5.2-1. None of these species have been observed breeding or nesting on the base. The ae'o (Hawaiian stilt) has been observed in the Reef Runway Lagoon, near the Manuwai Canal, and in ephemeral ponds on other parts of the base. Habitat for the 'alae ke'oke'o (Hawaiian coot) and the 'alae'ula (Hawaiian common moorhen) exists at the Manuwai Canal, but these birds have not been recorded at this location. The koloa maoli (Hawaiian duck) has been observed on the Waipio Peninsula, which is 2 to 3 mi from Hickam AFB. The Hawaiian hoary bat, which is usually found on Kauai and Hawaii, could use portions of Hickam AFB since a few scattered sightings on Oahu have been reported. (U.S. Department of the Air Force, 2003)

Green sea turtles, Hawaiian monk seals, and humpback whales are known or could occur in waters off Hickam AFB.

Table 3.4.5.2-1. Listed Species Known or Expected to Occur in the Hickam Air Force Base Region

Scientific Name	Common Name	Federal Status
Reptiles		
Chelonia mydas	Green sea turtle	T
Birds		
Anas wyvilliana	Koloa maoli (Hawaiian duck)	E
Fulica americana alai	'Alae ke'oke'o (Hawaiian coot)	E
Gallinula chloropus sandvicensis	Alae ula (Hawaiian common moorhen)	E
Himantopus mexicanus knudseni	Ae'o (Hawaiian black-necked stilt)	E
Mammals		
Lasiurus cinereus semotus	Hawaiian hoary bat	E
Megaptera novaeangliae	Humpback whale	E
Monachus schauinslandi	Hawaiian monk seal	E

Source: U.S. Department of the Air Force, 2003; U.S. Fish and Wildlife Service, 2006

NOTES:

T Threatened
E Endangered

Environmentally Sensitive Habitat

Most of the wetlands on Hickam AFB are located in the southern part of the base in flat or depressed areas, along the coast, and along the edges of canals. Most wetlands, except for the coastal mangrove shrubland and sand beaches, are disturbed by human activities and of little value for wildlife.

3.4.6 WHEELER ARMY AIRFIELD

Of the 14 environmental resources considered for analysis, air quality, cultural resources, geology and soils, hazardous materials and hazardous waste, health and safety, land use, noise, socioeconomics, transportation, utilities, visual and aesthetics, and water resources are not addressed. There are no air emission issues from HRC operations associated with Wheeler. Operations associated with Wheeler adhere to policies and regulations governing hazardous materials and hazardous waste, health and safety, and noise, as discussed in Appendix C. There are no current or proposed operations that could affect land use, land forms, geology, and associated soils development. The proposed operations associated with Alternative 1 or Alternative 2 would not affect socioeconomic characteristics, modes of transportation, and utility demands on Oahu. Additionally, there is no planned construction or alteration associated with the Navy that would affect the visual quality or any cultural resources in the vicinity. Operations at the site would not generate any waste streams that could impact local water quality.

3.4.6.1 AIRSPACE—WHEELER ARMY AIRFIELD

Appendix C includes a detailed description of airspace.

Region of Influence

Based on RIMPAC, aircraft support includes space for the various types of aircraft, equipment for refueling and maintenance. The use of Wheeler Army Airfield by aircraft during RIMPAC is secondary and falls within the day-to-day coordination for the movement of equipment and supplies.

The use of Wheeler Army Airfield by aircraft during RIMPAC would be coordinated as part of the biennial planning process during three planning conferences leading up to the RIMPAC exercise. Due to the level and extent of planning involved, and the minimal potential for significant impacts, airspace has not been evaluated under the RIMPAC EAs (U.S. Department of the Navy, 2006; 2004; 2002; 2000).

The region of influence is defined as the area affected by the ongoing No-action Alternative and the proposed operations. Figure 3.4.2.1-1 shows a view of the airspace above Oahu including Wheeler Army Airfield. The region of influence includes the Class D and Class E airspace shown above Wheeler Army Airfield.

Affected Environment

The affected airspace use environment in the Wheeler Army Airfield region of influence is described below in terms of its principal attributes: controlled and uncontrolled airspace, special use airspace, en route airways and jet routes, and airports and airfields. There are no military training routes in the region of influence.

Controlled and Uncontrolled Airspace

The airspace within the region of influence consists of the airspace above Wheeler Army Airfield which includes Class D airspace from the surface to FL 33, and Class E airspace with a floor 700 ft above the surface.

No Class B (U.S. terminal control areas) airspace, which usually surrounds the nation's busiest airports, or Class C airspace is found in the region of influence.

Special Use Airspace

Several restricted airspace areas (3109 A, B, C and 3110 A, B, C) are located immediately northwest of the Wheeler Army Airfield Class D airspace. These areas are outside the region of influence for Wheeler Army Airfield.

The Pali Air Traffic Control Assigned Airspace is in effect above the entire Oahu area from FL 250 (25,000 ft) to unlimited. The Pali airspace is scheduled through the Navy FACSFAC Pearl Harbor who then coordinates with the FAA Honolulu Combined Facility.

En Route Airways and Jet Routes

The closest IFR en route low altitude airways are located outside the region of influence, south of Oahu.

Airports and Airfields

MCBH is located 15 nm to the east and Honolulu International Airport is located 12 nm to the south east, both outside the region of influence.

3.4.6.2 BIOLOGICAL RESOURCES (TERRESTRIAL)—WHEELER ARMY AIRFIELD

Appendix C includes a detailed description of biological resources.

Region of Influence

The region of influence includes the installation and adjacent land.

Affected Environment

Vegetation

Wheeler Army Airfield is a developed area that contains mostly non-native urban vegetation. (U.S. Department of the Army, 2004)

Threatened and Endangered Plant Species

No threatened or endangered plants have been identified on Wheeler Army Airfield.

Wildlife

There are no native terrestrial amphibians or reptiles on the Hawaiian Islands. Non-native amphibians and reptiles that have the potential to occur on Wheeler Army Airfield include the green and black poison dart frog, bullfrog, giant toad, Cuban tree frog, green anole, mourning gecko, house gecko, metallic skink, and island blind snake. (U.S. Department of the Army, 2004)

Several species of native and non-native birds are located in the region of influence. The black-crowned night heron, Pacific golden plover, and white-tailed tropicbird are indigenous birds that are in the region of influence. Non-native birds in the region include, but are not limited to, the rock dove, zebra dove, common myna, and red-vented bulbul. (U.S. Department of the Army, 2004)

<u>Threatened and Endangered Wildlife Species</u>

The Hawaiian hoary bat may occur at or in the vicinity of the airfield.

Environmentally Sensitive Habitat

No critical habitat has been designated in the region of influence (Figure 3.4.6.2-1).

EXPLANATION

Road

Critical Habitat

Wetland Area

Installation Area

Land

NORTH

0 1 2 4 Miles

Critical Habitat - Central Oahu, Hawaii

Oahu, Hawaii

Figure 3.4.6.2-1

3.4.7 MAKUA MILITARY RESERVATION

Of the 14 environmental resources considered for analysis, air quality, airspace, geology and soils, hazardous materials and hazardous waste, land use, socioeconomics, transportation, utilities, visual and aesthetics, and water resources are not addressed. Under the No-action Alternative, Alternative 1, or Alternative 2, there would be no airspace use at Makua. There are no air emission issues from HRC operations associated with Makua Military Reservation. Geology and soils impacts would be limited to short-term minor disturbance of beach sand and near-shore ocean floor along existing Special Warfare Operations (SPECWAROPS) access routes. Movement from the beach would also result in minor, short-term disturbance to soils along pre-defined access routes. Water resources would not be affected by the short term temporary foot traffic during the SPECWAROPS. Operations associated with this site adhere to policies and regulations governing hazardous materials and waste, and health and safety, as discussed in Appendix C. The site is compatible with existing surrounding land uses. The proposed operations associated with Alternative 1 or Alternative 2 would not affect socioeconomic characteristics, modes of transportation, and utility demands on Oahu. Additionally, there is no planned construction or alteration associated with the Navy that would affect the scenic and visual quality of the site.

3.4.7.1 BIOLOGICAL RESOURCES (TERRESTRIAL AND OFFSHORE)—MAKUA MILITARY RESERVATION

Appendix C includes a detailed description of biological resources.

Region of Influence

The region of influence includes Makua Military Reservation and its adjacent waters.

Affected Environment

Vegetation

Three ecological zones have been identified within Makua Military Reservation. The Army delineated these zones based on elevation, topography, and prevailing climatic conditions within the Reservation, resulting in three designations: Ridge Crest Vegetation Zone, Native Shrub on Cliff and Slope Zone, and Lowland Native Forest Zone. The ecological subzones and plant and animal biota within each of these have also been well documented. Guinea grass and molasses grass are two examples of alien plant species occurring on the installation. (25th Infantry Division (Light); U.S. Department of the Army Hawaii, 2005)

<u>Threatened and Endangered Plant Species</u>

Records dating back to 1970 indicate that there are 32 endangered plants on Makua Military Reservation (Table 3.4.7.1-1). The majority of these plants are found along the southern and northeastern boundaries of the reservation. The removal of wild goats on the range has been beneficial to the management of the endangered plants. Another primary threat to the endangered plants on the range is fire. Recent fires have burned acreage containing some of these plants.

Wildlife

In addition to native species, introduced nuisance species such as pigs, rats, and goats adversely affect range habitat. The Army has implemented measures, including more than 7 mi of fencing, to control the movement of pigs and goats onto the range. (25th Infantry Division (Light); U.S. Department of the Army Hawaii, 2005)

<u>Threatened and Endangered Wildlife Species</u>

Records dating back to 1970 indicate that there are two endangered birds, one endangered terrestrial mammal, and one endangered snail (*Achatinella mustelina*, Oahu tree snail) on Makua Military Reservation (Table 3.4.7.1-1). (25th Infantry Division (Light) and U.S. Army Hawaii, 2005)

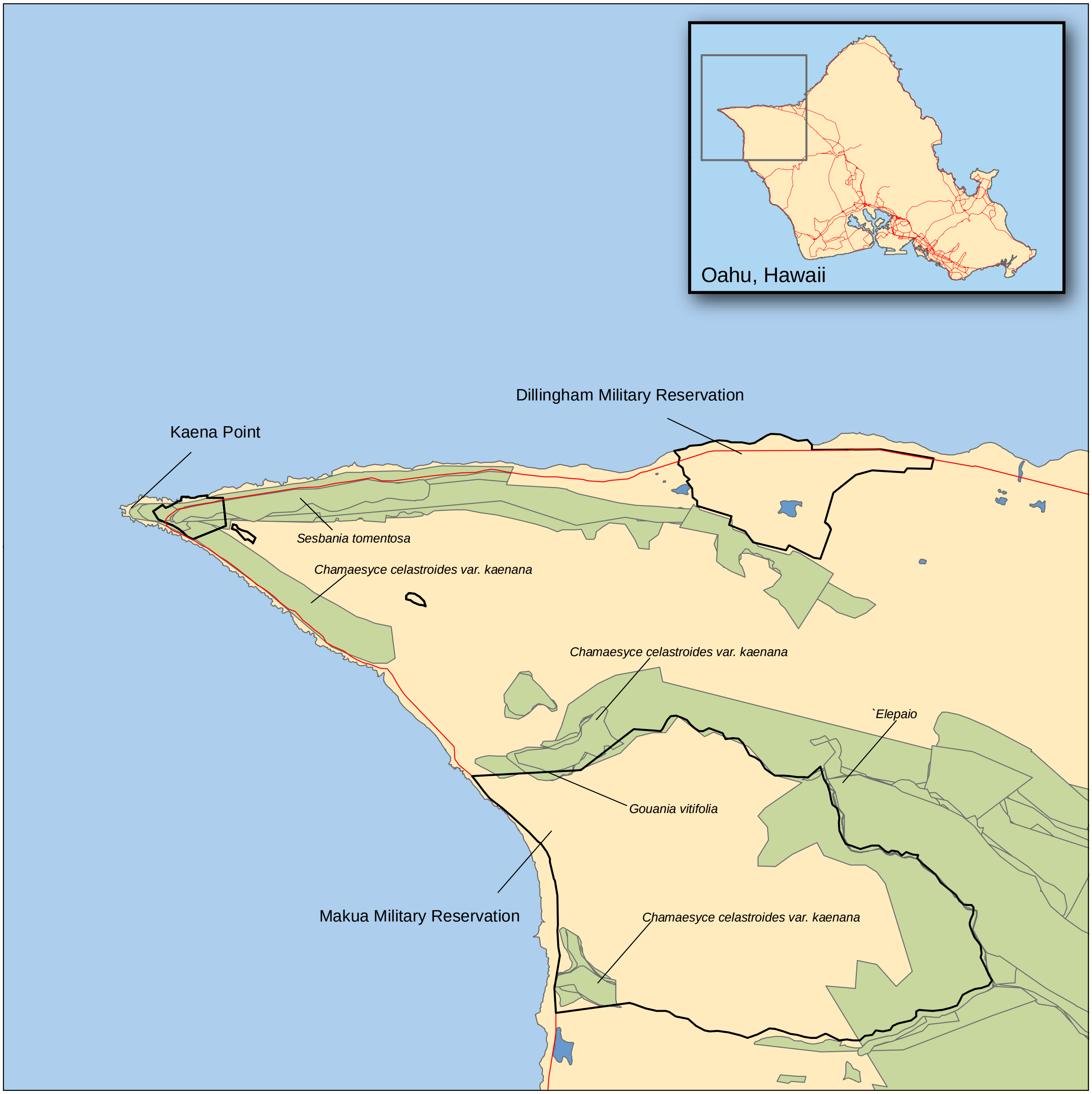
The only marine mammals considered possible in the region of influence are the Hawaiian monk seal, bottlenose dolphin, rough-toothed dolphin, and the humpback whale (U.S. Department of the Navy, 2005). Of the five species of sea turtles that occur in Hawaiian waters, only the green sea turtle and rarely the leatherback sea turtle are likely to be in the region of influence (25th Infantry Division (Light); U.S. Department of the Army Hawaii, 2005)

In 1998, Section 7 consultation was conducted with USFWS to determine if routine military training at Makua Military Reservation would jeopardize the continued existence of endangered species. In 1999, the USFWS issued a Biological Opinion concluding that the routine military training would not jeopardize the endangered species if certain conditions were met. These include restrictions to military training, and preparation and implementation of a Wildland Fire Management Plan. The Army is also required to complete an Implementation Plan to stabilize the targeted plant and animal populations. (U.S. Department of the Navy, Commander THIRD Fleet, 2002)

Environmentally Sensitive Habitat

The USFWS designated critical habitat on Makua Military Reservation in 2001 for the Oahu ‘elepaio (Figure 3.4.7.1-1). Critical habitat for endangered plants is outside the boundary of the reservation. The USFWS determined that lands on Oahu that fall under Army jurisdiction do not meet the definition of critical habitat based on the Army’s continuing commitment to manage and stabilize sensitive species. (U.S. Department of the Navy, Commander THIRD Fleet, 2002)

Although potential estuarine wetlands have been observed on Makua Military Reservation, no formal identification or designation has been made (U.S. Department of the Navy, Commander THIRD Fleet, 2002).



EXPLANATION

Road

Critical Habitat

Wetland Area

Installation Area

Land

NORTH

0 0.5 1 2 Miles

Critical Habitat - Northwest Oahu, Hawaii

Oahu, Hawaii

Figure 3.4.7.1-1

Table 3.4.7.1-1. Threatened and Endangered Terrestrial Species at Makua Military Reservation

Scientific Name	Common Name	Federal Status
Plants		
Alectryon macrococcus	Mahoe	E
Alsinidendron obovatum	No common name	E
Bonamia menziesii	No common name	E
Cenchrus agrimonioides	Kamanomano	E
Chamaesyce celastroides var. keanana	`Akoko	E
Ctenitis squamigera	Pauoa	E
Cyanea superba	Haha	E
Cyrtandra dentata	Ha`iwale	E
Delissea subcordata	No common name	E
Diellia falcata	No common name	E
Dubautia herbstobatae	Na`ena`e	E
Euphorbia haeleeleana	`Akoko	E
Flueggea neowawraea	Mehamehame	E
Hedyotis degeneri	No common name	E
Hedyotis parvula	No common name	E
Hibiscus brackenridgei	Ma`o hau hele	E
Lepidium arbuscula	`Anaunau	E
Lipochaeta tenuifolia	Nehe	E
Lobelia niihauensis	No common name	E
Lobelia oahuensis	No common name	E
Neraudia angulata	Ma'oloa (angularfruit)	E
Nototrichium humile	Kulu`i	E
Plantago princeps	Ale	E
Sanicula mariversa	Waianae Range black snakeroot	E
Schiedea hookeri	Sprawling schiedea	E
Schiedea nuttallii	Valley schiedea	E
Silene lanceolata	Kauai catchfly	E
Spermolepis hawaiiensis	Hawaii scaleseed	E
Tetramolopium filiforme	No common name	E
Tetramolopium lepidotum ssp. lepidotum	No common name	E
Viola chamissoniana ssp. chamissoniana	Pamakani	E
Birds		
Chasiempis sandwichensis ibidis	Oahu `elepaio	E
Paroreomyza maculata	‘Alauahio (Oahu creeper)	E
Reptiles		
Chelonia mydas	Green sea turtle	T
Dermochelys coriacea	Leatherback sea turtle	E

Table 3.4.7.1-1. Threatened and Endangered Terrestrial Species at Makua Military Reservation (Continued)

Scientific Name	Common Name	Federal Status
Mammals		
Lasiurus cinereus semotus	Hawaiian hoary bat	E
Megaptera novaeangliae	Humpback whale	E
Monachus schauinslandi	Hawaiian monk seal	E

Source: U.S. Department of the Navy, Commander THIRD Fleet, 2002; 25th Infantry Division (Light) and U.S. Army Hawaii, 2005; U.S. Fish and Wildlife Service, 2006.
Key to Federal Status:
E Endangered
T Threatened

3.4.7.2 CULTURAL RESOURCES—MAKUA MILITARY RESERVATION

Appendix C includes a description of cultural resources and the laws and regulations pertaining to them.

Region of Influence

The cultural resources region of influence for Makua Military Reservation encompasses all areas where Live Fire Exercise operations (including major ground troop and artillery movement and munitions detonation [e.g., mortars, heavy artillery]) will be conducted (see Figure 2.1-2).

Affected Environment

Underwater Cultural Resources

Underwater cultural resources within the offshore Makua Military Reservation region of influence include several shipwrecks (see Figure 3.1.3-2).

Archaeological Resources (Prehistoric and Historic)

Archaeological evidence indicates that Makua Valley once supported both a coastal population (historically known as Makua Village), and permanent occupation in the middle/upper elevations. Archaeologists hypothesize that Makua has similar settlement patterns to the Makaha, Waianae, and Lualualei valleys, with more people living in the back of the valley, at the higher elevations where rainfall was more abundant. Data infer that by the mid 1800s the middle area was claimed only as community kula (pasture) lands that had once been habitation sites abandoned early in the post-contact period (Williams and Patolo, 2000). Early missionary accounts of Makua Valley note that there was a large school, suggesting more population than just the coastal village. (The Onyx Group, 2001)

Sandalwood harvesting began in Makua Valley as early as 1815, but as the wood was exhausted, ranching and agriculture (particularly sweet potatoes) became the more common land use practices. After the Great Mahele of 1848 (a system of private land division/ownership), land in Makua Valley was awarded to various claimants, including a large portion to the Hawaiian government. The lands remained under private or government ownership or lease until 1941 when the Army took over the land for a training facility. (The Onyx Group, 2001)

Since the early 1900s, a number of archaeological surveys have been conducted in the Makua Valley. Among these are Thrum (1906); McAllister (1933); Rosendahl for the Bishop Museum (1977); and Williams and Patolo (2000). Additional surveys were undertaken at Makua Military Reservation by archaeologists from the Environmental Division of the Department of Public Works in 2000. Among the identified site types are heiaus, shrines, trails, stone walls, and enclosures, terraces, platforms, and habitation sites. One site, the Ukanipo Heiau is listed in the National Register and other sites may qualify (Pilia'au Range Complex and Makua Military Reservation, 2006). A list of recorded archaeological sites is provided in Appendix I (The Onyx Group, 2001; U.S. Department of the Navy, Commander, THIRD Fleet, 2002).

On September 18, 2000, a Section 106 Programmatic Agreement was finalized with the Hawaii State Historic Preservation Officer and the Advisory Council on Historic Preservation (Council). The Programmatic Agreement was developed in consultation with aboriginal/indigenous Hawaiian groups and regulatory agencies over a period of 2 years. It contains specific programs and efforts to protect and mitigate impacts to cultural resources at Makua Military Reservation. (The Onyx Group, 2001) A copy of the Programmatic Agreement is provided as Appendix I.

Historic Buildings and Structures

Makua Military Reservation is a large training range. There are no identified historic buildings and structures.

Traditional Resources

Makua Military Reservation is associated with a number of legends and traditional Hawaiian deities, and has significant religious and social value to local inhabitants. Among other important resources, a comprehensive investigation of the traditional complexion and resources of Makua Military Reservation entitled *Cultural History Report of Makua Military Reservation, Makua Valley, Oahu, Hawaii*, was prepared in 1977 by Kelley and Quintal. The report presents the history, traditional accounts, and legends of Makua Valley. (The Onyx Group, 2001)

The 2000 Programmatic Agreement described above includes provisions for access for members of the Native Hawaiian community to Ukanipo Heiau. This access is independent of training operations in the valley. Access to other sites within the valley has been given on a case-by-case basis as is consistent with training and safety concerns. The potential for increased access to other sites within Makua Military Reservation is being examined (see Appendix I). (The Onyx Group, 2001)

3.4.7.3 HEALTH AND SAFETY—MAKUA MILITARY RESERVATION

Appendix C includes a detailed discussion of health and safety resources laws and regulations.

Region of Influence

The region of influence for potential impact related to the health and safety of personnel and the public includes areas associated with training exercises at Makua Military Reservation and those off-base areas affected by training operations.

Affected Environment

Makua Military Reservation takes every precaution during planning and execution of training exercises to prevent injury to human life or property. Standard operating procedures for live-fire exercises outline assets, personnel, safety requirements, and procedures to be used during each exercise. Use of the range is scheduled through the Range Division—Hawaii Scheduling Office, and Makua Range Control monitors all communications during exercises.

For each training event, a detailed surface danger zone is determined, in accordance with Army Regulation 385-64, *Ammunition and Explosives Safety Standards.* A surface danger zone ensures a proper buffer zone to the range and ordnance impact area, which prevents accidental injury and exposure to live weapons outside the designated training area. Upon completion of the exercise, every effort is made to restore the range to its condition prior to use, including explosive ordnance disposal specialists destroying all identifiable unexploded ordnance.

An additional concern at Makua Military Reservation is accidental wildfires due to military training. A majority of the fires that have started on Makua Military Reservation have been contained with the boundaries of the installation. However, some fires have burned onto the adjacent land of Albert Silva, the Kuaokala Game Management Area, and the Air Force Kaena Point Satellite Tracking Station. (U.S. Department of the Army, Hawaii, 2005)

Fire prevention at Makua Military Reservation includes planning, managing fuels, using prescribed fire, planning water resources, and training firefighters. Makua Military Reservation has a fire danger rating system that uses the following three colors to characterize fire threat conditions:

- Green (indicating normal caution during training). Weather conditions are favorable for all authorized munitions, and smoking is permitted.
- Yellow (indicating caution because fires will start easily). For this fire danger period, smoking is permitted only in designated areas, and only ball ammunition, mortar, artillery, hand grenades, and smoke grenades are allowed.
- Red (indicating extreme caution because a fire would be difficult to control). No smoking is permitted on the ranges and no munitions or pyrotechnics are allowed. In other words, no live-fire training is allowed, and the ranges are closed. (U.S. Department of the Army, Hawaii, 2005)

3.4.7.4 NOISE—MAKUA MILITARY RESERVATION

Appendix C includes a definition of noise and the main regulations and laws that govern it.

Region of Influence

The region of influence for Makua Military Reservation is the area within and surrounding Makua Military Reservation in which humans and wildlife may suffer annoyance or disturbance noise levels proposed operations at Makua Military Reservation and those off-base areas affected by training exercises.

Affected Environment

Noise is generated at the Makua Military Reservation from military operations, including infantry and helicopter gunnery training exercises. Other noise sources include low background noise levels from wind, surf, birds, insects, and light highway traffic. Ambient noise levels at Makua Beach is estimated to be between 40- and 50-dBA, with peaks reaching noise levels greater than 70-dBA during high tide and afternoon winds. Small arms, demolition, mortar, artillery, and aircraft gunnery operations all generate noise at Makua Military Reservation. Noise level contributions from Makua Military Reservation operations vary greatly, depending on whether or not live-fire training exercises are in progress. Actual noise measurements in 1989, when the Army was conducting training operations showed that noise levels at the reservation boundary would ordinarily not exceed the standards of the Oahu community noise rule. (U.S. Department of the Army, Hawaii, 2005; Tetra Tech, Inc., 2005)

The nearest housing is approximately 1,000 to 3,000 ft down the beach that is adjacent to the Makua Military Reservation. Most military operations at the reservation occur during early morning hours, when the number of beachgoers is small. There are no schools, day-care centers, hospitals, or nursing homes within 2 mi of Makua Military Reservation. When there are no training exercises in progress at Makua Military Reservation, noise conditions are dominated by wind, bird songs, and insects. Under these conditions, noise levels typically vary between approximately 25 dBA and 45 dBA. (U.S. Department of the Army, Hawaii, 2005)

Wildlife receptors at for the Makua Military Reservation area are detailed in Section 3.4.7.1, Biological Resources (Terrestrial and Offshore).

3.4.8 KAHUKU TRAINING AREA

Of the 14 environmental resources considered for analysis, air quality, airspace, geology and soils, hazardous materials and hazardous waste, health and safety, land use, noise, socioeconomics, transportation, utilities, visual and aesthetics, and water resources are not addressed. Under the No-action Alternative, Alternative 1, or Alternative 2, operations would include only localized use of rotary wing aircraft within pre-defined areas. Geology and soils impacts would be limited to short-term minor disturbance of beach sand. Movement from the beach would also result in minor, short-term disturbance to soils along pre-defined access routes. There are no air emission issues from HRC operations associated with Kahuku Training Area. Water resources would not be affected by the movement of people and materials along existing roads during the operations. Operations associated with this site adhere to policies and regulations governing hazardous materials and waste, health and safety, and noise as discussed in Appendix C. The site is compatible with existing surrounding land uses. The proposed operations associated with Alternative 1 or Alternative 2 would not affect social and economic characteristics, modes of transportation, or utilities demand on Oahu. Additionally, there is no planned construction or alteration associated with the Navy that would affect the scenic and visual quality of the site.

3.4.8.1 BIOLOGICAL RESOURCES (TERRESTRIAL)—KAHUKU TRAINING AREA

Appendix C includes a detailed description of biological resources.

Region of Influence

The region of influence includes the training area and adjacent land.

Affected Environment

Vegetation

Parts of Kahuku Training Area contain valuable native vegetation communities. However, much of the lower lying vegetation is composed of introduced and invasive plants such as Christmas berry, ironwood, and strawberry guava. Manuka (New Zealand tea tree) and moho (white moho) are two plants recently discovered in the region of influence that are potentially devastating to the native communities of the Kahuku Training Area. (U.S. Department of the Army, 2004)

Montane wet, lowland wet, lowland forest, lowland moist, lowlands dry, and intermittent aquatic natural communities are the six general categories of native natural vegetation community types. (U.S. Department of the Army, 2004)

Makou (*Botrychium subbifoliatum*), ‘oha (*Cyanea lanceolata Ssp. calycina*), anini (*Eurya sandwicensis*), *Hedyotis fluviatilis*, *Lindsaea repens* var. macraeana, keahi (*Nesoluma polynesicum*), *Platydesma cornuta*, and kaulu (*Pteralyxia macrocarpe*) are species of concern that have been identified on the Kahuku Training Area. (U.S. Department of the Navy, Commander THIRD Fleet, 2002)

Threatened and Endangered Plant Species

Eighteen rare plant types have been identified at Kahuku Training Area, of which 10 are Federally listed as endangered (Table 3.4.8.1-1). (U.S. Department of the Navy, Commander THIRD Fleet, 2002)

Table 3.4.8.1-1. Threatened and Endangered Vegetation at Kahuku Training Area

Scientific Name	Common Name	Federal Status
Plants		
Adenophorus periens	Pendant kihi fern	E
Chamaesyce rockii	‘Akoko, koko, kokomalei	E
Cyanea grimesiana Ssp. *grimesiana*	‘Oha, haha, ‘ohawai	E
Cyanea koolauensis	‘Oha, haha, ‘ohawai	E
Cyanea longiflora	‘Oha, haha, ‘ohawai	E
Eugenia koolauensis	Nioi	E
Gardenia mannii	Nanu, na’u	E
Hesperomannia arborescens	Lanai island-aster	E
Phyllostegia hirsuta	No common name	E
Tetraplasandra gymnocarpa	'Ohe’ohe	E
Birds		
Chasiempis sandwichensis ibidis	Oahu ‘elepaio	E
Paroreomyza maculata	‘Alauahio (Oahu creeper)	E
Invertebrates		
Achatinella sp.	Tree snail	E
Achatinella sp.	Tree snail	E
Achatinella sp.	Tree snail	E
Achatinella sp.	Tree snail	E

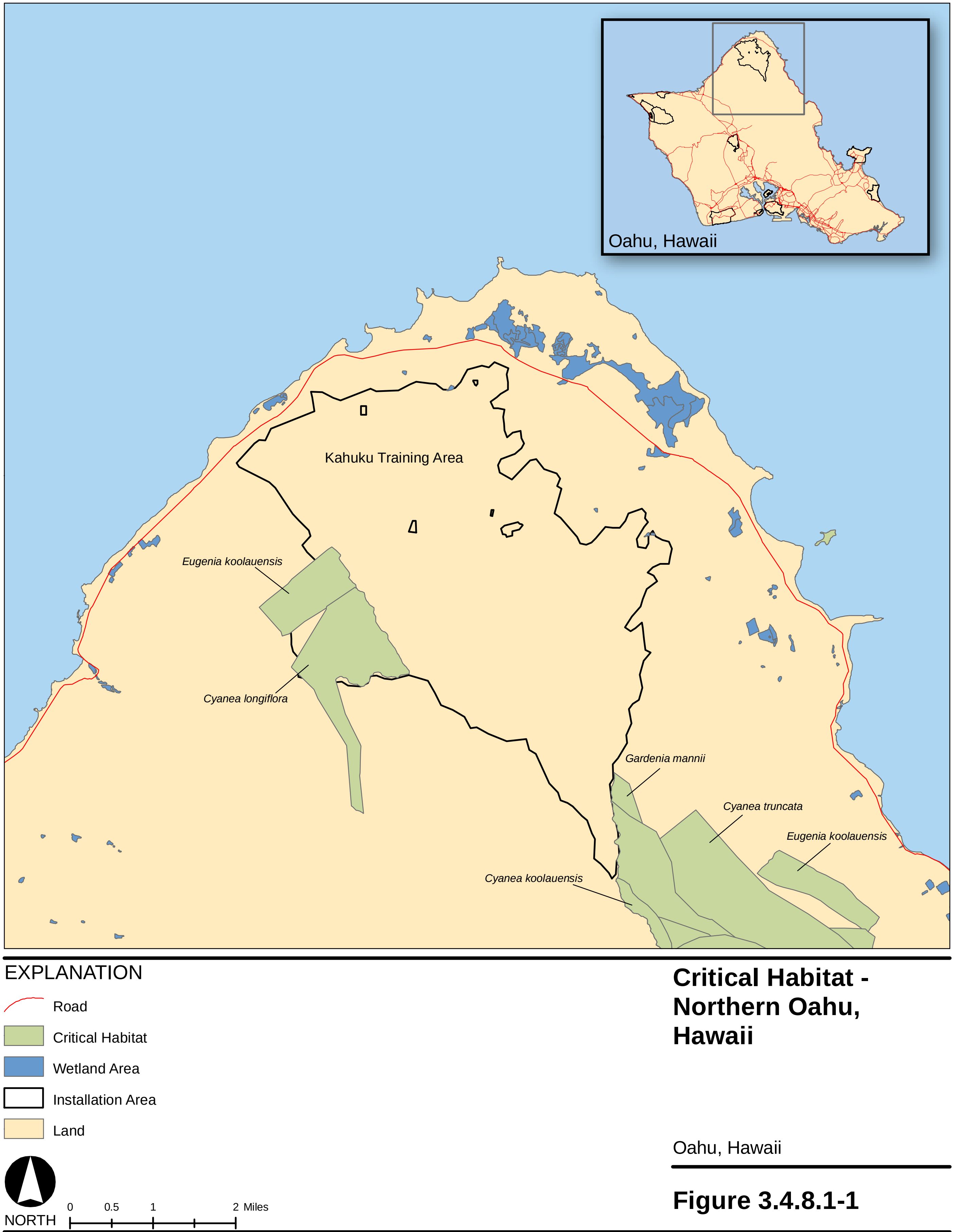
Source: U.S. Department of the Navy, Commander THIRD Fleet, 2002; U.S. Fish and Wildlife Service, 2006.
Key to Federal Status:
E Endangered

Wildlife

The bullfrog, wrinkled frog, coqui frog, and poison dart frog are non-native amphibians found on Oahu and potentially on Kahuku Training Area. Reptiles such as the green anole, gecko, and metallic skink may be found in the region of influence. Feral pigs, Indian mongoose, feral dogs, rats, and the house mouse are terrestrial mammals that may occur on Kahuku Training Area. The great frigate bird, Pacific golden plover, pueo (Hawaiian short-eared owl), and the Oahu ‘amakihi are indigenous birds that have been observed on the training area. Several non-native bird species such as the white-rumped shama, zebra dove, and house finch are also in the area. (U.S. Department of the Army, 2004)

Threatened and Endangered Wildlife Species

Eight rare wildlife species have been identified at the Kahuku Training Area. These include six varieties of tree snail (*Achatinella* sp.), four of which are listed as endangered, and two rare birds including the Oahu ‘elepaio and ‘alauahio (Oahu creeper), species Federally listed as endangered (Table 3.4.8.1-1). (U.S. Department of the Navy, Commander THIRD Fleet, 2002)



Critical Habitat - Northern Oahu, Hawaii

Oahu, Hawaii

Figure 3.4.8.1-1

Environmentally Sensitive Habitat

Critical habitat was officially designated for the Oahu ‘elepaio on 10 December 2001 that encompasses areas in the Koolau and Waianae Mountain Ranges on Oahu south of Kahuku Training Area (Figure 3.4.8.1-1). Five biologically significant areas occur in the southern and midwestern portion of the training area. (U.S. Department of the Navy, Commander THIRD Fleet, 2002)

3.4.8.2 CULTURAL RESOURCES—KAHUKU TRAINING AREA

Appendix C includes a description of cultural resources and the laws and regulations pertaining to them.

Region of Influence

The cultural resources region of influence for Kahuku Training Area encompasses all areas where HA/DR operations or any other ground disturbing or amphibious operations would occur. These areas would include beach landing areas and well established trails that lead to predetermined buildings or temporary tent areas (see Appendix D).

Affected Environment

Underwater Cultural Resources

Underwater cultural resources within the Kahuku offshore region of influence include numerous shipwrecks and at least one Hawaiian fishpond (see Figures 3.1.3-2 and 3.4.1.1.2-1).

Archaeological Resources (Prehistoric and Historic)

Kahuku Training Area was occupied at least seasonally from the 14th century on and was used for agriculture beginning in the 15th century. Evidence of occupation prior to European contact includes rock shelters, burial sites, irrigation complexes, and habitation sites. (Tetra Tech, Inc., 2004)

In 1890 James Campbell, James Castle, and Benjamin Dillingham formed the Kahuku Plantation Company and sugarcane began to replace pastureland. A sugar mill was established at Kahuku and the area of Kahuku Training Area was operated as a sugar plantation until the 1930s. Just prior to World War II, an airfield and radar station was constructed; after the war, additional land was purchased to support the Kahuku Training Area. A Nike Hercules missile battery was constructed in 1959. (Tetra Tech, Inc., 2004)

There have been several archaeological surveys of Kahuku Training Area (Anderson and Williams 1998; Davis 1981; Drolet 2000; McAllister 1933; Rosendahl 1977; Williams and Patolo 1998; and GANDA 2003) and the area has been divided into six separate archaeological management areas (U.S. Army Garrison, Hawaii, and U.S. Army Corps of Engineers 1998). Within the six areas approximately 100 archaeological sites have been identified, including prehistoric, historic, and military-era sites. Sites include the Hanakoae Heiau, which is listed in the National Register; several rock shelters; a possible Plantation-period site; and hearth, dwelling, and agricultural sites. Historic sites include a house, irrigation features, foxholes, and bunkers (Tetra Tech, Inc., 2004). Areas closest to the coast have the highest potential for archaeological resources (U.S. Department of the Navy, Commander, Third Fleet, 2002). A list of identified archaeological sites and historic buildings at Kahuku Training Area is provided in Appendix I.

Historic Buildings and Structures

Within the Kahuku Training Area, the World War II-era Opana Mobile Radar Station is listed in the National Register and has been designated a National Historic Landmark. The site was operational on December 7, 1941, and is famous for its role in detecting the approaching Japanese aircraft just prior to the attack on Pearl Harbor. (Tetra Tech, Inc., 2004)

There are also 22 Cold War-era buildings and structures at Kahuku Training Area. The features are associated with the former Nike missile facility active in Hawaii between January 1961 and March 1970. The site is significant as an intact example of a Cold War Nike missile site and has been determined eligible for inclusion in the National Register (International Archaeological Resources Institute, Inc, 2003). Preservation of the site was mandated as a result of consultation with the Hawaii State Historic Preservation Officer over the Nike site at Dillingham (Tetra Tech, Inc., 2004).

Traditional Resources

The general area of Kahuku plays an important role in Hawaiian legends. Identified legend locations are in the off-shore and coastal areas but, to date, none of the legends have been tied to Kahuku Training Area land areas. There are, however, important Native Hawaiian sites within the Kahuku Training Area, including a terrace that may have been used for religious ceremonies and burials (Drolet, 2000).

In 1998, archival information concerning traditional cultural places in and around Kahuku Training Area was collected and reviewed (Anderson, 1998). Subsequently, the Army began a traditional cultural resources survey of Kahuku Training Area, which is ongoing and has resulted in the identification of several traditional sites.

3.4.9 DILLINGHAM MILITARY RESERVATION

Of the 14 environmental resources considered for analysis, air quality, airspace, geology and soils, hazardous materials and hazardous waste, health and safety, land use, noise, socioeconomics, transportation, utilities, visual and aesthetics, and water resources are not addressed. Under the No-action Alternative, Alternative 1, or Alternative 2, operations would include only localized use of rotary wing aircraft within pre-defined areas. Most operations would be conducted at night when the airfield is not in use. There are no air emission issues from HRC operations associated with Dillingham Military Reservation. Geology and soils impacts would be limited to short-term minor disturbance of beach sand. Movement from the beach would also result in minor, short-term disturbance to soils along pre-defined access routes. Water resources would not be affected by the movement of SPECWAROPS troops during the operations. Operations associated with this site adhere to policies and regulations governing hazardous materials and waste, health and safety, and noise, as discussed in Appendix C. The site is compatible with existing surrounding land uses. The proposed operations associated with Alternative 1 or Alternative 2 would not affect socioeconomic characteristics, modes of transportation, or utility demands on Oahu. Additionally, there is no planned construction or alteration associated with the Navy that would affect the scenic and visual quality of the site.

3.4.9.1 BIOLOGICAL RESOURCES (TERRESTRIAL AND OFFSHORE)—DILLINGHAM MILITARY RESERVATION

Appendix C includes a detailed description of biological resources.

Region of Influence

The region of influence consists of the Dillingham Military Reservation land and offshore areas.

Affected Environment

Vegetation

Dillingham Military Reservation contains native natural communities that are considered rare and globally imperiled. The area is composed primarily of stands of native forest and shrubland vegetation on the cliffs and talus slopes. Ecological surveys have identified four rare plant species of concern associated with the cliff ecological zone: ‘ahakea (*Bobea sandwicensis*), koki’o ‘ula’ula (*Hibiscus kokio* ssp. *kokio*), ‘anaunau (*Lepidium bidentatum* var. *o-waihiense*), and nehe (*Lipochaeta remyi*).

Threatened and Endangered Plant Species

Ecological surveys have identified eight rare plants associated with the cliff ecological zone, including four with endangered status (Table 3.4.9.1-1). (U.S. Department of the Navy, Commander THIRD Fleet, 2002)

Wildlife

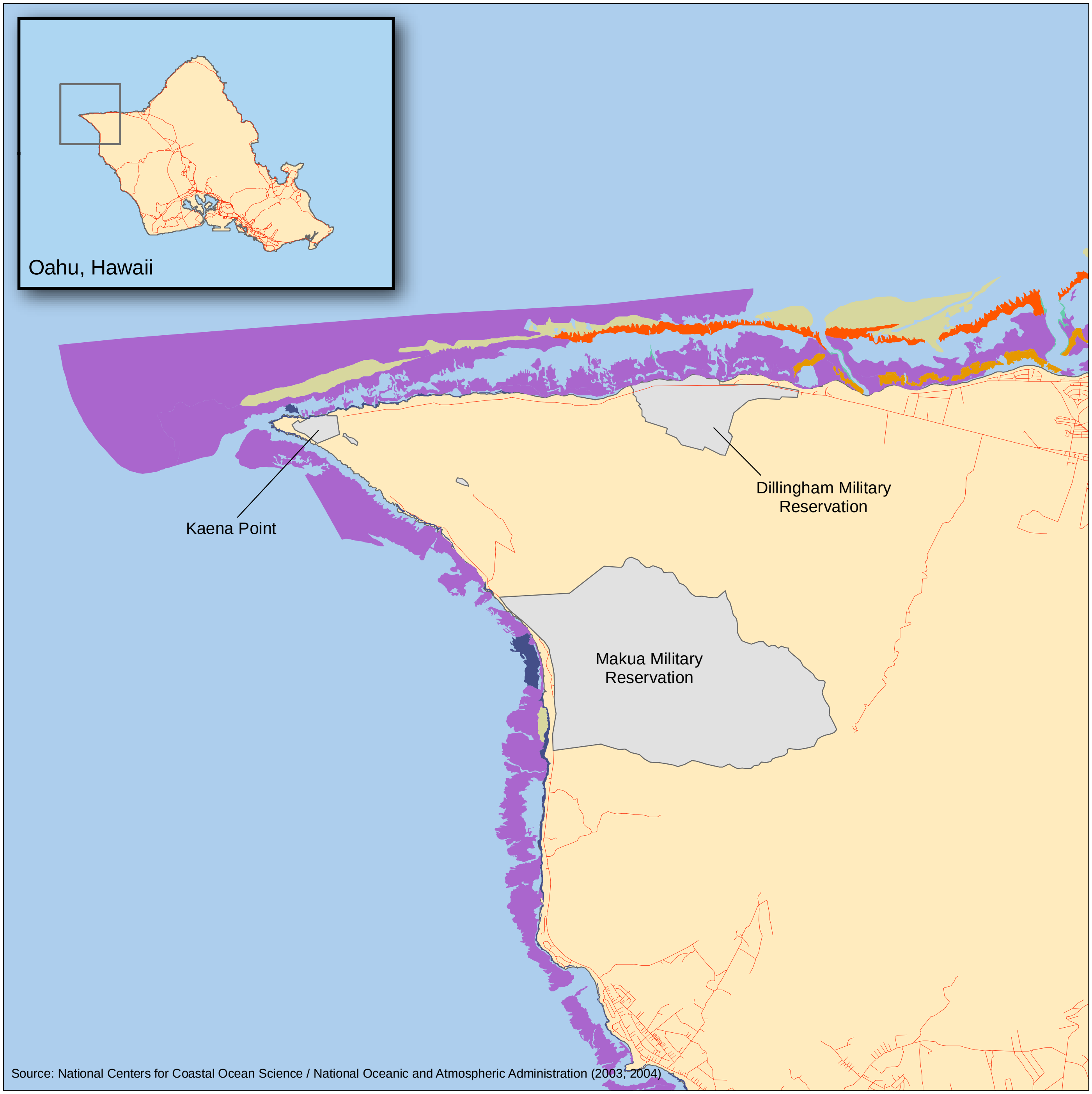
Field surveys on Dillingham Military Reservation have been limited to special status wildlife due mainly to the rugged terrain. Non-native amphibians that have the potential to occur on Dillingham Military Reservation include the bullfrog, green and black poison dart frogs, giant toad, and coqui frogs. Non-native reptiles could include the green anole, mourning gecko, tree gecko, and metallic skink. Feral pigs, cats, and dogs; rats and the house mouse are mammals that may be found on the installation. (U.S. Department of the Army, 2004)

There are coral reefs within 0.5 mi of the shoreline. However, there is a spur and groove reef approximately 0.75 mi of the shoreline (Figure 3.4.9.1-1). There are no specific coral reefs of management concern. (U.S. Department of the Army, 2004)

Table 3.4.9.1-1. Threatened and Endangered Vegetation at Dillingham Military Reservation

Scientific Name	Common Name	Federal Status
Plants		
Cyperus trachysanthos	Pu'uka'a (Sticky flatsedge)	E
Hibiscus brackenridgei ssp. *Mokuleianus*	Ma'o hau hele (Mokulei rosemallow)	E
Nototrichium humile	Kulu'I (Kaala rockwort)	E
Schiedea kealiae	Ma'oli'oli	E
Birds		
Anas wyvilliana	Koloa maoli (Hawaiian duck)	E
Chasiempis sandwichensis ibidis	O'ahu 'elepaio	E
Fulica americana alai	'Alae ke'oke'o (Hawaiian coot)	E
Gallinula chloropus sandvicensis	Alae ula (Hawaiian common moorhen)	E
Himantopus mexicanus knudseni	Ae'o (Hawaiian black-necked stilt)	E
Paroreomyza maculata	'Alauahio (Oahu creeper)	E
Reptiles		
Chelonia mydas	Green sea turtle	T
Dermochelys coriacea	Leatherback sea turtle	E
Mammals		
Lasiurus cinereus semotus	Hawaiian hoary bat	E
Megaptera novaeangliae	Humpback whale	E
Monachus schauinslandi	Hawaiian monk seal	E

Source: U.S. Department of the Navy, Commander THIRD Fleet, 2002; U.S. Department of the Army, 2004; U.S. Fish and Wildlife Service, 2006
Key to Federal Status:
E Endangered
T Threatened



EXPLANATION

- Road
- Uncolonized Volcanic Rock/Boulder
- Uncolonized Pavement
- Spur and Groove Reef
- Colonized Pavement
- Aggregated Coral
- Installation Area
- Land

NORTH

0 3,950 7,900 15,800 Feet

Offshore Hardbottom Habitats of Dillingham Military Reservation, Makua Military Reservation, and Kaena Point

Oahu, Hawaii

Figure 3.4.9.1-1

<u>Threatened and Endangered Wildlife Species</u>

The endangered Hawaiian hoary bat has the potential to occur on Dillingham. The ‘alae ke’oke’o (Hawaiian coot), ‘alae’ula (Hawaiian moorhen), koloa maoli (Hawaiian duck), and nene (Hawaiian goose) have been recorded on Dillingham Military Reservation. The Oahu ‘elepaio and ‘alauahio (Oahu creeper) are normally found in Native Hawaiian forest habitat. (U.S. Department of the Army, 2004)

Since Dillingham Military Reservation is adjacent to a small segment of beachfront, a portion of the region of influence extends to the offshore waters. This area is outside the Hawaiian Islands Humpback Whale National Marine Sanctuary. The humpback whale and several dolphin species are marine mammals most likely to be present in the region of influence (U.S. Department of the Navy, 2005). The Hawaiian monk seal also has the potential to occur. No sea turtle nesting has been observed in the region of influence, although the green sea turtle is expected to occur in the region of influence. (U.S. Department of the Army, 2004)

Environmentally Sensitive Habitat

Army lands were excluded from the latest critical habitat for plants (Figure 3.4.7.1-1). A wetland delineated on the reservation is within the region of influence, but outside of the area used for maneuver training. (U.S. Department of the Army, 2004)

3.4.9.2 CULTURAL RESOURCES—DILLINGHAM MILITARY RESERVATION

Appendix C includes a description of cultural resources and the laws and regulations pertaining to them.

Region of Influence

The cultural resources region of influence for Dillingham Military Reservation encompasses areas where Navy and Marine Corps SPECWAROPS under RIMPAC and small unit maneuvers by the Army occur (e.g., reconnaissance insertions and search and rescue). (See Figure 2.1-2).

Affected Environment

Underwater Cultural Resources

Underwater cultural resources within the offshore Dillingham region of influence include scattered shipwrecks; none of which are known to have been evaluated for eligibility in the National Register.

Archaeological Resources (Prehistoric and Historic)

An extensive complex of agricultural and occupation features has been identified at Dillingham Military Reservation within in the rocky sloping area between the airfield and the cliffs. Pre- and post-contact features have also been identified. These include platforms, boulder alignments, stone piles, walls, a ditch, and concrete foundations. There are three heiau temples also located within the Dillingham Military Reservation —two fishing shrines and “hidden waters” associated with Hawaiian legend (U.S. Army Garrison, Hawaii U.S. Army Corps of Engineers 1998; U.S. Department of the Navy, Commander, Third Fleet, 2001).

Historic Buildings and Structures

There are several World War II-era buildings at Dillingham Military Reservation; however, they have not been evaluated for eligibility for inclusion in the National Register (U.S. Army Garrison, Hawaii, U.S. Army Corps of Engineers 1998; U.S. Department of the Navy, Commander, Third Fleet, 2001).

Traditional Resources

There are indications of pre-contact use of the coastal dune areas of Dillingham Military Reservation for burials. Burial remains in sand deposits would be considered significant as "properties of traditional religious and cultural importance" (U.S. Army Garrison, Hawaii, and U.S. Army Corps of Engineers 1998; U.S. Department of the Navy, Commander, Third Fleet, 2001).

3.4.10 EWA TRAINING MINEFIELD

Of the 14 environmental resources considered for analysis, air space, air quality, cultural resources, geology and soils, land use, noise, socioeconomics, transportation, utilities, visual and aesthetics, and water resources are not addressed. Use of this site does not require control of the airspace above this land area. There are no air emission issues from HRC operations associated with Ewa. Operations associated with this site adhere to policies and regulations governing noise, as discussed in Appendix C. The proposed operations associated with Alternative 1 or Alternative 2 would not affect socioeconomic characteristics, modes of transportation, and utility demands on Oahu. There are no prehistoric, historic, or archaeological sites associated with Ewa. Additionally, there is no planned construction or alteration associated with the Navy that would affect the scenic and visual quality of the site, land use, land forms, geology, and associated soils development. Operations at the site would not generate any waste streams that could impact local water quality.

3.4.10.1 BIOLOGICAL RESOURCES (OFFSHORE)—EWA TRAINING MINEFIELD

Appendix C includes a detailed description of biological resources.

Region of Influence

The region of influence is the area that can be affected by mine avoidance training.

Affected Environment

Vegetation

The Ewa Beach area is a popular seaweed harvesting area on Oahu (U.S. Department of the Navy, Commander THIRD Fleet, 2002).

<u>Threatened and Endangered Plant Species</u>
No threatened or endangered plant species have been identified in the region of influence.

Wildlife

Organisms offshore of Ewa Beach include corals, several species of sea cucumber, sea urchins, and colonial soft corals. A few species of reef fish are also present in low numbers in the littoral waters. A benthic survey conducted in 2001 indicated that corals were locally abundant on the northern inshore reef slope at Ewa Beach (Figure 3.4.1.1.1-1). (U.S. Department of the Navy, Commander THIRD Fleet, 2002) A detailed description, including status, distribution, and habitat preference of managed fisheries is provided in Appendix G.

<u>Threatened and Endangered Wildlife Species</u>
Green sea turtles are common in the region of influence. Threatened and endangered species potentially occurring in the region of influence would be similar to those described in Section 3.4.1.6.1 for Puuloa.

Environmentally Sensitive Habitat

No environmentally sensitive habitat has been identified.

3.4.10.2 HAZARDOUS MATERIALS AND WASTE—EWA TRAINING MINEFIELD

Appendix C includes a discussion of hazardous materials and waste resource laws and regulations.

Region of Influence

The region of influence for hazardous materials and wastes includes the range and adjacent ocean waters.

Affected Environment

Ewa Training Minefield is an ocean area extending from Ewa Beach approximately 2 nm toward Barbers Point, and out to sea approximately 4 nm. This restricted area has been used in the past for surface ship mine avoidance training. Although the area is not used for this training mission, the Navy may use it in the future, and retains control over it. No hazardous materials are used on this range, and no hazardous wastes are normally generated. Bottom sediments within the range may harbor some residual contamination, however, from past uses of the area.

3.4.10.3 HEALTH AND SAFETY—EWA TRAINING MINEFIELD

Appendix C includes a detailed discussion of health and safety resources laws and regulations.

Region of Influence

The region of influence for public health and safety includes the footprint of the range and adjacent ocean areas.

Affected Environment

Because there are no current public health and safety concerns, there are no restrictions on commercial or recreation activities at Ewa Beach. Ocean activities occurring at Ewa Beach include netting, fishing, tropical fish collecting, surfing, scuba diving, paddling, kayaking, and shelling. A commercial net pen cage aquaculture site is located near the western range boundary (U.S. Department of the Navy, 2000).

3.4.11 BARBERS POINT UNDERWATER RANGE

Of the 14 environmental resources considered for analysis, air space, air quality, cultural resources, geology and soils, land use, noise, socioeconomics, transportation, utilities, visual and aesthetics, and water resources are not addressed. Use of this site does not require control of the airspace above this land area. There are no air emission issues from HRC operations associated with Barbers Point. Operations associated with this site adhere to policies and regulations governing noise, as discussed in Appendix C. The proposed operations associated with Alternative 1 or Alternative 2 would not affect socioeconomic characteristics, modes of transportation, or utility demands on Oahu. There are no prehistoric, historic, or archaeological sites associated with Barbers Point. Additionally, there is no planned construction or alteration associated with the Navy that would affect the scenic and visual quality of the site, land use, land forms, geology, and associated soils development. Operations at the site would not generate any waste streams that could impact local water quality.

3.4.11.1 BIOLOGICAL RESOURCES (OFFSHORE)—BARBERS POINT UNDERWATER RANGE

Appendix C includes a detailed description of biological resources.

Region of Influence

The region of influence includes the underwater range and adjacent waters.

Affected Environment

Vegetation

Seaweed is abundant in the offshore areas (U.S. Department of the Navy, Commander THIRD Fleet, 2002).

<u>Threatened and Endangered Plant Species</u>

No threatened or endangered plant species have been observed in the region of influence.

Wildlife

Biological resources are similar to those described previously for the Puuloa Underwater Range (Section 3.4.1.6.1). A variety of whales and dolphins not listed as threatened or endangered are found around the Hawaiian Islands, including the Minke whale and Bryde's whale. Spinner dolphin, spotted dolphin, bottlenose dolphin, short finned pilot whale, false killer whale, and sperm whale are seen in the area most frequently. (U.S. Department of the Navy, Commander THIRD Fleet, 2002)

Coral coverage ranges from 80 to 90 percent at depths between 9.7 and 13 fathoms to less than 1 percent in water depths from 13 to 20 fathoms. The coral community (Figure 3.4.1.1.1-1) is dominated by *Pocillopora meandrina*, *Porites lobata,* and *Porites compressa*. (U.S. Department of the Navy, Commander THIRD Fleet, 2002)

Fish species are generally associated with the deeper (greater than 20 fathoms) areas designated by the National Oceanic and Atmospheric Administration as Habitat Areas of Particular Concern, and containing coral coverage and vertical relief. The most common families represented are surgeonfishes (acanthurids), butterflyfishes (chaetodontids), damselfishes (pomacentrids), wrasses (labrids), triggerfishes (balistids) and moorish idols (zanclidae) (U.S. Department of the Navy, Commander THIRD Fleet, 2002). A detailed description, including status, distribution, and habitat preference of managed fisheries is provided in Appendix G.

<u>Threatened and Endangered Species</u>

Nine marine wildlife species listed as Federal and State threatened or endangered species are known or suspected to exist in Hawaiian waters, although the offshore environment may be too shallow for frequent use. These species include the Hawaiian monk seal, blue whale, fin whale, humpback whale, sei whale, sperm whale, hawksbill turtle, green sea turtle, and loggerhead sea turtle. A description of these listed species is provided in Section 3.1.2. (U.S. Department of the Navy, Commander THIRD Fleet, 2002)

Environmentally Sensitive Habitat

No environmentally sensitive habitat has been identified.

3.4.11.2 HAZARDOUS MATERIALS AND WASTE—BARBERS POINT UNDERWATER RANGE

Appendix C includes a discussion of hazardous materials and waste resource laws and regulations.

Region of Influence

The region of influence for hazardous materials and wastes includes the range and adjacent ocean waters and shoreline.

Affected Environment

Barbers Point Underwater Range comprises a narrow strip of offshore ocean that directly fronts the entire southern boundary of the former Naval Air Station Barbers Point. Naval Air Station Barbers Point was closed as part of the Base Realignment and Closure in July 1998 and renamed the Kalaeloa Airport. The northern range boundary is the high water mark of the beach fronting the beach at Kalaeloa Airport. It aligns with what was once the station boundary of the closed Naval Air Station Barbers Point. The U.S. Coast Guard Air Station Barbers Point is across the street from the beach and covers a third of the shore of the original installation. No hazardous materials are used on this range, and no hazardous wastes are normally generated. Bottom sediments within the range may harbor some residual contamination, however, from past uses of the area.

3.4.11.3 HEALTH AND SAFETY—BARBERS POINT UNDERWATER RANGE

Appendix C includes a detailed discussion of health and safety resources laws and regulations.

Region of Influence

The region of influence for public health and safety includes the range and adjacent shore and ocean areas.

Affected Environment

Because there are no current public health and safety concerns, beach activities, including netting, fishing, topical fish collecting, surfing, scuba diving, paddling, kayaking, and shelling, are not constrained.

3.4.12 NAVAL UNDERSEA WARFARE CENTER RANGE

The NUWC provides underwater target services and range pinger installation services. The Fleet Technical Evaluation Center is an existing building that would be used as is.

3.4.12.1 SHIPBOARD ELECTRONIC SYSTEMS EVALUATION FACILITY (SESEF)

Of the 14 environmental resources considered for analysis, airspace, air quality, cultural resources, geology and soils, hazardous materials and hazardous waste, land use, noise, socioeconomics, transportation, utilities, visual and aesthetic resources, and water resources are not addressed. Under the No-action Alternative, Alternative 1 or Alternative 2, operations would not include airspace use. There are no air emission issues from HRC operations associated with SESEF. Water resources would not be affected by the ships and submarines operating within the range area during electromagnetic transmitting and receiving equipment testing. Operations associated with this site adhere to policies and regulations governing hazardous materials and hazardous waste, and noise as discussed in Appendix C. The site is compatible with existing surrounding land uses. There are no prehistoric, historic, or archaeological sites associated with SESEF. The proposed operations associated with Alternative 1 or Alternative 2 would not affect socioeconomic characteristics, modes of transportation, or utility demands on Oahu. Additionally, there is no planned construction or alteration associated with the Navy that would affect the scenic and visual quality of the site, land forms, geology, and associated soils development.

3.4.12.1.1 Biological Resources (Offshore)—SESEF

Appendix C includes a detailed description of biological resources.

Region of Influence

The region of influence is the ocean area that could be affected by operations.

Affected Environment

Wildlife

Wildlife in the SESEF range would be similar to that discussed in Section 3.1.2, Biological Resources (Marine)—Open Ocean Area.

Threatened and Endangered Wildlife Species

Threatened and endangered species would be similar to those discussed in Section 3.1.2, Biological Resources (Marine)—Open Ocean Area.

Environmentally Sensitive Habitat

Environmentally sensitive habitat would be similar to that discussed in Section 3.1.2, Biological Resources (Marine)—Open Ocean Area.

3.4.12.1.2 Health and Safety—SESEF

Appendix C includes a detailed discussion of health and safety resources laws and regulations.

Region of Influence

The region of influence for public health and safety includes the footprints of the range and adjacent ocean areas.

Affected Environment

Land areas associated with NUWC ranges are minimal and are for range operations facilities only. NUWC's SESEF area provides state-of-the-art testing and evaluation of combat systems which emit or receive electromagnetic radiation (EMR). At present, an average of about 3,910 operations—or about 15 per day—take place on the SESEF range.

The potential public health risks of these training operations include public exposure to excessive densities of EMR. The potential public safety risks include conflicts between Navy vessels and other vessels on the range.

The sea space where SESEF tests are conducted is unrestricted and is not controlled by NUWC or the Navy. Ships underway for SESEF tests maintain safe separation from other vessels without direct control by SESEF operators.

Communications and electronic devices such as radar, electronic jammers, and other radio transmitters produce EMR. Equipment that produces an electromagnetic field has the potential to generate hazardous levels of EMR. An EMR hazard exists when transmitting equipment generates electromagnetic fields that induce currents or voltages great enough to trigger electro-explosive devices in ordnance, cause harmful effects to people or wildlife, or create sparks that can ignite flammable substances in the area.

EMR fields generally decrease rapidly in intensity with increasing distance from the source, so hazards are reduced or eliminated by establishing minimum distances from EMR emitters for people, ordnance, and fuels. Furthermore, ground-level EMR levels that are generally safe for military personnel aboard ship for long-term exposure are generally safe for transient exposure of individuals at greater distances from the source. Thus, EMR emissions from Navy vessels operating on the NUWC ranges are not a public health concern.

NUWC's SESEF area provides state-of-the-art testing and evaluation of combat systems which radiate or receive electromagnetic energy. The sea space where SESEF tests are conducted is unrestricted and is not controlled by NUWC or the Navy. Ships underway for SESEF tests maintain safe separation from other units without direct control by SESEF operators. If the range is fouled by non-participants, the NUWC Range Control Officer determines if and when range operations can continue.

3.4.12.2 FLEET OPERATIONAL READINESS ACCURACY CHECK SITE (FORACS)

Of the 14 environmental resources considered for analysis, air quality, airspace, cultural resources, geology and soils, hazardous materials and hazardous waste, land use, noise, socioeconomics, transportation, utilities, visual and aesthetics and water resources are not addressed. Under the No-action Alternative, Alternative 1, or Alternative 2, operations would not include airspace use. There are no air emission issues from HRC operations associated with FORACS. No impacts to geology and soils or water resources are anticipated. Operations associated with this site adhere to policies and regulations governing hazardous materials and hazardous waste, and noise, as discussed in Appendix C. The proposed operations associated with Alternative 1 or Alternative 2 would not affect socioeconomic characteristics, modes of transportation, or utility demands on Oahu. There are no prehistoric, historic, or archaeological sites associated with FORACS. Additionally, there is no planned construction or alteration associated with the Navy that would affect the scenic and visual quality of the site, land use, land forms, geology, and associated soils development.

3.4.12.2.1 Biological Resources (Offshore)—FORACS

Appendix C includes a detailed description of biological resources.

Region of Influence

The region of influence is that area of the range that could be affected by current or proposed operations.

Affected Environment

Vegetation

A filamentous green algae that grows upright is common over wide areas of sandy substrate at depths between about 12.5 and 15 fathoms (Commander in Chief Pacific Fleet, 2001).

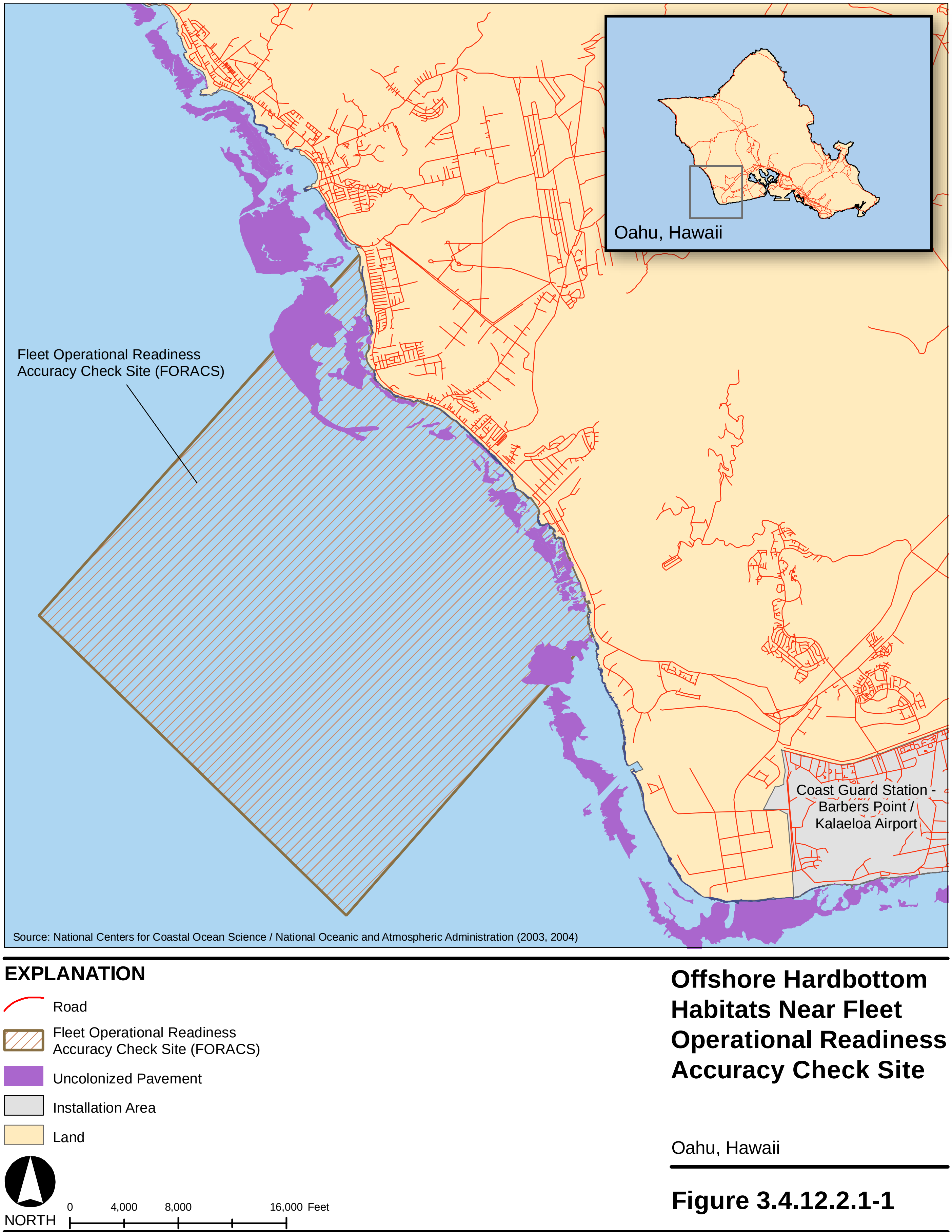
Threatened and Endangered Plant Species

No threatened or endangered plants have been identified in the region of influence.

Wildlife

Inshore areas at depths of about 7 to 12 fathoms have a modestly diverse coral community. *Pocillopora meandrina*, *Porites lobata,* and *Porites compressa* are dominant species of coral. Coral coverage (Figure 3.4.12.2.1-1) declines markedly at depths below 12.5 fathoms with gently sloping sand flats. (Commander in Chief Pacific Fleet, 2001)

Fish are generally rare, except where a coral colony or debris provides habitat. The Hawaiian dascyllus is often abundant in these areas. Small schools of pennantfish, Hawaiian cleaner wrasses, Moorish idols, damselfish, and surgeonfish are also present. Common invertebrates include black sea urchins and sea cucumbers. (Commander in Chief Pacific Fleet, 2001) Appendix G provides a detailed description, including status, distribution, and habitat preference of managed fisheries.



Offshore Hardbottom Habitats Near Fleet Operational Readiness Accuracy Check Site

Oahu, Hawaii

Figure 3.4.12.2.1-1

Threatened and Endangered Wildlife Species

Green sea turtles are abundant in the area and frequently use caves and ledges along the fringing reef as resting areas. (Commander in Chief Pacific Fleet, 2001)

Environmentally Sensitive Habitat

No environmentally sensitive habitat has been identified.

3.4.12.2.2 Health and Safety—FORACS

Appendix C includes a detailed discussion of health and safety resources laws and regulations.

Region of Influence

The region of influence for public health and safety includes the footprints of the range and adjacent ocean areas.

Affected Environment

Land areas associated with Naval Undersea Warfare Center (NUWC) ranges are minimal and are for range operations facilities only. At present, an average of about five operations take place on the FORACS range.

The sea space where FORACS tests are conducted is unrestricted and is not controlled by NUWC or the Navy. The NUWC Range Control Officer conducts visual lookout and radar searches of the FORACS range to identify any transient, non-participating vessels. If the range contains non-participants, the NUWC Range Control Officer determines if and when range operations can continue. These measures have proved adequate for safe operation of the ranges, and the potential for public safety effects from current training operations on the NUWC ranges is considered to be negligible.

The potential health risks of these training operations include exposure to excessive densities of EMR. As discussed in Section 3.4.12.1.2, EMR emissions from Navy vessels operating on the NUWC ranges are not a public health concern.

3.4.13 KEEHI LAGOON

Keehi Lagoon is located on Oahu's southern shore. It includes a triangular shaped area between the Honolulu Harbor and the Honolulu International Airport. Keehi Lagoon was originally a large shallow reef and subtidal area approximately 3 to 6.5 ft deep. The lagoon has changed over the passage of time into an almost completely artificial area. A review of the 14 environmental resources against program operations determined there were no impacts from site operations under the No-action Alternative, Alternative 1, or Alternative 2 at Keehi Lagoon. Salvage Operations take place in Keehi Lagoon. Use of Keehi Lagoon does not require control of the airspace above this area. There are no reports of emission from Navy operations affecting the air quality for Keehi Lagoon. Because no ground disturbance or building modifications would occur, there would be no impact to biological resources, cultural resources, or geology and soils. Additionally, there are no known significant archaeological sites at Keehi Lagoon. Geology and soils impacts would be limited to short-term minor disturbance of the lagoon bottom. Water resources effects would include minor, temporary increase in turbidity as the Salvage Operations are implemented. There are no air emission issues from HRC operations associated with Keehi Lagoon. Every effort would be made to limit actions that would decrease visibility in order to have effective training for the divers. Operations associated with this site adhere to policies and regulations governing hazardous materials and waste, health and safety, and noise, as discussed in Appendix C. There is no impact on native or naturalized vegetation or wildlife within Keehi Lagoon. The proposed operations associated with Alternative 1 or Alternative 2 would not affect socioeconomic characteristics, modes of transportation, or utilities demand on Oahu. There are no prehistoric, historic, or archaeological sites associated with Keehi Lagoon. Additionally, there is no planned construction or alteration associated with the Navy that would affect the scenic and visual quality of the site or land use.

3.4.14 KAENA POINT

The Hawaii Tracking Station located at Kaena Point provides real-time telemetry data to PMRF. Metric and signature tracking data are also provided by the 30th Range Squadron located at Kaena Point. Operations at this site consist of an existing tracking radar operated by the Air Force.

A review of the 14 environmental resources against program operations determined there would be no impacts from site operations under the No-action Alternative, Alternative 1, or Alternative 2 at Kaena Point. No building modifications would occur. No air emissions would be generated from site operations unless use of diesel generators would be required for backup power. The site does not affect the existing airspace structure in the region. Because no ground disturbance or building modifications would occur, there would be no impact to biological resources (including the Laysan albatross eggs being accepted from PMRF), cultural resources, or geology and soils. Operation of the radar does require the use of small amounts of hazardous materials for facility maintenance such as paint repair and oil for the radar unit and generates small amounts of hazardous waste. All hazardous materials used and hazardous waste generated would continue to be managed in accordance with Air Force, Federal, and State regulations. There is an established safety zone around the radar unit to prevent electromagnetic radiation hazards exposures, which eliminates health and safety issues. The site is compatible with existing surrounding land uses, and operations are consistent to the maximum extent practicable with the Hawaii Coastal Zone Management Program. No noise is generated by site operations. The site, which employs up to 15 personnel, would not affect local transportation levels of service or utilities. There is no socioeconomic impact from site operations, and the site does not block any prominent public vistas. Existing or proposed operations would not generate any waste streams that could impact local water quality.

3.4.15 MT. KAALA

The Mt. Kaala site consists of leased building space only, thus biological resources are not discussed. Operations at this site consist of radio frequency communication and radar tracking.

A review of the 14 environmental resources against program operations determined there would be no impacts from site operations under the No-action Alternative, Alternative 1, or Alternative 2 at Mt. Kaala. No building modifications would occur. No air emissions would be generated from operations unless use of diesel generators would be required for backup power. The site does not affect the existing airspace structure in the region. Because no ground disturbance or building modifications would occur, there would be no impact to biological resources, cultural resources, or geology and soils. HRC operations at this location would continue to use small amounts of hazardous materials and generate hazardous waste associated with facility maintenance to prevent building corrosion. All hazardous materials used and hazardous waste generated would continue to be handled in accordance with Federal and State regulations. The site does not represent any public health and safety issues. The site is compatible with existing surrounding land uses and operations are consistent to the maximum extent practicable with the Hawaii Coastal Zone Management Program. No noise is generated by site operations. The site, which is only operated by a few personnel, would not affect local transportation levels of service or utilities. There is no socioeconomic impact from operations, and the site does not block any prominent public vistas. HRC operations would not generate any waste streams that could impact local water quality.

3.4.16 WHEELER NETWORK SEGMENT CONTROL/PMRF COMMUNICATION SITES

Wheeler Network Communications Control is a major communications hub for PMRF. Operations at this site consist of support for the existing telemetry towers and communications.

A review of the 14 environmental resources against program operations determined there would be no impacts from site operations under the No-action Alternative, Alternative 1 or Alternative 2 at Wheeler Network Communications Control. No building modifications would occur. No air emissions would be generated from operations at the sites unless use of diesel generators would be required for backup power. The site does not affect the existing airspace structure in the region. Because no ground disturbance or building modifications would occur, there would be no impact to biological resources, cultural resources, or geology and soils. Operation of this site does require small amounts of hazardous materials for facility maintenance and generates small amounts of hazardous waste. All hazardous materials used and hazardous waste generated would continue to be managed in accordance with applicable regulations. There is no electromagnetic radiation generated at the site; therefore, there are no public health and safety issues. The site is compatible with existing surrounding land uses, and operations are consistent to the maximum extent practicable with the Hawaii Coastal Zone Management Program. No noise is generated by operations at the site. The site, which is only manned during operations, employs two to four persons. Such a small work force would not affect local transportation levels of service or utilities. There is no socioeconomic impact from operation of the site, and the site does not block any prominent public vistas. HRC operations at the site would not generate any waste streams that could impact local water quality.

3.4.17 MAUNA KAPU COMMUNICATION SITE

The Mauna Kapu Communication Site, leased through the FAA by the Department of Energy, contains a repeater station. Operations at this site consist of support for existing telemetry towers and communications.

A review of the 14 environmental resources against program operations determined there would be no impacts from site operations under the No-action Alternative, Alternative 1, or Alternative 2 at the Mauna Kapu Communication Site. No building modifications would occur. No air emissions would be generated from operations at the sites unless use of diesel generators would be required for backup power. The site does not affect the existing airspace structure in the region. Because no ground disturbance or building modifications would occur, there would be no impact to biological resources, cultural resources, or geology and soils. Operation of this site does require small amounts of hazardous materials for facility maintenance and generates small amounts of hazardous waste. All hazardous materials used and hazardous waste generated would continue to be managed in accordance with applicable regulations. There is no electromagnetic radiation generated at the site; therefore, there are no public health and safety issues. The site is compatible with existing surrounding land uses, and operations are consistent to the maximum extent practicable with the Hawaii Coastal Zone Management Program. No noise is generated by operations at the site. The site, which is only manned during operations, employs two to four persons. Such a small work force would not affect local transportation levels of service or utilities. There is no socioeconomic impact from operation of the site, and the site does not block any prominent public vistas. HRC operations at the site would not generate any waste streams that could impact local water quality.

3.4.18 MAKUA RADIO/REPEATER/CABLE HEAD

Makua Radio/Repeater/Cable Head is a Department of Energy communication site. Operations at this site consist of existing telemetry towers and communications.

A review of the 14 environmental resources against program operations determined there would be no impacts from site operations under the No-action Alternative, Alternative 1 or Alternative 2 at Makua Radio/Repeater/Cable Head. No building modifications would occur. No air emissions would be generated from operations at the sites unless use of diesel generators would be required for backup power. The site does not affect the existing airspace structure in the region. Because no ground disturbance or building modifications would occur, there would be no impact to biological resources, cultural resources, or geology and soils. Operation of this site does require small amounts of hazardous materials for facility maintenance and generates small amounts of hazardous waste. All hazardous materials used and hazardous waste generated would continue to be managed in accordance with applicable regulations. There is no electromagnetic radiation generated at the site; therefore, there are no public health and safety issues. The site is compatible with existing surrounding land uses, and operations are consistent to the maximum extent practicable with the Hawaii Coastal Zone Management Program. No noise is generated by operations at the site. The site, which is only manned during operations, employs two to four persons. Such a small work force would not affect local transportation levels of service or utilities. There is no socioeconomic impact from operation of the site, and the site does not block any prominent public vistas. HRC operations at the site would not generate any waste streams that could impact local water quality.

3.5 MAUI

Maui is the second largest of the populated Hawaiian Islands. It covers approximately 700 square miles and was formed by two separate volcanoes: Mt. Haleakala, the world's largest dormant volcano, and Puu Kukui. Wailuku is the county seat. Current and proposed Hawaii Range Complex (HRC) operations on or offshore of Maui addressed in this Environmental Impact Statement (EIS)/Overseas EIS (OEIS) are located at the Maui Offshore area, Maui Space Surveillance Site, Maui High Performance Computing Center, and Sandia Maui Haleakala Facility.

3.5.1 MAUI OFFSHORE

The Maui Offshore is an area situated around the islands of Maui, Kahoolawe, Lanai, and Molokai. The location is a popular submarine training area due to its highly reverberant acoustic environment and shallow depths of 50 and 100 fathoms. The area is located completely within the Hawaiian Islands Humpback Whale National Marine Sanctuary. According to the Hawaiian Islands Humpback Whale National Marine Sanctuary EIS, "… the waters adjacent to Maui, Molokai, and Lanai are important training areas for Navy ships homeported in Pearl Harbor. The channel between Maui, Lanai and Molokai is extensively used for biennial RIMPAC [Rim of the Pacific] exercises, EOD/MCM [explosive ordnance disposal/mine countermeasures] exercises, and as well for shallow-water ASW [anti-submarine warfare]… The areas inside the 100-fathom isobath surrounding Maui, Molokai and Lanai, and specifically the channel between these islands, are used for shallow-water ASW operations." (National Oceanic and Atmospheric Administration National Ocean Service, 1997)

Of the 14 environmental resources considered for analysis, air quality, airspace, cultural resources, geology and soils, hazardous materials and hazardous waste, health and safety, land use, noise, socioeconomics, transportation, utilities, visual and aesthetics, and water resources are not addressed. Use of this site does not require control of the airspace above this area. There are no reports of emissions from Navy operations affecting the air quality for the Maui Offshore area. Operations associated with this site adhere to policies and regulations governing hazardous materials and waste, health and safety, and noise, as discussed in Appendix C. There are no earth resources (land forms, geology and soils) that are adversely affected by operations associated with Maui Offshore. Water resources would not be affected by the movement of submarines during the operations. The socioeconomic characteristics of Maui are not affected by operations associated with Maui Offshore. This site has no prehistoric or historic artifacts, archaeological sites (including underwater sites), historic buildings or structures, or traditional resources that could be affected by HRC operations. HRC operations would not affect local transportation levels of service or utilities. The site is compatible with existing surrounding land uses. Additionally, there is no planned construction or alteration associated with the Navy that would affect the scenic and visual quality of the site.

3.5.1.1 BIOLOGICAL RESOURCES (OFFSHORE)—MAUI OFFSHORE

Appendix C includes a description of the primary laws and regulations regarding biological resources.

Region of Influence

The region of influence is Maui Offshore.

Affected Environment

Marine Habitats, Invertebrates, and Fish

Detritus from nearby islands and calcareous sand and mud make up the bottom sediments in the region of influence. Sand, coral, and mud are all present in the area that formerly held hydrophones. Since black coral has been identified near the western end of Kahoolawe, additional coral patches are expected to be in the area. (Naval Undersea Warfare Center Detachment, 1994)

Lutjanid snapper (opakapaka) makes up the bulk of the bottomfish catch, although other fish, crabs, lobsters, and occasionally shrimp are present. The bottom fishery appears to be in decline or to have reached its maximum sustainable yield. A small commercial and recreational hand-line fishery for opakapaka is located in the region of influence. (Naval Undersea Warfare Center Detachment, 1994)

Marine Mammals

Spinner dolphins travel in pods of 10 to 300 dolphins throughout the Hawaiian Islands, but are found most frequently in deeper water. They prefer clear, calm water close to deep water where food is found, and rest in shallow bays during the day. Spotted dolphins, which may be the most numerous Hawaiian cetacean, are found in large pods in offshore waters less than 100 fathoms. Bottlenose dolphins inhabit offshore waters along the 50- to 100-fathom isobaths around the Hawaiian Islands. They are common during the December to May timeframe. (Commander, Submarine Force U.S. Pacific Fleet, 1997)

Rare, Threatened, and Endangered Species

The presence of the endangered humpback whale in the region of influence is seasonal, with peak concentrations in mid-February to mid-March. The whales seem to prefer areas within the 100-fathom contours such as the Molokai–Lanai–Maui–Kahoolawe channels and Penguin Bank. Humpback whale sightings in the region of influence are mainly concentrated north of Kahoolawe in protected channel areas. Monk seals, which are occasionally seen in the vicinity of Kahoolawe, may be observed in the region of influence. (Commander, Submarine Force U.S. Pacific Fleet, 1997)

Green sea turtles and hawksbill sea turtles are the most commonly seen marine turtles in the Main Hawaiian Islands. Most sightings of these species have been in shallow water. The green sea turtle prefers waters less than about 27 fathoms deep. Numerous sightings have been reported for the water off Maui. Hawksbill sea turtles have been observed on Molokai and Maui.

3.5.2 MAUI SPACE SURVEILLANCE SYSTEM

The Maui Space Surveillance Site provides facilities that observe sub-orbital vehicles. Operations at this site consist of an existing telemetry tower, communications, and tracking facilities.

A review of the 14 environmental resources against program operations determined there would be no impacts from site operations under the No-action Alternative, Alternative 1, or Alternative 2 at the Maui Space Surveillance Site. No building modifications would occur. No air emissions would be generated from site operations unless use of diesel generators would be required for backup power. The site does not affect the existing airspace structure in the region. Because no ground disturbance or building modifications would occur as a result of proposed operations, there would be no impact to biological resources, cultural resources, or geology and soils. The use of hazardous materials and generation of hazardous waste at this site would be in accordance with applicable regulations. There are established safety zones around electromagnetic radiation hazards, which eliminate health and safety issues. The site is compatible with existing surrounding land uses. No noise is generated by site operations, and the site is operated by up to 60 persons. This small staff would not affect local transportation levels of service or utilities. There is no socioeconomic impact from site operations, and the site does not block any prominent public vistas. Operations would not generate any waste streams that could impact local water quality.

3.5.3 SHALLOW-WATER MINEFIELD SONAR TRAINING AREA

This site provides Pearl Harbor based submarines with the capability to conduct mine sonar training operations. A review of the 14 environmental resources against program operations determined there were no impacts from site operations under the No-action Alternative, Alternative 1, or Alternative 2 at the Shallow-Water Minefield Sonar Training Area. Use of this site does not require control of the airspace above this area. There are no reports of emissions from Navy operations affecting the air quality in the training area. Operations associated with this site adhere to policies and regulations governing hazardous materials and waste, health and safety, and noise, as discussed in Appendix C. During the preparation of a 1997 Environmental Assessment, exploration of the site indicated no archeological or historic submerged sites or coral reefs in the area. The training area is located within the Hawaii Island Humpback Whale National Marine Sanctuary; however, the inert shapes and mine detection equipment used in operations at the shallow water training area would be clean and free from residual materials and invasive species from prior use, and no environmental effects on biological resources are anticipated. Since the shapes will rest on the ocean bottom, they would pose no entanglement hazard to marine mammals and sea turtles. A minimum of one inspection per year of the training area and mooring cables/anchor chain is performed. The site is compatible with existing surrounding land uses. There are no earth resources (land forms, geology and soils) that are adversely affected by operations associated with the site. HRC operations would not affect local transportation levels of service or utilities. There is no planned construction or alteration associated with the Navy that would affect the scenic and visual quality of the site. The socioeconomic characteristics of Maui are not affected by operations associated with this training area. Additionally, water resources would not be affected by the movement of submarines during the operations.

3.5.4 MAUI HIGH PERFORMANCE COMPUTING CENTER

The Maui High Performance Computing Center is an Air Force Research Laboratory managed by the University of Hawaii that provides state-of-the-art data processing. Operations at this site consist of data processing. A review of the 14 environmental resources against program operations determined there would be no impacts from site operations under the No-action Alternative, Alternative 1, or Alternative 2 at the Maui High Performance Computing Center. No building modifications would occur. No air emissions would be generated from operations at the sites unless use of diesel generators would be required for backup power. The site does not affect the existing airspace structure in the region. Because no ground disturbance or building modifications would occur, there would be no impact to biological resources, cultural resources, or geology and soils. Operation of this site does require small amounts of hazardous materials for facility maintenance and generates small amounts of hazardous waste. All hazardous materials used and hazardous waste generated would continue to be managed in accordance with applicable regulations. There is no electromagnetic radiation generated at the site; therefore, there are no public health and safety issues. The site is compatible with existing surrounding land uses. No noise is generated by operations at the site. HRC operations would not affect local transportation levels of service or utilities. There is no socioeconomic impact from operation of the site, and the site does not block any prominent public vistas. HRC operations at the site would not generate any waste streams that could impact local water quality.

3.5.5 SANDIA MAUI HALEAKALA FACILITY

The Sandia Maui Haleakala Facility provides telemetry receiving and recording, flight following, command control and flight termination systems for high-altitude/exoatmospheric launches from the Pacific Missile Range Facility and for high-altitude operations that traverse the Hawaiian Island Chain. Operations at this site consist of support for existing telemetry towers and communications.

A review of the 14 environmental resources against program operations determined there would be no impacts from site operations under the No-action Alternative, Alternative 1, or Alternative 2 at the Sandia Maui Haleakala Facility. No building modifications would occur. No air emissions would be generated from operations at the sites unless use of diesel generators would be required for backup power. The site does not affect the existing airspace structure in the region. Because no ground disturbance or building modifications would occur, there would be no impact to biological resources, cultural resources, or geology and soils. Operation of this site does require small amounts of hazardous materials for facility maintenance and generates small amounts of hazardous waste. All hazardous materials used and hazardous waste generated would continue to be managed in accordance with applicable regulations. There is no electromagnetic radiation generated at the site; therefore, there are no public health and safety issues. The site is compatible with existing surrounding land uses. No noise is generated by operations at the site. The site, which is only manned during operations, employs two to four persons. Such a small work force would not affect local transportation levels of service or utilities. There is no socioeconomic impact from operation of the site, and the site does not block any prominent public vistas. Operations at the site would not generate any waste streams that could impact local water quality.

3.6 HAWAII

The island of Hawaii, often called the "Big Island," is the largest of the Hawaiian Islands. It covers approximately 4,028 square miles and is still growing because of continual eruptions of Kilauea. Resorts and most residential developments are located in coastal areas. Hilo, located on the east side of the island, is the county seat. Current and proposed Hawaii Range Complex (HRC) operations on the island of Hawaii addressed in this Environmental Impact Statement (EIS)/Overseas EIS (OEIS) are located at Pohakuloa Training Area (PTA), Bradshaw Army Airfield, and Kawaihae Pier.

3.6.1 POHAKULOA TRAINING AREA

3.6.1.1 POHAKULOA TRAINING AREA

PTA is a sub-installation of Schofield Barracks located near the center of the island of Hawaii in the Humuula Saddle between the three volcanoes of Mauna Kea, Mauna Loa, and Hualalai. Of the 14 environmental resources considered for analysis, air quality, hazardous materials and hazardous waste, geology and soils, land use, socioeconomics, transportation, utilities, and visual aesthetics and water resources are not addressed. No building modifications would occur. No substantial air emissions would be generated from site operations unless use of diesel generators would be required for backup power. Any ground disturbance as a result of proposed operations would be handled in accordance with existing practices, and no impact to geology and soils is expected. The use of hazardous materials and generation of hazardous waste at this site would be in accordance with applicable regulations. The site is compatible with existing surrounding land uses. HRC operations would not affect local transportation levels of service or utilities. The socioeconomic characteristics of the area are not affected by operations associated with this site. The site does not block any prominent public vistas. Operations would not generate any waste streams that could impact local water quality.

3.6.1.1.1 Airspace—PTA

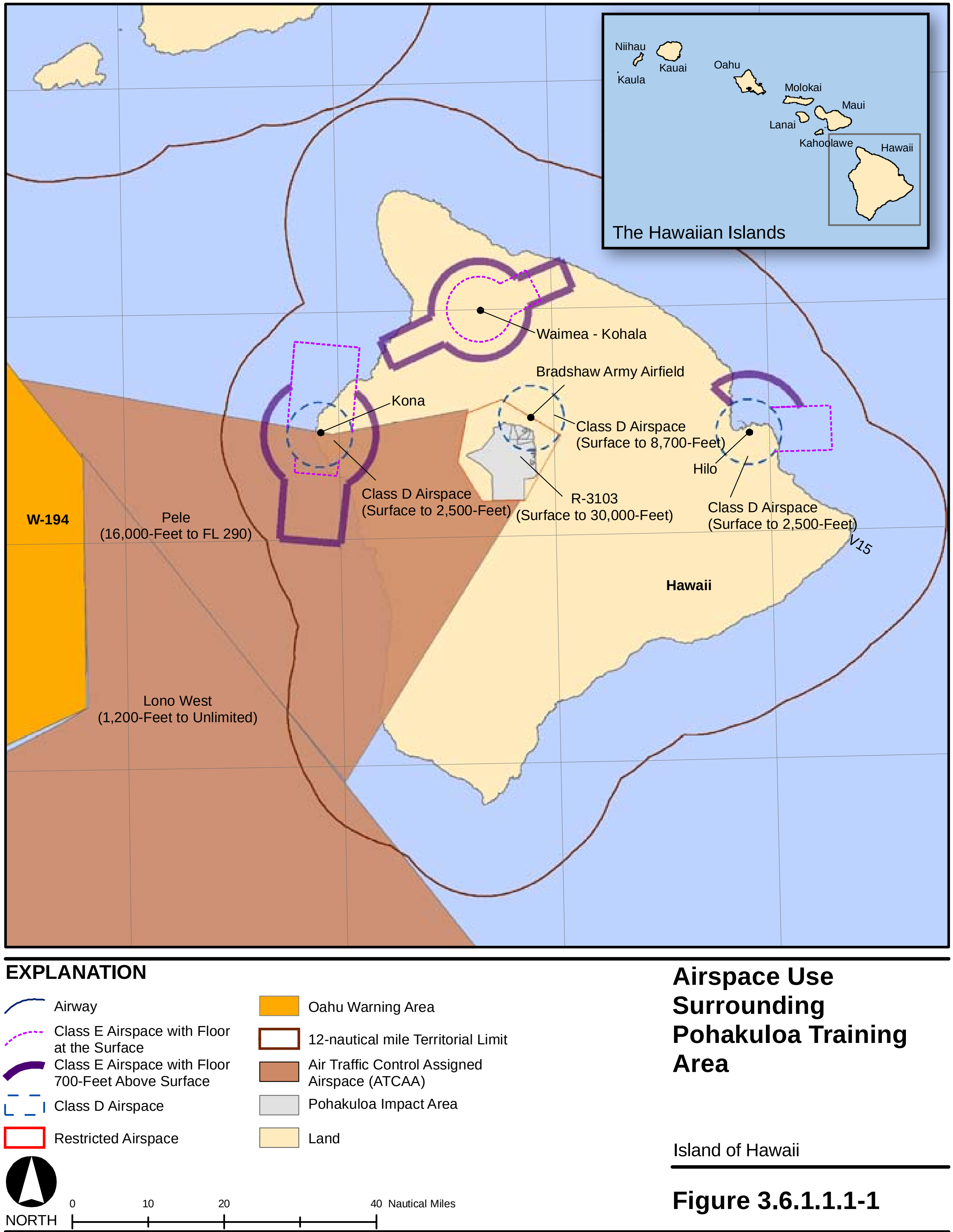
Appendix C includes a detailed description of airspace.

Region of Influence

The PTA region of influence includes selected airspace within the territorial limits of the island of Hawaii as shown on Figure 3.6.1.1.1-1. The primary operations occur above the PTA and within the Pele transition area between PTA and Warning Area W-194.

Affected Environment

The affected airspace in the PTA region of influence is described below in terms of its principal attributes: controlled and uncontrolled airspace, special use airspace, en route airways and jet routes, airports and airfields, and air traffic control. There are no military training routes in the region of influence.



Airspace Use Surrounding Pohakuloa Training Area

Island of Hawaii

Figure 3.6.1.1.1-1

Controlled and Uncontrolled Airspace

The airspace in the PTA region of influence includes uncontrolled Class G airspace (see Appendix C), which extends from the surface to a ceiling of 1,200 feet (ft), and controlled Class E airspace, which is airspace above 1,200 ft unless the special use airspace, discussed below, is activated. Bradshaw Army Airfield, located within PTA, is surrounded by Class D airspace extending from the surface to a ceiling of 8,700 ft. There is also class D airspace at the Kona and Hilo airports extending from the surface to 2,500 ft. (National Aeronautical Charting Office, 2006) However, because the PTA impact area and Bradshaw Army Airfield are located at an elevation approximately 6,000 ft above Hilo and Kona, those airports are typically not within the region of influence.

Special Use Airspace

The R-3103 restricted area (Figure 3.6.1.1.1-1) lies above the PTA, extending from the surface to 30,000 ft (Table 3.6.1.1.1-1). The time of use is intermittent; notification is made by Notice to Airmen 12 hours in advance. The area is scheduled through the Navy Fleet Area Control and Surveillance Facility Pearl Harbor who coordinates with the Honolulu Combined Facility. When R-3103 is active, Bradshaw Army Airfield Tower maintains control of a corridor of airspace for aircraft arriving or departing Bradshaw Army Airfield and PTA. Aircraft operating outside this corridor must coordinate with Range Control to enter or exit the airspace and to obtain specific routes for flights within Restricted Airspace R-3103 (U.S. Army Garrison, Hawaii, 1996). When the airspace is scheduled to be inactive, the agency releases it back to the Honolulu Combined Facility, and, in effect, the airspace is no longer restricted. (U.S. Department of the Army, 2004; Federal Aviation Administration, 2006)

Table 3.6.1.1.1-1. Special Use Airspace in the Island of Hawaii Region of Influence

Warning/ATCAA			Time of Use		
Number/Name	Location	Altitude (Ft)	Days	Hours	Controlling Agency
R-3103	Restricted Airspace	To 30,000	Int[1]	By Notice to Airmen	HCF
Pele	Between W-194 and R-3103	16,000 to FL290		By request	HCF

[1]Int=Intermittent
W-Warning
ATCAA = Air Traffic Control Assigned Airspace
FL = Flight Level (FL 290 = 29,000 ft)
HCF = Honolulu Combined Facility
Source: National Aeronautical Charting Office, 2006; Federal Aviation Administration, 2006

Although there are no formal, published military training routes on the island of Hawaii, the R-3103 restricted area is used for helicopter training exercises, with an average of 900 aircraft movements per month, 99 percent of which involve helicopters. Typical training involves the use of 10 rotary winged aircraft at any one time. During deployment training one or two C-130s would be involved about twice a year. (U.S. Department of the Army, 2004)

Naval aircraft use of the R-3103 restricted area include Navy and Marine Corps fighter and attack aircraft crews training during major range training events. A Strike Warfare exercise would typically involve a flight of 2 to 10 aircraft training in air-to-ground missile firing, conventional ordnance delivery, and precision-guided munitions firing. All Strike Warfare Training at PTA uses inert munitions.

There is also one Air Traffic Control Assigned Airspace (ATCAA) area within the region of influence (Pele) that provides additional controlled airspace between R-3103 and Warning Area W-194 (Table 3.6.1.1.1-1).

En Route Airways and Jet Routes

As shown on Figure 3.6.1.1.1-1, there is one oceanic route (B595) located approximately 18 nautical miles (nm) west of PTA, running along the eastern side of the island, terminating near Kona. Several low altitude Air Traffic Service (ATS) routes are located near Kona, and several others are located approximately 26 nm west of PTA at Hilo. One ATS route is located approximately 15 nm north of PTA.

Airports and Airfields

Bradshaw Army Airfield, located within PTA, is surrounded by Class D airspace extending from the surface to a ceiling of 8,700 ft. As described earlier, the Hilo and Kona airports and associated airspace are below the airspace typically utilized at PTA. Both Hilo and Kona are surrounded by Class D airspace. Both include surface Class E airspace extensions and additional Class E extensions with a floor 700 ft above the surface. The Waimea airfield is located approximately 15 nm north of PTA at an altitude of 2,671 ft. It is surrounded by surface Class E airspace with additional Class E airspace extensions with a floor 700 ft above the surface. Air traffic in the region of influence is managed by the Honolulu Air Route Traffic Control Center.

3.6.1.1.2 Biological Resources (Terrestrial)—PTA

For the purpose of discussion, terrestrial biological resources have been divided into the areas of vegetation and wildlife (including threatened and endangered species) and environmentally sensitive habitat. A list of some of the regulations that govern biological resources is provided in Appendix C.

Region of Influence

The region of influence is the area within or adjacent to PTA that could be affected by proposed operations.

Affected Environment

Vegetation

Lava with little vegetative development covers approximately 25 percent of the installation. Treelands are dominated primarily by 'ohi'a lehua (*Metrosideros polymorpha),* which is a member of the myrtle family and is the most abundant tree in Hawaii. Shrublands are the most diverse plant communities on the installation (14 different types). Dominant shrubs include naio *(Myoporum),* mamane *(Sophora),* a'ali'I *(Dodonaea),* 'aweoweo *(Chenopodium),* and pukiawe *(Styphelia).* Introduced plants are components of all habitats on PTA. (U.S. Department of Agriculture, 1990; U.S. Department of the Army, 2004; 2006)

<u>Threatened and Endangered Plant Species</u>

Fourteen Federally endangered plants and one threatened one, listed in Table 3.6.1.1.2-1, are known or expected to occur in the region of influence.

Table 3.6.1.1.2-1. Listed Species Known or Expected to Occur in the Vicinity of the Proposed Action

Scientific Name	Common Name	Federal Status
Plants		
*Asplenium fragile var. insulare**	Fragile fern	E
Haplostachys haplostachya	Honohono (Hawaiian mint)	E
*Hedyotis coriacea**	Kio'ele (leather-leaf sweet ear)	E
*Isodendrion hosakae**	Aupauka	E
Lipochaeta venosa	Nehe	E
*Neraudia ovata**	Big Island ma'oloa (spotted nettle brush)	E
*Portulaca sclerocarpa**	Po'e (purselane)	E
*Silene hawaiiensis**	Hawaii catchfly	T
*Silene lanceolata**	Lanceleaf catchfly	E
*Solanum incompletum**	Popolo ku mai (Hawaiian prickle leaf)	E
*Spermolepis hawaiiensis**	Hawaii scaleseed (Hawaiian parsley)	E
Stenogyne angustifolia	Ma'ohi'ohi (creeping mint)	E
*Tetramolopium arenarium**	Mauna Kea pamakani	E
*Vigna owahuensis**	Mohihihi	E
*Zanthoxylum hawaiiense**	A'e (Hawaiian yellow wood)	E
Birds		
Branta sandvicensis	Nene (Hawaiian goose)	E
Buteo solitarius	'Io (Hawaiian hawk)	E
Hemignathus munroi	'Akiapola'au (honeycreeper)	E
Loxioides bailleui	Palila (finch-billed honeycreeper)	E
Pterodroma phaeopygia sandwichensis	'Ua'u (Hawaiian petrel)	E
Mammals		
Lasiurus cinereus spp. *semotus*	Hawaiian hoary bat	E

Source: Shaw, 1997; U.S. Fish and Wildlife Service, 2006; U.S. Department of the Army, 2004; 2006

NOTES:

* Critical habitat originally proposed for this plant, but later determined unnecessary by the U.S. Fish and Wildlife Service due to the management actions put forth in the Integrated Natural Resources Management Plan and Ecosystem Management Plan of the installation.

T Threatened
E Endangered

Wildlife

No reptiles have been documented on PTA. Wild pigs, goats, sheep, cats, and dogs have been observed on PTA. U.S. Army Garrison Hawaii is proposing to construct and maintain fence units on PTA to protect threatened and endangered species and their habitats from the impact of introduced ungulates (hoofed mammals). The program would involve the removal of all ungulates from within the fence units. Without a physical barrier, sheep, pigs, and goats would continue to damage native natural communities and threatened and endangered species. (U.S. Department of the Army, 2006) Mouflon sheep, cows, Norway rats, and house mice are also present.

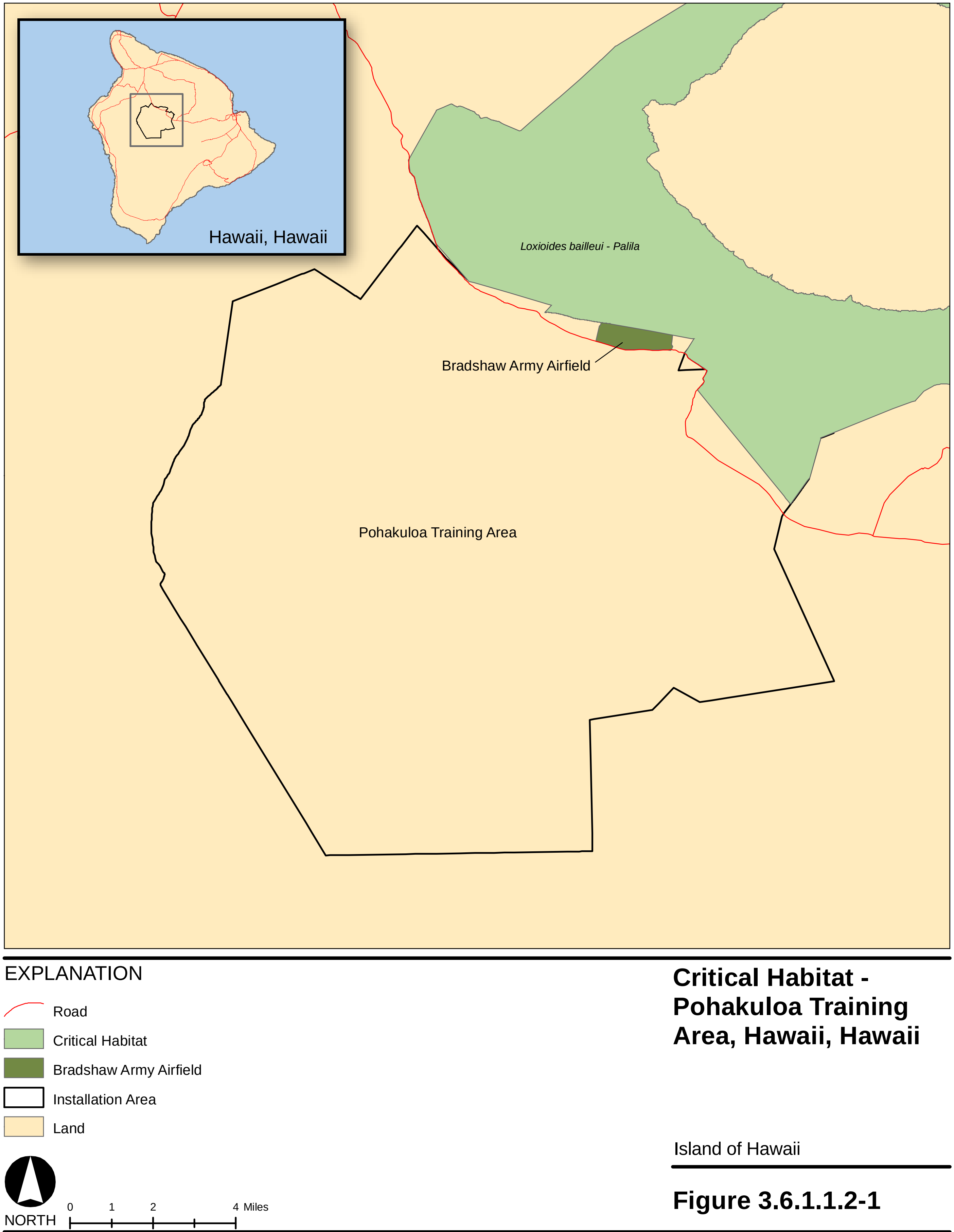
Endemic birds common to PTA are the ‘apapane (a honeycreeper) and Hawaii ‘amakihi (a honeycreeper). The i’iwi (a honeycreeper), Hawaii ‘elepaio (flycatcher), and ōma’o (Hawaiian thrush) are present, but less common to PTA. The first ‘elepaio nest observed on PTA was discovered during a 2006 survey (U.S. Army Garrison, Hawaii, 2006). The pueo (Hawaiian owl) is also present (U.S. Department of the Army, 2006). Nonnative bird species include Erckel’s francolin, black francolin, California quail, and Japanese quail. (U.S. Department of the Army, 2004)

<u>Threatened and Endangered Wildlife Species</u>

The only native terrestrial mammal in the Hawaiian Islands, the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*), is known to occur on PTA (Table 3.6.1.1.2-1). Of the four endangered forest birds listed in Table 3.6.1.1.2-1, only the ‘io (Hawaiian hawk) (*Buteo solitarius*) and nene (*Branta sandvicensis*) have been recorded in the past 5 years at PTA. The Federally endangered Hawaiian petrel (*Pterodroma phaeopygia sandwichensis*), a seabird, has also been known to occur on PTA (Colorado State University, 2002). (U.S. Department of the Army, 2004; 2006)

Environmentally Sensitive Habitat

Critical habitat is the term used in the Endangered Species Act to define those areas of habitat that are known to be essential for an endangered or threatened species to recover and that require special management protection. The U.S. Fish and Wildlife Service determined that critical habitat for 12 plants (see Table 3.6.1.1.2-1) was not necessary since the PTA Integrated Natural Resources Management Plan and Ecosystem Management Plan encompass management actions that will benefit the listed species for which critical habitat was originally proposed (Federal Register, 2003). Critical habitat has been designated on the installation (Figure 3.6.1.1.2-1) for one of the larger Hawaiian honeycreepers, the palila (*Loxioides bailleui*), although this bird has not been observed in recent years. Up to 96 percent of the palila population and nearly all of the successful breeding occur on the southwestern slope of Mauna Kea (U.S. Fish and Wildlife Service, 2003). The mamane-naio forest on the central plateau of Hawaii is the prime habitat of the palila, an endangered native bird (University of Hawaii Kapiolani Community College, undated).



Critical Habitat - Pohakuloa Training Area, Hawaii, Hawaii

Island of Hawaii

Figure 3.6.1.1.2-1

3.6.1.1.3 Cultural Resources—PTA

Appendix C includes a description of cultural resources and the laws and regulations pertaining to them.

Region of Influence

The region of influence for cultural resources at PTA encompasses existing, heavily disturbed impact and training areas, trails, and roads and PTA facilities where Live Fire Exercises would take place and Large Area Tracking Range (ground relay stations) would be added.

Affected Environment

Archaeological Resources (Prehistoric and Historic)

PTA is part of a large cultural landscape that includes Mauna Kea, Mauna Loa, and the Saddle area between them. Researchers of Hawaiian culture (Maly, 1999; McEldowney, 1979; and Langlas, 1997) indicate that this landscape is spiritually and historically one of the most important places in Hawaiian tradition and history. Evidence of the area's significance is confirmed by physical and archaeological remains and through the many oral histories that describe historical events and uses of the area (Tetra Tech, 2004). Site types encompass traditional activities such as bird hunting for feathers and meat, quarrying volcanic glass, and lithic workshop locations for manufacturing the adzes made from Mauna Kea basalt. The Saddle region also displays numerous trails used for movement both cross-island and to the Mauna Kea and Mauna Loa summits. The Umi heiau on the slopes of Hualalai (south of PTA) is believed to have been built by the legendary chief "Umi a Liloa" around 1600 and derives some of its importance from its location at the juncture of several of these trails. Cave shelters are abundant due to an extensive natural lava tube system in the area; historically they have been a source of limited water and have provided refuge from the elements.

In the late 1800s, cattle and sheep ranching was the primary activity within the PTA area. There were two primary land leases during those years—the John Parker lease (ca. 1876-1891) situated in the western portion of what is now the PTA, and the Waimea Grazing and Agricultural Company lease (ca. 1860-1891) situated in the eastern portion. The latter completed a wagon road from one of its remote sheep stations near the Saddle Road (at Humuula) to Waimea to transport wool to the harbor at Kawaihae, and a portion of that road is still visible. A number of stone walls were also constructed during the 1890s (Tetra Tech, Inc., 2004).

Approximately 30 percent of the PTA has been surveyed for archaeological resources, and 291 prehistoric and historic archaeological sites and traditional resources sites have been recorded (U.S. Department of the Navy, Commander, Third Fleet 2002, 2004, and 2006; Tetra Tech, Inc., 2004); additional sites have been recorded within adjacent areas. Typical site types include lava tubes, walls, trails, shelters (including C-shape), lithic scatters, quarries, shrines, cairns (ahu), platforms, and pits of unclear origin. Appendix I contains a list of PTA sites recommended as eligible for inclusion in the National Register. One site, the Bobcat Trail Habitation Cave, is already listed in the National Register. (Tetra Tech, Inc., 2004)

Historic Buildings and Structures

PTA's use as a military installation began in 1942 with the building of the Kaumana Road for military access between Hilo and Waimea (i.e., the Saddle Road). The new road allowed development of the Saddle Training Area, which consisted of the Bradshaw Army Airfield and the PTA. There are no identified historic buildings or structures within the PTA; however, there are 138 identified historic properties within the Bradshaw Army Airfield (see Figure 2.1-4 and Section 3.6.1.2.3).

Traditional Resources

An oral history survey of PTA that included both interviews and a field visit with eight of the informants was conducted by Social Research Pacific, Inc. in 2002. The survey focused on place names, trail systems, and known Native Hawaiian structures. The report from this survey includes information gleaned from previous works, including McEldowney (1982), which contains oral accounts and written evidence about the Mauna Kea summit area; other early accounts from western visitors passing through the area (Maly, 1999); and myth and legend material found in Elbert (1959) and Kamakau (1992). Specific types of traditional sites identified in the region include agricultural terraces and enclosures, habitation shelters, and rock art sites. Some of the archaeological sites described above may have traditional components or be considered traditional sites as well.

3.6.1.1.4 Health and Safety—PTA

Appendix C includes a detailed discussion of health and safety resources laws and regulations.

Region of Influence

The region of influence is the area of the PTA where proposed operations are planned.

Affected Environment

The affected environment is in an isolated area in the center of PTA with restricted access and located away from the civilian population. Safety and health precautions are covered in *Pohakuloa Training Area External Standing Operating Procedures* and are briefed by the Pohakuloa Training Area Operations Center.

For missile and weapons systems, the Range Safety Office at PTA establishes criteria for the safe execution of the test operation in the form of Range Safety Approval and Range Safety Operational Plan documents. These plans are required for all weapon and target systems using PTA. The plans include the allowable launch and flight conditions and flight control methods necessary to contain the missile flight and impacts within the predetermined impact hazard areas. All hazard areas are checked and determined to be clear of nonessential personnel and aircraft prior to an exercise.

Ammunition is brought from Wheeler Army Air Field or Lualualei to PTA via boat or helicopter. In the event boats are used, the ammunition is driven from Kawaihae Harbor to PTA. Once ammunition is brought to PTA, it is temporarily stored in ammunition holding areas on PTA. At completion of training, unused ammunition is returned to the ammunition supply point on Wheeler Army Air Field. Permanent ammunition storage is not authorized on PTA. Ranges at PTA have designated surface danger zones, whose construction is based on information in

Army Regulation 385-63 and the draft update of this regulation. For 2 years prior to 2004, there were no accidents pertaining to the transporting, storage, or firing of ammunition at PTA that risked public safety, there were no accidents pertaining to the transporting, storage, or firing of ammunitions at PTA that risked public safety. (U.S. Department of the Army, 2004)

3.6.1.1.5 Noise—PTA

Appendix C includes a definition of noise and the main regulations and laws that govern it.

Region of Influence

The region of influence for noise analysis is the area within and surrounding PTA in which humans and wildlife may suffer annoyance or disturbance from proposed operations noise sources at PTA.

Affected Environment

Noise levels surrounding PTA are typically low due to the area having a low population and low volume of traffic on nearby roads. The noise levels within PTA can be high due to military training, such as artillery firing and low-flying aircraft, including helicopters and jet fighters. With the exception of the cantonment area, no noise-sensitive land uses are affected by existing noise levels. Because troops are not permanently based at PTA, all troop housing is used for troops who are visiting PTA to participate in training exercises.

The Army is in the process of developing an environmental noise management plan for PTA. This plan is intended to improve land use compatibility and notification to surrounding communities about the scheduling and nature of military training operations (U.S. Department of the Army, 2004).

Wildlife receptors at PTA are detailed in Section 3.6.1.1.2, Biological Resources (Terrestrial).

3.6.1.2 BRADSHAW ARMY AIRFIELD

Bradshaw Army Airfield is located on the northern boundary of PTA on the island of Hawaii. It has a 3,700-ft airstrip and a small cantonment area. Of the 14 environmental resources considered for analysis, air quality, geology and soils, hazardous materials and hazardous waste, health and safety, land use, noise, socioeconomics, transportation, utilities, visual and aesthetics, and water resources are not addressed. No air emissions would be generated from site operations unless use of diesel generators would be required for backup power. Under the No-action Alternative, Alternative 1, and Alternative 2, there would be no ground-disturbing activities or building modifications that could affect geology and soils at Bradshaw Army Airfield. HRC operations at Bradshaw Army Airfield represent only a small portion of the operations at this airfield and are similar to any airport area. The socioeconomic characteristics of Hawaii are not affected by operations associated with Bradshaw Army Airfield. The use of hazardous materials and generation of hazardous waste at this site would be in accordance with applicable regulations. Operations would be performed in accordance with all applicable safety regulations. The site is compatible with existing surrounding land uses. HRC operations would not affect local transportation levels of service or utilities. The site does not block any prominent public vistas. Operations would not generate any waste streams that could impact local water quality.

3.6.1.2.1 Airspace—Bradshaw Army Airfield

Appendix C includes a detailed description of airspace.

Region of Influence

The region of influence for Bradshaw Army Airfield is similar to that described for airspace at PTA (Section 3.6.1.1.1)

Affected Environment

The affected airspace for Bradshaw Army Airfield is the same as that described in Section 3.6.1.1.1 for PTA.

3.6.1.2.2 Biological Resources (Terrestrial)—Bradshaw Army Airfield

Appendix C includes a detailed description of biological resources.

Region of Influence

The region of influence is the area within or adjacent to Bradshaw Army Airfield that could be affected by proposed operations.

Affected Environment

Since Bradshaw Army Airfield is located on the northern boundary of PTA, its affected environment is similar to that described in Section 3.6.1.1.2.

Vegetation

The majority of the open area is vegetated with native plants and is identified as Subalpine dryland.

Threatened and Endangered Plant Species

Plant species listed in Table 3.6.1.1.2-1 could also potentially be located on Bradshaw Army Airfield.

Wildlife

Since the area has been cleared for the runway, only small mammals and birds are likely to be in the region of influence. However, other wildlife species listed above at PTA could also potentially occur at Bradshaw Army Airfield.

Threatened and Endangered Wildlife Species

The endangered Hawaiian hoary bat could pass through the area, as well as the ‘io and nene.

Environmentally Sensitive Habitat

Critical habitat for the endangered palila has been established both north and southeast of Bradshaw Army Airfield (see Figure 3.6.1.1.2-1), but none is located in the immediate vicinity of the airfield.

3.6.1.2.3 Cultural Resources—Bradshaw Army Airfield

Appendix C includes a description of cultural resources and the laws and regulations pertaining to them.

Region of Influence

The region of influence for cultural resources at Bradshaw Army Airfield encompasses the building where a new ground relay station will be added.

Affected Environment

Archaeological Resources (Prehistoric and Historic)

Bradshaw Army Airfield is located within the PTA; therefore, the prehistoric and historic context for the facility is the same as described for PTA. There are no known significant archaeological resources within Bradshaw Army Airfield; however, there are numerous archaeological sites identified within the adjacent PTA (see Figure 2.1-4 and Section 3.6.1.1.3). (U.S. Department of the Navy, Commander, Third Fleet, 2002)

Historic Buildings and Structures

The PTA cantonment/Bradshaw Army Airfield encompasses 138 buildings and structures, including Quonset huts that date from 1955 to 1958. The condition and historic significance of the 138 facilities have been assessed, and all 138 facilities have been determined eligible for inclusion in the National Register.

Traditional Resources

Bradshaw Army Airfield is within the PTA; therefore, the traditional resources context for the facility is the same as described for PTA. There are no known traditional resources sites within the Bradshaw Army Airfield (see Section 3.6.1.1.3). (Tetra Tech, Inc., 2004)

3.6.1.3 KAWAIHAE PIER

Kawaihae Pier is located within the Kawaihae Harbor on the northwest corner of the island of Hawaii. Kawaihae Harbor is one of two deep-water ports on the island of Hawaii. Of the 14 environmental resources considered for analysis, air space, air quality, cultural resources, geology and soils, hazardous material and waste, health and safety, land use, noise, socioeconomics, transportation, utilities, visual and aesthetics, and water resources are not addressed. Use of Kawaihae Pier does not require control of the airspace above this land area. No air emissions would be generated from site operations unless use of diesel generators would be required for backup power. There are no concerns with noise as it relates to HRC operations at Kawaihae Pier. Because no ground disturbance or building modifications would occur as a result of proposed operations, there would be no impact to geology and soils. Operations associated with this site adhere to policies and regulations governing hazardous materials and waste, health and safety, and noise, as discussed in Appendix C. Kawaihae Pier has no prehistoric and historic artifacts, archaeological sites (including underwater sites), historic buildings or structures, or traditional resources that could be affected by HRC operations. The socioeconomic characteristics of Hawaii are not affected by operations associated with Kawaihae Pier. HRC operations would not affect local transportation levels of service or utilities. The site does not block any prominent public vistas. Operations would not generate any waste streams that could impact local water quality.

3.6.1.3.1 Biological Resources (Offshore and Terrestrial)—Kawaihae Pier

Appendix C includes a detailed description of biological resources.

Region of Influence

The region of influence includes the beach and other areas adjacent to the pier that may be affected by proposed operations.

Affected Environment

Vegetation

A small beach area containing no vegetation is located immediately adjacent to the pier.

<u>Threatened and Endangered Plant Species</u>

No threatened or endangered plant species have been identified within the harbor area.

Wildlife

Terrestrial wildlife at Kawaihae Pier is limited to transitory birds and small mammals. Habitat areas of particular concern have not been identified within the harbor. A coral reef of management concern is located at Kawaihae Harbor. It is at risk from extensive development at the commercial harbor and from recent and continued development at the small boat harbor. Another coral reef, Puako Reef, is located approximately 3 to 4 mi from Kawaihae Harbor. (National Park Service, 2004)

The following coral information is summarized from the more extensive data provided in Appendix G. Overall, coral communities of Hawaii are considered to be in good condition. The growth of coral reefs around the island of Hawaii is correlated to the intensity and frequency of wave disturbance. Coral reefs are primarily found on the western (leeward) side of the island, which includes the offshore area between Waikui and Mahukona (Figure 3.6.1.3.1-1). During summer, an occasional Kona storm generates storm swells of about 10 to 20 ft in height that can remove accreted reefs on the leeward side.

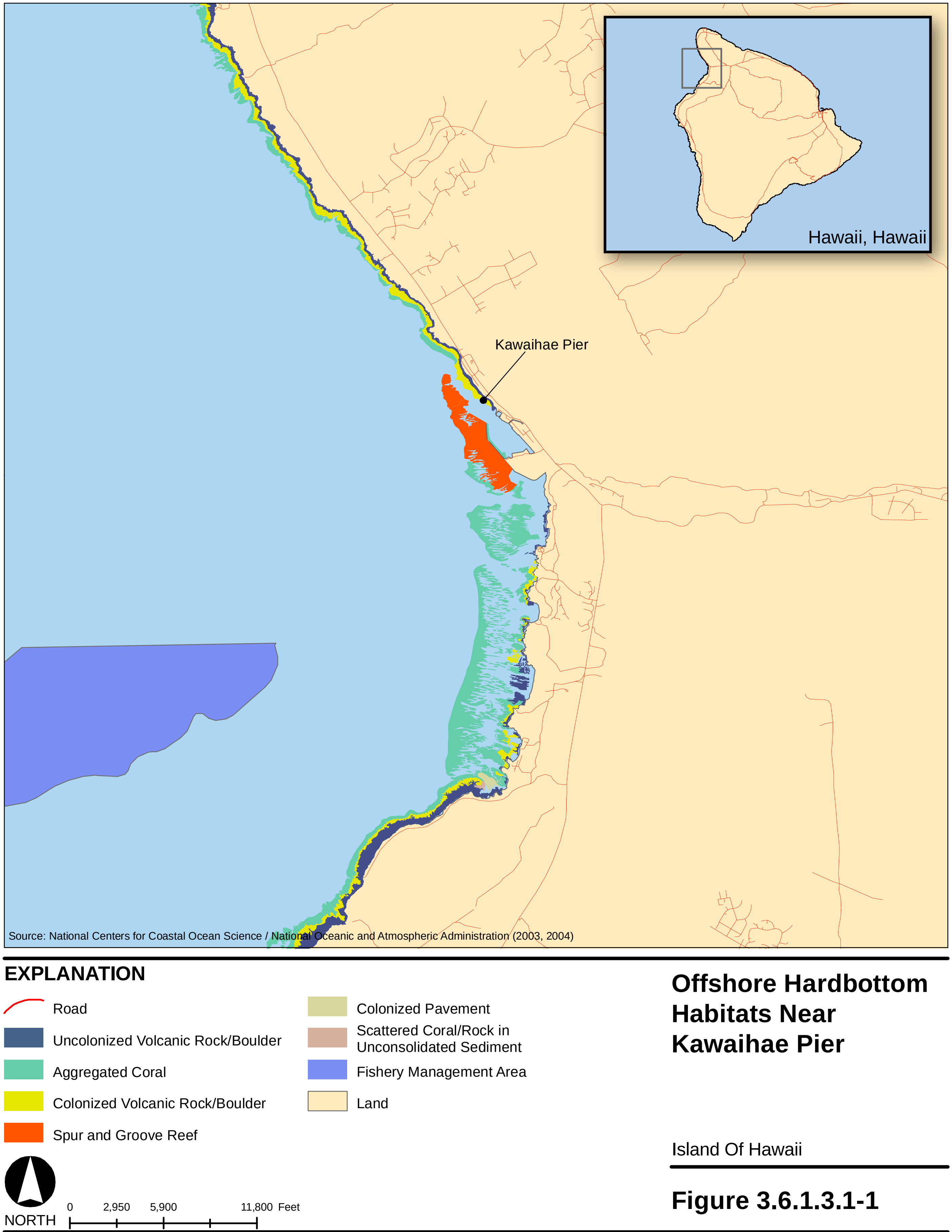
North of Waikui, there is a fairly large spur-and-groove reef system (1.3 nm long, 590 to 1,772 ft wide) off the Kawaihae Small Boat Harbor (Figure 3.6.1.3.1-1). This is the only spur-and-groove reef that the National Centers for Coastal Ocean Science/National Oceanic and Atmospheric Administration (2003) benthic habitat mapping program recorded for the island of Hawaii. From the Kawaihae Small Boat Harbor to Malae Point, the shoreline is flanked by a narrow intertidal area consisting of uncolonized volcanic rock (approximately 131 ft wide); just seaward there is a strip of colonized volcanic rock (131 to 459 ft wide) and aggregated coral heads (131 to 459 ft wide). Another 2.2 nm north of Malae Point, there is similar habitat zonation and sizes. From Malae Point to Makaohule Point the widths of colonized volcanic rock and aggregated coral head habitats range from 328 to 820 ft and 590 to 1,181 ft, respectively.

Threatened and Endangered Wildlife Species

No threatened or endangered species have been identified within the harbor. However, the water on this leeward side of the island provides good habitat for humpback whale mother and calf pods and for resting dolphin pods (National Park Service, 2004).

Environmentally Sensitive Habitat

Kawaihae Harbor and Small Boat Basin is excluded from the Hawaiian Islands Humpback Whale National Marine Sanctuary boundaries (National Oceanic and Atmospheric Administration, 2001). No critical habitat is present (National Park Service, 2004).



Offshore Hardbottom Habitats Near Kawaihae Pier

Island Of Hawaii

Figure 3.6.1.3.1-1

4.0 Environmental Consequences

4.0 ENVIRONMENTAL CONSEQUENCES

This chapter describes potential environmental consequences at each location that may be affected by the No-action Alternative, Alternative 1, and Alternative 2. The same resource areas addressed in Chapter 3.0 for each location are addressed in this chapter. The following sections address the potential for impacts on each environmental resource and its attributes by activity and subactivities identified in Chapter 2.0. The rationale for not addressing certain resources for a given location is provided under the Open Ocean heading and each main island heading. Table 4-1 lists each location and the section of each of the resources addressed.

Potential environmental effects described in this section focus on the continuation of ongoing operations in the Hawaii Range Complex (HRC) (No-action Alternative) and the effect of implementing Alternatives 1 and 2 to the No-action Alternative. The environmental consequences assessment in the Environmental Impact Statement (EIS)/Overseas EIS (OEIS) includes estimates of the potential direct and indirect effects; long- and short-term effects; and irreversible and irretrievable resource commitments.

The EIS/OEIS generally describes the measures required to mitigate adverse impacts. The EIS/OEIS also identifies those measures already committed to as part of current, ongoing operations, and additional mitigations (if any) which could reasonably be expected to reduce impacts if Alternative 1 or 2 is implemented.

Table 4-1. Chapter 4.0 Locations and Resources

	Air Quality	Airspace	Biological Resources	Cultural Resources	Geology & Soils	Hazardous Materials & Waste	Health & Safety	Land Use	Noise	Socioeconomics	Transportation	Utilities	Water Resources
Open Ocean		4.1.1	4.1.2	4.1.3		4.1.4	4.1.5		4.1.6	4.1.7			4.1.8
Northwestern Hawaiian Islands			4.2.1	4.2.2									
Kauai													
Pacific Missile Range Facility													
PMRF/Main Base	4.3.1.1.1	4.3.1.1.2	4.3.1.1.3	4.3.1.1.4	4.3.1.1.5	4.3.1.1.6	4.3.1.1.7	4.3.1.1.8	4.3.1.1.9	4.3.1.1.10	4.3.1.1.11	4.3.1.1.12	4.3.1.1.13
Makaha Ridge	4.3.1.2.1		4.3.1.2.2	4.3.1.2.3		4.3.1.2.4	4.3.1.2.5						
Kokee	4.3.1.3.1		4.3.1.3.2			4.3.1.3.3	4.3.1.3.4						
HIANG Kokee			4.3.1.4.1										
Kamokala Magazines						4.3.1.5.1	4.3.1.5.2						
Port Allen*													
Kikiaola Small Boat Harbor*													
Mt Kahili*													
Niihau			4.3.1.9.1			4.3.1.9.2	4.3.1.9.3						
Kaula		4.3.1.10.1	4.3.1.10.2	4.3.1.10.3	4.3.1.10.4		4.3.1.10.5	4.3.1.10.6					
Oahu													
Pearl Harbor													
Naval Station Pearl Harbor			4.4.1.1.1	4.4.1.1.2						4.4.1.1.3			
Ford Island			4.4.1.2.1	4.4.1.2.2									4.4.1.2.3
Naval Inactive Ship Maintenance Facility, Pearl Harbor			4.4.1.3.1			4.4.1.3.2							4.4.1.3.3
EOD Shore Range NAVMAG Pearl Harbor West Loch			4.4.1.4.1	4.4.1.4.2	4.4.1.4.3		4.4.1.4.4						4.4.1.4.5
Lima Landing			4.4.1.5.1	4.4.4.5.2		4.4.1.5.3	4.4.1.5.4						
Puuloa Underwater Range			4.4.1.6.1	4.4.1.6.2		4.4.1.6.3	4.4.1.6.4						
Naval Defensive Sea Area			4.4.1.7.1	4.4.1.7.2			4.4.1.7.3						
CG Station Barbers Point/Kalaeola		4.4.2.1	4.4.2.2						4.4.2.3				
Marine Corps Base Hawaii		4.4.3.1	4.4.3.2	4.4.3.3					4.4.3.4				
Marine Corps Training Area/Bellows			4.4.4.1	4.4.4.2									
Hickam Air Force Base		4.4.5.1	4.4.5.2										
Wheeler Army Airfield		4.4.6.1	4.4.6.2										
Makua Military Reservation			4.4.7.1	4.4.7.2			4.4.7.3		4.4.7.4				
Kahuku Training Area			4.4.8.1	4.4.8.2									
Dillingham Military Reservation			4.4.9.1	4.4.9.2									
Ewa Training Minefield			4.4.10.1			4.4.10.2	4.4.10.3						
Barbers Point Underwater Range			4.4.11.1			4.4.11.2	4.4.11.3						
Naval Undersea Warfare Center													
Shipboard Electronic Systems Evaluation Facility			4.4.12.1.1				4.4.12.1.2						
Fleet Operational Readiness Accuracy Check Site			4.4.12.2.1				4.4.12.2.2						
Keehi Lagoon*													
Kaena Point*													
Mt Kaala*													
Wheeler Network Communications Control*													
Mauna Kapu Communication Site*													
Makua Radio/Repeater/Cable Head*													
Maui													
Maui Offshore			4.5.1.1										
Maui Space Surveillance Site*													
Shallow Water Minefield Sonar Training Area*													
Maui High Performance Computing Center*													
Sandia Maui Haleakala Facility*													
Hawaii													
Pohakuloa Training Area													
Pohakuloa Training Area		4.6.1.1.1	4.6.1.1.2	4.6.1.1.3			4.6.1.1.4		4.6.1.1.5				
Bradshaw Army Airfield		4.6.1.2.1	4.6.1.2.2	4.6.1.2.3									
Kawaihae Pier			4.6.1.3.1										

*A review of the 14 environmental resources against program activities determined there would be no impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2.

4.1 OPEN OCEAN AREA

Table 4.1-1 lists ongoing operations for the No-action Alternative and proposed operations for Alternatives 1 and 2 at Open Ocean Area. Alternative 2 is the preferred alternative.

Table 4.1-1. Operations Occurring in the Open Ocean Area

Training Operations	Research, Development, Testing, and Evaluation (RDT&E) Operations
• Air Combat Maneuver	• Testing and Evaluation Operations
• Air-to-Air Missile Exercise	• Anti-air Warfare RDT&E
• Surface-to-Air Gunnery Exercise (S-A GUNEX)	• Antisubmarine Warfare
• Surface-to-Air Missile Exercise (S-A MISSILEX)	• Combat System Ship Qualification Trial
• Chaff Exercise (CHAFFEX)	• Electronic Combat/Electronic Warfare
• Naval Surface Fire Support Exercise	• High Frequency
• Visit, Board, Search, and Seizure	• Missile Operations
• Surface-to-Surface Gunnery Exercise (S-S GUNEX)	• Missile Defense
• Surface-to-Surface Missile Exercise (S-S MISSILEX)	• Shipboard Electronic Systems Evaluation Facility (SESEF) Quick Look
	• SESEF System Performance Test
• Air-to-Surface Gunnery Exercise (A-S GUNEX)	• Additional Chemical Simulant (Alternative 1)
• Air-to-Surface Missile Exercise (A-S MISSILEX)	• Intercept Targets Launched into Pacific Missile Range Facility (PMRF) Controlled Area (Alternative 1)
• Bombing Exercise (BOMBEX) (Sea)	• Launched SM-6 from Sea-Based Platform (AEGIS) (Alternative 1)
• Sink Exercise (SINKEX)	• Test Unmanned Surface Vehicles (Alternative 1)
• Antisurface Warfare Torpedo Exercise (Submarine-Surface)	• Test Unmanned Aerial Vehicles (Alternative 1)
• Antisubmarine Warfare (ASW) Tracking Exercise	• Test Hypersonic Vehicles (Alternative 1)
• Antisubmarine Warfare Torpedo Exercise	• Portable Undersea Tracking Range (Alternative 1)
	• Large Area Tracking Range Upgrade (Alternative 1)
• Major Integrated ASW Training Exercise	• Enhanced Electronic Warfare Training (Alternative 1)
• Electronic Combat Operations	• Expanded Training Capability for Transient Air Wings (Alternative 1)
• Mine Countermeasures Exercise	• Direct Energy (Alternative 2)
• Mine Neutralization	• Advanced Hypersonic Weapon (Alternative 2)
• Swimmer Insertion/Extraction	
• Command and Control (C2) (Sea)	
• Demolition Exercises (Sea)	
• Submarine Operations	

4.1.1 AIRSPACE—OPEN OCEAN

The potential impacts on airspace in the Open Ocean Area are discussed in terms of conflicts with the use of controlled and uncontrolled airspace, special use airspace, en route airways and jet routes, and airports and airfields.

4.1.1.1 NO-ACTION ALTERNATIVE (AIRSPACE—OPEN OCEAN)

4.1.1.1.1 HRC Training Operations

The ongoing, continuing HRC Training Operations that could affect airspace include mine laying, surface-to-surface gunnery exercises (S-S GUNEX), air-to-surface gunnery exercises (A-S GUNEX), air-to-surface missile exercises (A-S MISSILEX), bombing exercises (BOMBEX), sink exercises (SINKEX), air combat maneuvers (ACM), air-to-air missile exercises (A-A MISSILEX), electronic countermeasures (ECM), surface-to-air gunnery exercises (S-A GUNEX), surface-to-air missile exercises (S-A MISSILEX), naval surface fire support (NSFS), flare exercises, and chaff exercise (CHAFFEX).

Controlled and Uncontrolled Airspace

The Navy can accomplish the No-action Alternative without modifications or need for additional airspace to accommodate continuing training operations.

Special Use Airspace

Ongoing, continuing operations identified above will continue to use the existing Open Ocean Area special use airspace including Warning Areas and Air Traffic Control Assigned Airspace (ATCAA) shown on Figure 3.1.1-1. Although the nature and intensity of use varies over time and by individual special use airspace area, the continuing training operations represent precisely the kinds of operations for which the special use airspace was created. The Warning Areas are designed and set aside by the Federal Aviation Administration (FAA) to accommodate operations that present a hazard to other aircraft. As such, the continuing training operations do not conflict with any airspace use plans, policies, and controls. The ATCAA has been developed by the FAA to facilitate the management of aircraft moving between and adjacent to other special use airspace areas.

En Route Airways and Jet Routes

Numerous instrument flight rules (IFR), en route low altitude air traffic service routes, and IFR en route high altitude oceanic routes are used by commercial aircraft that pass through the region of influence (see Figure 3.1.1-1). However, the region of influence is relatively remote from the majority of jet routes that crisscross the northern Pacific Ocean. The Navy coordinates closely with FAA to avoid conflicts with commercial aviation. This may lead to the Navy being unable to conduct antisubmarine warfare (ASW) training between Oahu and Maui.

Attempts to avoid airspace conflicts also impact where the Strike Group (including the aircraft carrier) operates. This specifically impacts where ASW occurs on the HRC when the focus of the training is defending the aircraft carrier. The low altitude airways that pass through a Warning Area include V-7 (through W-190), V15 (through W-188), and V-16 (through W-186). There are no oceanic routes that pass through a Warning Area. Several low altitude airways pass below the Pali ATCAA near Oahu. The floor of the Pali ATCAA is above the ceiling of the low altitude routes. Two low altitude airways pass above the ceiling of the Mela North ATCAA.

Use of these low altitude airways and high altitude jet routes comes under the control of the Honolulu and Oakland Air Route Traffic Control Center (ARTCC). In addition, the Navy surveys the airspace involved in each training operation either by radar or patrol aircraft. Safety regulations dictate that hazardous operations will be suspended by the Navy when it is known that any non-participating aircraft has entered any part of a training activity danger zone. The suspension lasts until the non-participating entrant has left the area or a thorough check of the suspected area has been performed. Consequently, there are no airspace conflicts.

In terms of potential airspace use impacts to en route airways and jet routes, the continuing training operations would be in compliance with Department of Defense (DoD) Directive 4540.1, as directed by Office of the Chief of Naval Operations Instruction (OPNAVINST) 3770.4A, which specifies procedures for conducting aircraft operations and for missile/projectile firing. Namely, that missile and projectile firing areas shall be selected so that trajectories are clear of established oceanic air routes or areas of known surface or air activity. In addition, before conducting an operation that is hazardous to non-participating aircraft, Notices to Airmen (NOTAMs) published by the FAA would be sent in accordance with the conditions of the directive specified in OPNAVINST 3721.20A. The increasing adoption of “Free Flight” by commercial aircraft could make the airspace coordination task somewhat more difficult, but this would still be handled by the issuance of NOTAMs. As noted in Chapter 3.0, with the full implementation of this program, the amount of airspace in the region of influence that is likely to be clear of traffic may decrease as pilots, whenever practical, choose their own route and file a flight plan that follows the most efficient and economical route.

All airspace outside the territorial limits is located in international airspace. Because the Open Ocean Area airspace use region of influence is in international airspace, the procedures outlined in International Civil Aviation Authority (ICAO) Document 444, *Rules of the Air and Air Traffic Services* are followed. The FAA acts as the U.S. agent for aeronautical information to the ICAO, and air traffic in the over-water region of influence is managed by the Honolulu ARTCC, and to a lesser extent, the Oakland ARTCC.

As noted above, continuing training operations will use the existing Open Ocean Area special use airspace and will not require either: (1) a change to an existing or planned IFR minimum flight altitude, a published or special instrument procedure, or an IFR departure procedure; or (2) a visual flight rules (VFR) operation to change from a regular flight course or altitude. Consequently, there are no airspace conflicts.

Airports and Airfields

There are no airports and airfields in the Open Ocean Area region of influence.

4.1.1.1.2 HRC RDT&E Operations

The ongoing research, development, test, and evaluation (RDT&E) operations that could affect airspace include missile defense ballistic missile target flights, Terminal High Altitude Area Defense (THAAD) interceptor operations, A-S MISSILEX, A-A MISSILEX, S-A MISSILEX, and S-S MISSILEX. RDT&E operations are conducted in Pacific Missile Range Facility (PMRF)

Warning Areas and the Temporary Operating Area for PMRF, as shown on Figure 3.1.1-1. Missile launches from PMRF and Kauai Test Facility would move into Open Ocean Areas soon after launch.

Controlled and Uncontrolled Airspace

No new airspace proposal or any modification to the existing controlled airspace has been identified to accommodate continuing training operations. Typically target and interceptor missiles would be above flight level (FL) 600 within minutes of the rocket motor firing. As such, all other local flight activities will occur at sufficient distance and altitude that the target missile and interceptor missiles will be little noticed. However, activation of the proposed stationary altitude reservation (ALTRV) procedures, where the FAA provides separation between non-participating aircraft and the missile flight test activities in the Temporary Operating Area for use of the airspace identified in Figure 3.1.1-1, will impact the controlled airspace available for use by non-participating aircraft for the duration of the ALTRV—usually for a matter of a few hours, with a backup day reserved for the same hours. The airspace in the Temporary Operating Area is not heavily used by commercial aircraft, and is far removed from the en route airways and jet routes crossing the North Pacific Ocean.

Special Use Airspace

Ongoing RDT&E operations identified above will continue to utilize the existing Open Ocean Area special use airspace including PMRF Warning Areas shown on Figure 3.1.1-1.

Missile intercepts will continue to be conducted within either the existing special use airspace in Warning Area W-188 and W-186 controlled by PMRF or within the Temporary Operating Area shown in the inset on Figure 3.1.1-1. Similarly, intercept impact debris will be contained within these same areas. Although the nature and intensity of use varies over time and by individual special use airspace area, the proposed operations will not represent a direct special use airspace impact.

Warning Areas consist of airspace over international waters in which hazardous activity may be conducted. The Warning Areas are designed and set aside by the FAA to accommodate activities that present a hazard to other aircraft. Similarly, the use of ALTRV procedures as authorized by the Central Altitude Reservation Function, an air traffic service facility, or appropriate ARTCC (the Oakland ARTCC for the Temporary Operating Area) for airspace use under prescribed conditions in the Temporary Operating Area will not impact special use airspace. According to the FAA Handbook, 7610.44, ALTRVs may encompass certain rocket and missile operations and other special operations as may be authorized by FAA approval procedures.

PMRF will coordinate with the Honolulu or Oakland ARTCC military operations specialist assigned to handle such matters and the airspace coordinator at the Honolulu Center Radar Approach using ALTRV request procedures. After receiving the proper information on each test flight, a hazard pattern will be constructed and superimposed on a chart depicting the area of operations. Ensuring that the hazard pattern will not encroach any land mass, this area is then plotted using minimum points (latitude-longitude) to form a rectangular area. This plotted area is then faxed to the military operations specialist at Honolulu or Oakland ARTCC requesting airspace with the following information: area point (latitude-longitude); date and time for primary and backup (month, day, year, Zulu time); and, altitude. A copy is sent to the Honolulu Center

Radar Approach Control. A follow-up phone call is made after 48 hours to verify receipt of the fax. When approval of the request of the airspace is received from the military operations specialist at Honolulu or Oakland ARTCC, PMRF will submit an ALTRV request to Central Altitude Reservation Function, which publishes the ALTRV 72 hours prior to the flight test.

Due to the coordination and planning procedures that are in place, the RDT&E operations do not conflict with any airspace use plans, policies, and controls.

En Route Airways and Jet Routes

Two IFR en route low altitude airways are used by commercial aircraft that pass through the PMRF Warning Areas. The two low altitude airways are V15 (through W-188), and V-16 (through W-186). Use of these low altitude airways comes under the control of the Honolulu ARTCC. In addition, during a training operation, provision is made for surveillance of the affected airspace either by radar or patrol aircraft. Safety regulations dictate that hazardous operations will be suspended when it is known that any non-participating aircraft has entered any part of the training operation danger zone until the non-participating entrant has left the area or a thorough check of the suspected area has been performed.

The numerous airways and jet routes that crisscross the Open Ocean Area airspace region of influence have the potential to be affected by RDT&E operations. However, target and defensive missile launches and missile intercepts will be conducted in compliance with DoD Directive 4540.1, as enclosed by OPNAVINST 3770.4A (U.S. Department of the Navy, 1994). DoD Directive 4540.1 specifies procedures for conducting missile and projectile firing, namely "firing areas shall be selected so that trajectories are clear of established oceanic air routes or areas of known surface or air activity" (Department of Defense Directive 4540.1, § E5, 1981).

Before conducting a missile launch and/or intercept test, NOTAMs will be sent in accordance with the conditions of the directive specified in OPNAVINST 3721.20. In addition, to satisfy airspace safety requirements, the responsible commander will obtain approval from the Administrator, FAA, through the appropriate Navy airspace representative. Provision is made for surveillance of the affected airspace either by radar or patrol aircraft. In addition, safety regulations dictate that hazardous operations will be suspended when it is known that any non-participating aircraft have entered any part of the danger zone until the non-participating entrant has left the area or a thorough check of the suspected area has been performed.

In addition to the reasons cited above, there is a scheduling agency identified for each piece of special use airspace that would be used. The procedures for scheduling each piece of airspace are performed in accordance with letters of agreement with the controlling FAA facility, and the Honolulu and Oakland ARTCCs. Schedules are provided to the FAA facility as agreed between the agencies involved. Aircraft transiting the Open Ocean Area region of influence on one of the low-altitude airways and/or high-altitude jet routes that will be affected by flight test activities will be notified of any necessary rerouting before departing their originating airport and will be able to take on additional fuel before takeoff. Real-time airspace management involves the release of airspace to the FAA when the airspace is not in use or when extraordinary events occur that require drastic action, such as weather requiring additional airspace.

The FAA ARTCCs are responsible for air traffic flow control or management to transition air traffic. The ARTCCs provide separation services to aircraft operating on IFR flight plans and principally during the en route phases of the flight. They also provide traffic and weather advisories to airborne aircraft. Hazardous military operations are contained within the over-water Warning Areas or by using ALTRV procedures in the Temporary Operating Area to ensure non-participating traffic is advised or separated accordingly.

Continuing RDT&E operations would use the existing Open Ocean Area special use airspace and will not require either: (1) a change to an existing or planned IFR minimum flight altitude, a published or special instrument procedure, or an IFR departure procedure; or (2) a VFR operation to change from a regular flight course or altitude.

Airports and Airfields

There are no airports and airfields in the Open Ocean Area region of influence.

4.1.1.1.3 Major Exercises

Major Exercises such as Rim of the Pacific (RIMPAC) and Undersea Warfare Exercise (USWEX), include combinations of ongoing training operations and, in some cases RDT&E operations. Therefore, potential impacts from a Major Exercise on the open ocean airspace will be similar to those described above for the Training Operations and RDT&E operations. RIMPAC planning conferences, which include coordination with the FAA, are conducted beginning in March of the year prior to each RIMPAC. Each of the USWEX training operations, up to four per year, will include coordination with the FAA well in advance of the 3- or 4-day exercise.

4.1.1.2 ALTERNATIVE 1 (AIRSPACE—OPEN OCEAN)

4.1.1.2.1 Increased Tempo and Frequency of Training Operations

Alternative 1 would include increases in the number of training operations including mine laying, S-S GUNEX, A-S GUNEX, A-S MISSILEX, BOMBEX, SINKEX, ACM, A-A MISSILEX, ECM, S-A GUNEX, S-A MISSILEX, NSFS, flare exercises, and CHAFFEX. Training operations would occur in the same locations as for the No-action Alternative.

The potential impacts on controlled and uncontrolled airspace, special use airspace, en route airways and jet routes, and airports and airfields would be similar to that described in Section 4.1.1.1 for the No-action Alternative. The total number of training operations that affect airspace would increase by approximately 11 percent above the No-action Alternative. No new airspace proposal or any modification to the existing controlled airspace would be required. The training operations would continue to utilize the existing Open Ocean Area special use airspace including the PMRF and Oahu Warning Areas and ATCAA shown on Figure 3.1.1-1. By appropriately containing hazardous military operations within the over-water Warning Areas or coordinating the use of the ATCAA areas, non-participating traffic is advised or separated accordingly.

4.1.1.2.2 Enhanced and Future RDT&E Operations

The proposed operations include interceptor targets launched from Wake Island, Kwajalein Atoll, or Vandenberg AFB into the Temporary Operating Area; SM-6 launches from a sea-based platform; and high speed and unmanned aerial vehicle testing. The potential impacts on controlled and uncontrolled airspace, special use airspace, en route airways and jet routes would be similar to that described above for missile launches in Section 4.1.1.1.2. The intercept areas would be in the Broad Ocean Area and Temporary Operating Area of the PMRF Range.

Alternative 1 would include increases in the number of RDT&E operations including missile defense ballistic missile target flights, THAAD interceptor operations, A-S MISSILEX, A-A MISSILEX, S-A MISSILEX, and S-S MISSILEX. RDT&E operations would occur in the same locations as for the No-action Alternative.

The potential impacts on controlled and uncontrolled airspace, special use airspace, en route airways and jet routes, and airports and airfields would be similar to that described in Section 4.1.1.1 for the No-action Alternative. The total number of RDT&E operations that may affect airspace would increase by approximately 3 percent above the No-action Alternative. No new airspace proposal or any modification to the existing controlled airspace would be required. The RDT&E operations would continue to utilize the existing Open Ocean Area special use airspace including the PMRF Warning Areas and ATCAA shown on Figure 3.1.1-1. By appropriately containing hazardous military operations within the over-water Warning Areas or coordinating the use of the ATCAA areas, non-participating traffic is advised or separated accordingly.

4.1.1.2.3 HRC Enhancements

Range safety for high-energy lasers at PMRF could affect airspace. Depending on the intensity of the lasers, nomenclature would need to be added to aeronautical charts, and certain test events could require NOTAMs and Notices to Mariners (NOTMARs).

The potential impacts on controlled and uncontrolled airspace, special use airspace, en route airways and jet routes, and airports and airfields would be similar to that described above for missile launches. The establishment of laser range operational procedures, including horizontal and vertical buffers, would minimize potential impacts to aircraft. All operations would be in accordance with American National Standards Institute (ANSI) Z136.1, *Safe Use of Lasers*, which has been adopted by DoD as the governing standard for laser safety. Additional information on range safety for high-energy lasers is in Section 4.1.5, Health and Safety.

4.1.1.2.4 Major Exercises

Major Exercises, such as RIMPAC and USWEX, include combinations of ongoing training operations and, in some cases, RDT&E operations. Therefore, potential impacts from a Major Exercise on the open ocean airspace would be similar to those described above for the Training Operations and RDT&E Operations. RIMPAC planning conferences, which include coordination with the FAA, are conducted beginning in March of the year prior to each RIMPAC. Each of the USWEX training operations, up to six per year, would include coordination with the FAA well in advance of the 3- or 4-day exercise.

4.1.1.3 ALTERNATIVE 2 (AIRSPACE—OPEN OCEAN)

4.1.1.3.1 Increased Tempo and Frequency of Training Operations

Alternative 2 would include increases in the number of training operations including mine laying, S-S GUNEX, A-S GUNEX, A-S MISSILEX, BOMBEX, SINKEX, ACM, A-A MISSILEX, ECM, S-A GUNEX, S-A MISSILEX, NSFS, flare exercises, and CHAFFEX. Training operations would occur in the same locations as for the No-action Alternative.

The potential impacts on controlled and uncontrolled airspace, special use airspace, en route airways and jet routes, and airports and airfields would be similar to that described in Section 4.1.1.1 for the No-action Alternative. The total number of training operations that affect airspace would increase by approximately 11 percent above the No-action Alternative. No new airspace proposal or any modification to the existing controlled airspace would be required. The training operations would continue to use the existing Open Ocean Area special use airspace including the PMRF and Oahu Warning Areas and ATCAA shown on Figure 3.1.1-1. By appropriately containing hazardous military operations within the over-water Warning Areas or coordinating the use of the ATCAA areas, non-participating traffic is advised or separated accordingly, thus avoiding substantial adverse impacts to the low altitude airways and high altitude jet routes in the region of influence.

Alternative 2 would also include increases in the number of RDT&E operations including missile defense ballistic missile target flights, THAAD interceptor operations, A-S MISSILEX, A-A MISSILEX, S-A MISSILEX, and S-A MISSILEX. RDT&E operations would occur in the same locations as for the No-action Alternative.

The potential impacts on controlled and uncontrolled airspace, special use airspace, en route airways and jet routes, and airports and airfields would be similar to that described in Section 4.1.1.1 for the No-action Alternative. The total number of RDT&E operations that may affect airspace would increase by approximately 11 percent above the No-action Alternative. No new airspace proposal or any modification to the existing controlled airspace would be required. The RDT&E operations would continue to use the existing Open Ocean Area special use airspace including the PMRF Warning Areas and ATCAA shown on Figure 3.1.1-1. By appropriately containing hazardous military operations within the over-water Warning Areas or coordinating the use of the ATCAA areas, non-participating traffic would be advised or separated accordingly, thus avoiding substantial adverse impacts to the low altitude airways and high altitude jet routes in the region of influence.

4.1.1.3.2 Enhanced and Future RDT&E Operations

Future RDT&E Operations include a Maritime Directed Energy Test Center at PMRF and the Advanced Hypersonic Weapon test program.

The Directed Energy Test Center, which may include a High Energy Laser Program, would have minimal impacts on airspace due to the required electromagnetic radiation/electromagnetic interference (EMR/EMI) coordination process. As discussed in Section 4.1.1.2.3, high-energy lasers at PMRF could affect airspace. Depending on the intensity of the lasers, nomenclature would need to be added to aeronautical charts, and certain test events could require NOTAMs and NOTMARs. The potential impacts on controlled and uncontrolled airspace, special use airspace, en route airways and jet routes, and airports and airfields would be similar to that described earlier for missile launches. The establishment of laser range operational procedures, including horizontal and vertical buffers, would minimize potential impacts to aircraft. All operations would be in accordance with ANSI Z136.1, *Safe Use of Lasers*, which has been adopted by DoD as the governing standard for laser safety. Additional information on range safety for high-energy lasers is in Section 4.1.5, Health and Safety.

The Advanced Hypersonic Weapon tests would be similar to a ballistic missile test. Potential impacts on controlled and uncontrolled airspace, special use airspace, en route airways and jet routes, and airports and airfields would be similar to that described earlier for missile launches.

4.1.1.3.3 Additional Major Exercises—Multiple Strike Group Training

A Multiple Strike Group exercise consists of operations that involve Navy assets engaging in a schedule of events battle scenario, with U.S. forces (blue forces) pitted against a notional opposition force (red force). Participants use and build upon previously gained training skill sets to maintain and improve the proficiency needed for a mission-capable, deployment-ready unit. The exercise would occur over a 5- to 10-day period. The Multiple Strike Group training would involve many of the training operations identified and evaluated under Section 4.1.1.1, No-action Alternative, including mine laying, S-S GUNEX, A-S GUNEX, A-S MISSILEX, BOMBEX, SINKEX, ACM, A-A MISSILEX, ECM, S-A GUNEX, S-A MISSILEX, NSFS, flare exercises, and CHAFFEX.

Additional training operations include Maritime Interdiction and Air Interdiction of Maritime Targets. These operations would include a red force surface action group consisting of Navy surface combatants, Military Sea-Lift Command ships, and a U.S Coast Guard Cutter. Blue forces would consist of Navy frigates, cruisers, and destroyers, carrier air wing aircraft from the three Navy aircraft carriers and Air Force F-15 aircraft. All coordinated operations would take place within the PMRF and Oahu Warning Areas and areas as required. The exercise may include Air Force aircraft that would operate from Hickam Air Force Base (AFB), and carrier air wing aircraft that would operate from their respective aircraft carriers. The aircraft would coordinate efforts with blue force surface ships to locate, target, and simulate strikes against the red force surface action group.

During Defensive Counter Air Operations, Air Force F-15 aircraft would simulate red force aircraft and anti-ship missiles. These red force aircraft would attempt simulated coordinated attacks against the blue force Strike Groups. The Strike Groups would defend against the red air forces with air wing aircraft and simulated surface-to-air missile attacks.

The potential impacts on controlled and uncontrolled airspace, special use airspace, en route airways and jet routes, and airports and airfields would be similar to that described in Section 4.1.1.1 for the No-action Alternative. The additional types of training operations described in the previous paragraphs are similar to and would occur in the same areas as some of the operations analyzed under the No-action alternative. No new airspace proposal or any modification to the existing controlled airspace would be required. The Multiple Strike Group exercises and operations identified above would continue to use the existing Open Ocean Area special use airspace including the PMRF and Oahu Warning Areas and ATCAA shown on Figure 3.1.1-1. By appropriately containing hazardous military operations within the over-water Warning Areas or coordinating the use of the ATCAA areas, non-participating traffic would be advised or separated accordingly, thus avoiding substantial adverse impacts to the low altitude airways and high altitude jet routes in the region of influence.

4.1.2 BIOLOGICAL RESOURCES (MARINE)—OPEN OCEAN

Generally, impacts to biological resources are evaluated as potential losses to populations of species of concern or to important habitat resources. Criteria for assessing potential impacts to marine biological resources are based on the following:

- Loss of habitat (destruction, degradation, denial, competition)
- Over-harvesting or excessive take (accidental or intentional death, injury)
- Harassment
- Increases in exposure or susceptibility to disease and predation
- Decrease in breeding success

Collision with ordnance, debris, or vehicles; release of contaminants from munitions constituents or range debris; noise; terrain disturbance; range fires; or human contact could potentially cause impacts. Impacts are considered substantial if they have the potential to result in reduction of population size of Federally listed threatened or endangered species, degradation of biologically important unique habitat, or reduction in capacity of a habitat to support species.

4.1.2.1 FISH (BIOLOGICAL RESOURCES (MARINE)—OPEN OCEAN)

Sonar

Behavioral and physiological (evoke potential) studies have shown that most fish only detect low- to mid-frequency sound below about 3 kilohertz (kHz) (Nedwell, 2004; Mann et al., 2007). HRC mid-frequency active tactical sonar transmits at center frequencies of 2.6 kHz and 3.3 kHz. Several species such as the herring (up to 4 kHz; Nedwell 2004) and shad (up to 180 kHz; Mann et al., 1998). Most skates and sharks hear in the range of 10 hertz (Hz) to 1.5 kHz (Casper et al., 2003). Therefore, it is expected that some fish species would be able to detect the mid-frequency sonar only at the upper end of their hearing range (i.e., at very high sounds levels).

Although most fish will not be able to detect the mid-frequency sonar, significant effects on fish are not anticipated with implementation of the No-action Alternative or Alternatives 1 or 2. There is no information available that suggests that exposure to non-impulsive acoustic sources results in fish mortality. While experiments have shown that exposure to high amplitude (180 decibel [dB] re 1 micropascal [µPa]) and low frequency sound (300 Hz) can result in significant threshold shifts in certain fish that are classified as hearing specialists (but not those classified as hearing generalists), these threshold shifts are temporary, and it is not evident that they lead to any long-term behavioral disruptions.

Further, while fish may respond behaviorally to mid-frequency sources, this behavioral modification is only expected to be brief and not biologically significant. Additionally, review of the available literature appears to indicate that low and high frequency acoustic sources are more likely to result in behavioral modifications in fish than are mid-frequency acoustic sources. Research by Gearin et al. (2000) and Culik et al. (2001) indicated the mid-frequency sound from acoustic devices designed to deter marine mammals from gillnet fisheries were either inaudible to fish, or the fish were not disturbed by the sound. Significant effects on fish are not anticipated from the use of mid-frequency sonar.

Sharks generally do not detect sounds above 1 kHz, and their best sensitivity is to signals below 300 Hz (Popper and Fay, 1977). Sensitivity in lemon and horn sharks is best at about 40 Hz (Nelson, 1967; Kelly and Nelson, 1975). Popper and Fay noted that distinctions between vibration and sound detection are probably not meaningful in a consideration of the shark auditory system.

In many teolost fish, the swim bladder can aid in hearing by transferring sound to the inner ear by resonance matching of the two structure (Yan et al., 2004). Loud low frequency (below 300 Hz and above 180 dB re 1 µPa) sounds can affect both the swim bladder and damage the inner ear structures and the swim bladder. There is a mismatch between the low frequency hearing of fish coupled with the resonance frequency of their swim bladders and with the higher frequency mid-frequency active sonar; therefore, there is little effect from the Navy's sonar on fish hearing.

Although there may be many hours of active ASW sonar events, the actual "pings" of the sonar signal may only occur several times a minute, as it is necessary for the ASW operators to listen for the return echo of the sonar ping.

Underwater Detonation

Several factors determine a fish's susceptibility to harm. Most injuries in fish involve damage to air- or gas-containing organs (i.e., the swim bladder). Fish with swim bladders are vulnerable to effects of explosives, while fish without swim bladders are much more resistant (Yelverton, 1981; Young, 1991).

Hastings et al. (1996) studied the effects of sound (up to 300 Hz and 180 re 1 µPa) stimulation on the ear and lateral line of a nonspecialist fish (e.g., oscar, *Astronotus ocellatus*). They found that there was some damage to the sensory hair cells of two of the otolith organs, the lagena and utricle, when the fish were exposed to continuous sound at 300 Hz and 180 dB for 1 hour. There was no apparent damage with higher frequencies, sounds with shorter duty cycles, or shorter stimulation time. Moreover, the only apparent damage was found 4 days after stimulation. The interpretation of these results was that exposure to a high intensity sound has the potential to damage the ears of fish. However, many caveats accompanied this interpretation, including that fact that the sound had to be continuous; last at least 1 hour; and the tissue had to be examined several days after the end of stimulation. Hastings et al. (1996) further pointed out that this study was the most highly controlled and quantified of any of the few studies on the effects of intense sounds on fish.

The effects on fish from a given amount of explosive depend on location, season, and many other factors. O'Keeffe (1984) provides charts that allow estimation of the potential effect on swim-bladder fish using a damage prediction method developed by Goertner (1982). O'Keeffe's parameters include the size of the fish and its location relative to the explosive source, but are independent of environmental conditions (e.g., depth of fish, explosive shot, frequency content). Table 4.1.2.1-1 lists the estimated maximum effects ranges using O'Keeffe's (1984) method for an 8-lb explosion at source depths of 10 ft.

Table 4.1.2.1-1. Maximum Fish-Effects Ranges

Fish Weight	10% Mortality Range (in feet)
1 oz	518.3
1 lb	208.9
30 lb	155.2

Source: O'Keefe, 1984

A small number of fish are expected to be injured by detonation of explosive, and some fish located in proximity of the initial detonations can be expected to die. However, the overall impacts to water column habitat would be localized and transient. As operations commence, the natural reaction of fish in the vicinity would be to leave the area. When operations are completed, the fish stock would be expected to repopulate the area. The abundance and diversity of fish within the HRC will not measurably decrease as a result of implementation of the No-action Alternative.

4.1.2.2 SEA TURTLES (BIOLOGICAL RESOURCES (MARINE)—OPEN OCEAN)

Sonar

Extrapolation from human and marine mammal data to turtles is inappropriate given the morphological differences between the auditory systems of mammals and turtles. However, as stated above, the measured hearing threshold for green turtles (and by extrapolation, at least the olive ridley, loggerhead, and hawksbill) is only slightly lower than the maximum levels to which these three species could be exposed. It is not believed that a temporary threshold shift would occur at such a small margin over threshold in any species. Therefore, no threshold shifts in green, olive ridley, loggerhead, or hawksbill sea turtles are expected.

Given the lack of audiometric information, the potential for temporary threshold shifts among leatherback turtles must be classified as unknown but would likely follow those of other sea turtles.

Any potential role of long-range acoustical perception in sea turtles has not been studied and is unclear at this time; anecdotal information suggests that the acoustic signature of a turtle's natal beach might serve as a cue for nesting returns. However, the concept of sound masking is difficult, if not impossible, to apply to sea turtles. Although low frequency hearing has not been studied in many sea turtle species, most of those that have been tested exhibit low audiometric and behavioral sensitivity to low frequency sound. It appears, therefore, that if there were the potential for the mid frequency sonar to increase masking effects of any sea turtle species, it would be expected to be minimal.

Although there may be many hours of active ASW sonar events, the actual "pings" of the sonar signal may only occur several times a minute as it is necessary for the ASW operators to listen for the return echo of the sonar ping before another ping is transmitted.

Underwater Detonation

Criteria and thresholds for estimating the impacts on sea turtles from a single underwater detonation event were determined during the environmental assessments for the two Navy ship-shock trials (SEAWOLF Final EIS (U.S. Department of the Navy 1998; Churchill Final EIS (U.S. Department of the Navy, 2001a). During the analysis of the effects of explosions on marine mammals and sea turtles conducted by the Navy for the Churchill EIS, analysts compared the injury levels reported by the best of these experiments to the injury levels that would be predicted using the modified Goertner method and found them to be similar (U.S. Department of the Navy, 2001a, Goertner 1982). The criteria and thresholds for injury and harassment are summarized in Table 4.1.2.2-1.

Table 4.1.2.2-1. Summary of Criteria and Acoustic Thresholds for Underwater Detonation Impacts to Sea Turtles and Marine Mammals

Harassment Level	Criterion	Metric	Threshold[1]
Mortality	Onset severe lung injury		Indexed to 31 psi-ms
Injury	50% Tympanic membrane rupture	Energy flux density (EL)	1.17 in-lb/in^2 (psi) (about 205 dB re 1 μPa^2-s)
Injury	Onset slight lung injury	"Goertner" modified positive impulse	Indexed to 13 psi-ms (milliseconds) and 32 psi-ms
Harassment	Temporary auditory threshold shift (TTS)—Energy Threshold	Greatest energy flux density level in any 1/3-octave band above 100 Hz - for total energy over all exposures	182 dB re 1 μPa^2-s
Harassment	TTS—Peak Pressure Threshold	Peak pressure over all exposures	23 psi or 12 psi scaled to 27, 33, 36, and 43 psi for 60, 20, 10, and 5 pound shots, respectively

psi-ms = pounds per square inch-milliseconds μPa^2-s = squared micropascal-second

The criterion for non-injurious harassment is temporary threshold shift (TTS), which is a temporary, recoverable, loss of hearing sensitivity (National Marine Fisheries Service, 2001; U.S. Department of the Navy, 2001a). The criterion for TTS is 182 decibel (dB) re 1 squared micropascal-second (μPa^2-s) maximum EL level in any 1/3-octave band at frequencies >100 Hz for sea turtles. There is a second criterion for estimating TTS threshold: 12 psi peak pressure. The appropriate application of this second TTS criterion is currently under debate, as this 12-psi criterion was originally established for estimating the impact of a 10,000-lb explosive to be employed for the Navy's shock trial. It was introduced to provide a more conservative safety zone for TTS when the explosive or the animal approaches the sea surface (for which case the explosive energy is reduced but the peak pressure is not).

Two criteria are used for injury: onset of slight lung hemorrhage and 50 percent eardrum rupture (tympanic membrane [TM] rupture). These criteria are considered indicative of the onset of injury. The threshold for onset of slight lung injury is calculated for a small animal (a dolphin calf weighing 27 pounds [lb]), and is given in terms of the "Goertner modified positive impulse," indexed to 13 psi-ms in the (U.S. Department of the Navy, 2001a). This threshold is conservative since the positive impulse needed to cause injury is proportional to animal mass, and therefore, larger animals require a higher impulse to cause the onset of injury. The threshold for TM rupture corresponds to a 50 percent rate of rupture (i.e., 50 percent of animals exposed to the level are expected to suffer TM rupture); this is stated in terms of an EL value of 205 dB re 1 μPa^2-s. The criterion reflects the fact that TM rupture is not necessarily a serious or life-threatening injury, but is a useful index of possible injury that is well correlated with measures of permanent hearing impairment (e.g., Ketten 1998) indicates a 30 percent incidence of permanent threshold shift [PTS] at the same threshold).

The criterion for mortality for marine mammals used in the *CHURCHILL Final EIS* is "onset of severe lung injury." This is conservative in that it corresponds to a 1 percent chance of mortal injury, and yet any animal experiencing onset severe lung injury is counted as a lethal exposure. The threshold is stated in terms of the Goertner (1982) modified positive impulse with value "indexed to 31 psi-ms.'" Since the Goertner approach depends on propagation, source/animal depths, and animal mass in a complex way, the actual impulse value corresponding to the 31-psi-ms index is a complicated calculation. Again, to be conservative, *CHURCHILL* used the mass of a calf dolphin (at 12.2 kg), so that the threshold index is 30.5 psi-ms.

There is a long lead time for set up and clearance of the impact area before any event using explosives takes place (may be minutes to several hours). There will, therefore, be a long period of area monitoring before any detonation or live-fire event begins. Ordinance cannot be released until the target area is determined clear. Operations are immediately halted if sea turtles are observed within the target area. Operations are delayed until the animal clears the target area. Most underwater detonations take place in sandy areas that are generally not used by sea turtles. All of these factors serve to avoid the risk of harming cetaceans, pinnipeds, or sea turtles. Post event monitoring of underwater detonations have not observed any mortality.

The weapons used in most missile and live fire exercises pose little risk to sea turtles unless they were to be near the surface at the point of impact. Machine guns (fire 0.50 caliber) and the close-in weapons systems (anti missile systems) exclusively fire non-explosive ammunition. The same applies to larger weapons firing inert ordnance for training operations. The rounds pose an extremely low risk because only a direct hit has the potential to affect a marine species. Target area clearance procedures would again reduce to a level that potential impact to marine species are highly unlikely. Post event monitoring of live fire events (to assess the accuracy) have not observed any mortality.

4.1.2.3 MARINE MAMMALS (BIOLOGICAL RESOURCES (MARINE)—OPEN OCEAN)

Potential impacts to marine mammals can occur from sources that are non-acoustic (i.e., ship strikes) and acoustic with sonar and underwater explosives being the primary acoustic concern. The Navy has and is continuing to conduct research on the effect of sound on marine mammals, the modeling of sound effects to marine mammals in areas of Navy operations, and methods of reducing impacts through of marine mammals and sound reduction.

Regulatory Framework for Marine Mammals

A number of Navy actions and National Oceanic and Atmospheric Administration (NOAA) Rule Making have helped to qualify possible events deemed as "harassment" under the Marine

Mammal Protection Act (MMPA). Note that "harassment" under the MMPA includes both potential injury and disruptions of natural behavioral patterns to a point where they are abandoned or significantly altered. The acoustic effects analysis and exposure calculations are based on the following premises:

- Harassment that may result from Navy operations described in the operations within this EIS/OEIS is unintentional and incidental to those operations.
- This EIS/OEIS uses an unambiguous definition of injury developed in previous rulings (National Oceanic and Atmospheric Administration, 2001; 2002): injury occurs when any biological tissue is destroyed or lost as a result of the action.
- Behavioral disruption might result in subsequent injury and injury may cause a subsequent behavioral disruption, so Level A (potential to cause injury) and Level B (behavioral disruption) harassment categories can overlap and are not necessarily mutually exclusive. However, by prior ruling (National Oceanic and Atmospheric Administration, 2001), this EIS/OEIS assumes that Level A and B harassment exist on a single continuum without overlap.
- An individual animal predicted to experience simultaneous multiple injuries, multiple disruptions, or both, is counted as a single take (see National Oceanic and Atmospheric Administration, 2001). An animal whose behavior is disrupted by an injury has already been counted as a Level A harassment and will not also be counted as a Level B harassment.
- The acoustic effects analysis is based on primary exposures of the action. Secondary, or indirect, effects, such as susceptibility to predation following injury and injury resulting from disrupted behavior, while possible, can only be reliably predicted in circumstances where the responses have been well documented. Consideration of secondary effects would result in much Level A harassment being considered Level B harassment, and vice versa, since much injury (Level A harassment) has the potential to disrupt behavior (Level B harassment), and much behavioral disruption (Level B) could be conjectured to have the potential for injury (Level A). Consideration of secondary effects would lead to circular definitions of harassment.

Marine Mammal Habitat

The primary source of marine mammal habitat impact during operations within the Hawaiian Range Complex is noise resulting from ASW, missile exercise and testing, live fire (e.g., 5-inch guns) operations and aerial bombardment and pressure effects from underwater detonations during mine clearing operation. However, the noise does not constitute a long-term physical alteration of the water column or bottom topography, as the occurrences are of limited duration and are intermittent in time given that surface vessels associated with the operations move continuously and relatively rapidly through any given area. Other sources that may affect marine mammal habitat were considered and potentially include the introduction of fuel, debris, ordnance, and chemical residues into the water column. The effects of each of these components were considered in this EIS/OEIS. Critical Habitat within the HRC is for the Hawaiian monk seal was designated for beaches, sand spits, bays out to the 20 fathom line (120 ft) for the Northwest Hawaiian Islands (National Marine Fisheries Service, 1988).

4.1.2.3.1 Potential Non-Acoustic Impacts

Ship Collisions

Collisions with commercial and Navy ships can cause major wounds and may occasionally cause fatalities to sea turtles and cetaceans. The most vulnerable marine mammals are those that spend extended periods of time at the surface in order to restore oxygen levels within their tissues after deep dives (e.g., sperm whale). In addition, some baleen whales, such as the northern right whale and fin whale swim slowly and seem generally unresponsive to ship noise making them more susceptible to ship strikes (Nowacek et al., 2004). North Pacific right whales are primarily found in the Arctic, and there are only a few recorded sightings near the Hawaiian Islands (U.S. Department of the Navy, 2005). Fin whales are only rarely seen in Hawaiian Island waters (Barlow 2006). Most baleen whales are rare in the Hawaiian Islands with the exception of the humpback whale that occurs seasonally and generally close to shore (Department of the Navy, 2005).

The Navy has adopted standard operating procedures (SOPs) that reduce the potential for collisions with surfaced marine mammals and sea turtles (See Chapter 6.0). At all times when ships are underway, there are many people on watch scanning the area around the ship. If a marine mammal or sea turtle is sighted, appropriate action will be taken to avoid the animal. Collisions with cetaceans, pinnipeds, and sea turtles are not expected.

Torpedo Guidance Wire

The potential entanglement impact of Mk 48 torpedo control wires on sea turtles and marine mammals is very low because of the following:

- The control wire is very thin (approximately 0.02 in) and has a relatively low breaking strength. Even with the exception of a chance encounter with the control wire while it was sinking to the sea floor (at an estimated rate of 0.2 m [0.5 ft] per second), a marine animal would not be vulnerable to entanglement given the low breaking strength.
- The torpedo control wire is held stationary in the water column by drag forces as it is pulled from the torpedo in a relatively straight line until its length becomes sufficient for it to form a catenary droop (Department of the Navy, 1996). When the wire is released or broken, it is relatively straight and the physical characteristics of the wire prevent it from tangling, unlike the monofilament fishing lines and polypropylene ropes identified in the entanglement literature (Department of the Navy, 1996). Although Heezen (1957, as cited in Department of the Navy, 1996) theorized that the entanglement of marine mammals with undersea telecommunication cables was a direct result of the mammal coming into contact with loops in the cable (e.g., swimming through loops that then tightened around the mammal), this should not be the case for the thin torpedo guidance wires. The Navy therefore believes the potential for any harm or harassment to these species is extremely low.

4.1.2.3.2 Potential Anti-submarine Warfare Impacts

ASW is a primary warfare area for Navy patrol ships (surface and submarines), aircraft and ASW helicopters. ASW aircrews must practice using sensors, including electro-optical devices, radar, magnetic anomaly detectors, sonar (including helicopter dipping sonar and both active and passive sonobuoys) in both the deep and shallow water environment. The training events being analyzed for Alternative 1 are not new and have taken place in the HRC over the past 60 years, and with no significant changes in the equipment being used in the last 30 years. Although there may be many hours of active ASW sonar events, the actual “pings” of the sonar signal may only occur several times a minute as it is necessary for the ASW operators to listen for the return echo of the sonar ping.

As a result of scientific advances in acoustic exposure effects analysis modeling on marine mammals, the extent of acoustic exposure on marine mammals can be estimated.

The approach for estimating potential acoustic effects from operations within the HRC ASW training operations on cetacean species makes use of the methodology that was developed in cooperation with NOAA for the Navy’s USWEX DEIS (2005), USWEX Environmental Assessment (EA)/Overseas EA (OEA) (U.S. Department of the Navy, 2005), RIMPAC EA/OEA (2006) and COMPTUEX/JTFEX EA/OEA (2007). The methodology includes the following topics which are presented below (details of the acoustic modeling are presented in Appendix K):

- Regulatory Framework
- Physiological Effects
- Behavioral Effects
- Sound Pressure Level (SPL) Dose Response Functions
- Applying Effect Threshold to beaked whales
- Cetacean Stranding Events
- Other Effects Considered
- Marine Mammal Protective measures

4.1.2.3.3 Regulatory Framework

MMPA and Endangered Species Act (ESA) regulations provide guidance for determining effects on marine mammals. Specifically, effects that qualify as Level A harassment (and ESA harm) should address injury. Effects that qualify as Level B harassment (and ESA harassment) should address behavioral disruption.

The biological framework proposed here is structured according to potential physiological and behavioral effects resulting from sound exposure. The range of effects may then be assessed to determine which qualify as harm or harassment under MMPA and ESA regulations.

A “physiological effect” is defined here as one in which the “normal” physiological function of the animal is altered in response to sound exposure. Physiological function is any of a collection of processes ranging from biochemical reactions to mechanical interaction and operation of organs and tissues within an animal. A physiological effect may range from the most significant of impacts (i.e., mortality and serious injury) to lesser effects that would define the lower end of the physiological impact range, such as the non-injurious distortion of auditory tissues.

A “behavioral effect” is one in which the “normal” behavior or patterns of behavior of an animal are overtly disrupted in response to an acoustic exposure. Examples of behaviors of concern can be derived from the harassment definitions in the MMPA and ESA implementing regulations and Public Law (PL) 108—136 (2004).

In this EIS/OEIS the term "normal" is used to qualify distinctions between physiological and behavioral effects. Its use follows the convention of normal daily variation in physiological and behavioral function without the influence of anthropogenic acoustic sources. As a result, this EIS/OEIS uses the following definitions:

- A physiological effect is a variation in an animal's physiology that results from an anthropogenic acoustic exposure and exceeds the normal daily variation in physiological function.
- A behavioral effect is a variation in an animal's behavior or behavior patterns that results from an anthropogenic acoustic exposure and exceeds the normal daily variation in behavior, but which occurs without an accompanying physiological effect.

The definitions of physiological effect and behavioral effect used here are specific to this EIS/OEIS and should not be confused with more global definitions applied to the field of biology.

It is reasonable to expect some physiological effects to result in subsequent behavioral effects. For example, a marine mammal that suffers a severe injury may be expected to alter diving or foraging to the degree that its variation in these behaviors is outside that which is considered normal for the species. If a physiological effect is accompanied by a behavioral effect, the overall effect is characterized as a physiological effect; physiological effects take precedence over behavioral effects with regard to their ordering. This approach provides the most conservative ordering of effects with respect to severity, provides a rational approach to dealing with the overlap of the definitions, and avoids circular arguments.

The severity of physiological effects generally decreases with decreasing sound exposure and/or increasing distance from the sound source. The same generalization does not consistently hold for behavioral effects because they do not depend solely on the received sound level. Behavioral responses also depend on an animal's learned responses, innate response tendencies, motivational state, the pattern of the sound exposure, and the context in which the sound is presented. However, to provide a tractable approach to predicting acoustic effects that is relevant to the terms of behavioral disruption described in the MMPA, it is assumed here that the severities of behavioral effects also decrease with decreasing sound exposure and/or increasing distance from the sound source.

MMPA Level A and Level B Harassment

Categorizing potential effects as either physiological or behavioral effects allows them to be related to the harassment definitions. For military readiness operations, Level A harassment includes any act that injures or has the significant potential to injure a marine mammal or marine mammal stock in the wild. Injury defined in previous rule (National Oceanic and Atmospheric Administration, 2001; 2002), is the destruction or loss of biological tissue. The destruction or loss of biological tissue will result in an alteration of physiological function that exceeds the normal daily physiological variation of the intact tissue. For example, increased localized histamine production, edema, production of scar tissue, activation of clotting factors, white blood cell response, etc., may be expected following injury. Therefore, this EIS/OEIS assumes that all injury is qualified as a physiological effect and, to be consistent with prior actions and rulings (National Oceanic and Atmospheric Administration, 2001), all injuries (slight to severe) are considered Level A harassment.

PL 108-136 (2004) amended the definition of Level B harassment for military readiness operations, which applies to this action. For military readiness operations, Level B harassment is now defined as “any act that disturbs or is likely to disturb a marine mammal or marine mammal stock by causing disruption of natural behavioral patterns including, but not limited to, migration, surfacing, nursing, breeding, feeding, or sheltering to a point where such behaviors are abandoned or significantly altered.” Unlike Level A harassment, which is solely associated with physiological effects, both physiological and behavioral effects may cause Level B harassment.

4.1.2.3.4 Auditory Tissues as Indicators of Physiological Effects –

Exposure to continuous-type noise (non-impulse sounds with at least a one second duration) may cause a variety of physiological effects in mammals. For example, exposure to very high sound levels may affect the function of the visual system, vestibular system, and internal organs (Ward, 1997). Exposure to high-intensity, continuous-type sounds of sufficient duration may cause injury to the lungs and intestines (e.g., Dalecki et al., 2002). Sudden, intense sounds may elicit a “startle” response and may be followed by an orienting reflex (Ward, 1997; Jansen, 1998). The primary physiological effects of sound, however, are on the auditory system (Ward, 1997).

The mammalian auditory system, including those of marine mammals, consists of the outer ear (vestigial in cetaceans), middle ear, inner ear, and central nervous system (Ketten 1998). Sound waves are transmitted through the middle ears to fluids within the inner ear except cetaceans. The inner ear contains delicate electromechanical hair cells that convert the fluid motions into neural impulses that are sent to the brain. The hair cells within the inner ear are the most vulnerable to over-stimulation by noise exposure (Yost, 1994).

Very high sound levels may rupture the eardrum or damage the small bones in the middle ear (Yost, 1994). Lower level exposures of sufficient duration may cause permanent or temporary hearing loss; such an effect is called a noise-induced threshold shift, or simply a threshold shift (TS) (Miller, 1974). A TS may be either permanent, in which case it is called a permanent threshold shift (PTS), or temporary, in which case it is called a temporary threshold shift (TTS). Still lower levels of sound may result in auditory masking, which may interfere with an animal’s ability to hear other concurrent sounds.

Because the tissues of the ear appear to be the most susceptible to the physiological effects of sound and TSs tend to occur at lower exposures than other more serious auditory effects, PTS and TTS are used here as the biological indicators of physiological effects. TTS is the first indication of physiological non-injurious change and is not physical injury. The remainder of this section is, therefore, focused on TSs, including PTSs and TTSs. Because masking (without a resulting TS) is not associated with abnormal physiological function, it is not considered a physiological effect in this authorization request, but rather a potential behavioral effect.

Noise-Induced Threshold Shifts

The amount of TS depends on the amplitude, duration, frequency, and temporal pattern of the sound exposure. Threshold shifts will generally increase with the amplitude and duration of sound exposure. For continuous sounds, exposures of equal energy will lead to approximately equal effects (Ward, 1997). For intermittent sounds, less TS will occur than from a continuous exposure with the same energy (some recovery will occur between exposures) (Kryter et al., 1966; Ward, 1997).

The magnitude of a TS normally decreases with the amount of time post-exposure (Miller, 1974). The amount of TS just after exposure is called the initial TS. If the TS eventually returns to zero (the threshold returns to the pre-exposure value), the TS is a TTS. Since the amount of TTS depends on the time post-exposure, it is common to use a subscript to indicate the time in minutes after exposure (Quaranta et al., 1998). For example, TTS_2 means a TTS measured 2 minutes after exposure. If the TS does not return to zero but leaves some finite amount of TS, then that remaining TS is a PTS. The distinction between PTS and TTS is based on whether there is a complete recovery of a TS following a sound exposure. Figure 4.1.2.3.4-1 shows two hypothetical TSs, one that completely recovers, a TTS, and one that does not completely recover, leaving some PTS.

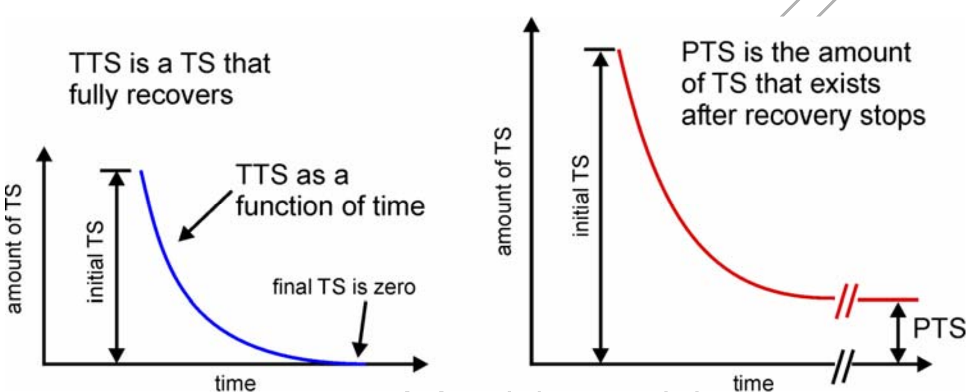


Figure 4.1.2.3.4-1. Hypothetical Temporary and Permanent Threshold Shifts

PTS, TTS, and Harassment Zones

PTS is non-recoverable and, by definition, must result from the destruction of tissues within the auditory system. PTS therefore qualifies as an injury and is classified as Level A harassment under the wording of the MMPA. In the Draft EIS/OEIS, the smallest amount of PTS (onset-PTS) is taken to be the indicator for the smallest degree of injury that can be measured. The acoustic exposure associated with onset-PTS is used to define the outer limit of the Level A harassment zone.

TTS is recoverable and, as in recent rulings (National Oceanic and Atmospheric Administration, 2001, 2002a), is considered to result from the temporary, non-injurious distortion of hearing-related tissues. Because it is considered non-injurious (there is no tissue damage), the acoustic exposure associated with onset-TTS is used to define the outer limit of the portion of the Level B harassment zone attributable to physiological effects. This follows from the concept that hearing loss potentially affects an animal's ability to react normally to the sounds around it. Therefore, TTS is considered as a Level B harassment resulting from physiological effects on the auditory system.

Indicators of Physiological Effects (PTS and TTS)

Very high sound levels may rupture the eardrum or damage the small bones in the middle ear of mammals (Yost, 1994). Lower sound levels may cause permanent or temporary hearing loss. Such an effect is called a TS. ATS may be either permanent or temporary. PTS is used as the criteria for physiological effects resulting in injury, and TTS is used as the criteria for physiological effects that do not result in injury but may result in a behavioral disturbance or in harassment.

TTS and PTS Effect Thresholds

The TTS threshold is primarily based on the cetacean TTS data from Schlundt et al. (2000). Since these tests used short-duration tones similar to sonar pings, they are the most directly relevant data. The mean exposure EL required to produce onset-TTS in these tests was 195 dB re 1 μPa^2-s. This result is corroborated by the short-duration tone data of Finneran et al. (2000, 2003a, 2005) and the long-duration noise data from Nachtigall et al. (2003a, 2003b). Together, these data demonstrate that TTS in cetaceans is correlated with the received EL and that onset-TTS exposures equate to an energy level of 195 dB re 1 μPa^2-s.

Generating precise PTS data for marine mammals poses moral and ethical issues due to the requirement that experiments be conducted that result in actual injury and/or death of marine mammals. Scientists overcome this dilemma by making extrapolations from behavioral effects data that err on the side of concluding that injury occurs at thresholds lower than scientists believe injury may occur. Therefore, PTS levels for marine mammals were estimated using TTS data and relationships between TTS and PTS. The 215 dB re 1 μPa^2-s PTS threshold is based on a 20 dB increase in exposure EL over that required for onset-TTS. The 20 dB value is based on extrapolations from terrestrial mammal data indicating that PTS occurs at 40 dB or more of TS, and that TS growth occurs at a rate of approximately 1.6 dB TTS per dB increase in EL. There is a 34 dB TS difference between onset-TTS (6 dB) and onset-PTS (40 dB). The additional exposure above onset-TTS that is required to reach PTS is therefore 34 dB divided by 1.6 dB or approximately 21 dB. This estimate is conservative because (1) 40 dB of TS is actually an upper limit for TTS used to approximate onset-PTS, and (2) the 1.6 dB/dB growth rate is the upper range of values from Ward et al. (1958, 1959).

4.1.2.3.5 Behavioral Effects

The Navy had proposed a behavioral effects threshold of 190 dB re 1 μPa^2-s, based primarily on the behavioral observations reported in Schlundt et al. (2000) and Finneran et al. (2000, 2003b, 2005). Finneran and Schlundt (2004) summarize these data and provide the statistical analysis used in development of this threshold. These studies are applicable because they used short-duration tones and frequencies similar to the sonar use modeled in this assessment. The most compelling reason for the use of these experimental data using captive animals was the considerable number of studies involved and the absence of any other data using representative sound characteristics and experimental controls. In particular, the studies summarized in Finneran and Schlundt (2004) and their resulting analysis provides the most appropriate data to develop a behavioral effects threshold because: (1) researchers had superior control over and ability to quantify noise exposure conditions; (2) behavioral patterns of exposed marine mammals were readily observable and definable; (3) fatiguing noise consisted of tonal noise exposures with frequencies contained in the tactical mid-frequency sonar bandwidth; and (4) the species involved were closely related to the majority of the marine mammals expected to be within the HRC operational areas. Since no directly comparable data exist, or are likely to be obtained, for marine mammals in the wild, the relationship between the behavioral results reported by Finneran and Schlundt (2004) and marine mammals in the wild is unknown. However, data from wild cetaceans exposed to mid frequency sonar and sounds similar to mid-frequency sonar have been collected, and these data were also considered by National Marine Fisheries Service (NMFS) in the development of behavioral effects criteria. Although experienced, trained subjects may tolerate higher sound levels than inexperienced animals, it is also possible that prior experiences and resultant expectations may have made some trained subjects less tolerant of the sound exposures (see Domjan, 1998). The following paragraphs discuss the applicability of the Finneran and Schlundt (2004) data.

As described in Finneran and Schlundt (2004), the behavior of a subject during intense sound exposure experiments was subjectively compared to the subject's "normal" behaviors to determine whether a subject exhibited altered behavior during a session. In this context, altered behavior means a deviation from a subject's typical trained behaviors. The subjective assessment was only possible because behavioral observations were made with the same subjects during many baseline hearing sessions with no intense sound exposures. This allowed comparisons to be made between how a subject usually acted and how it acted during test sessions with intense sound exposures. Each exposure session was then categorized as "normal behavior" or "altered behavior." The behavioral alterations primarily consisted of reluctance on the part of the subjects, during a test session, to return to the site of a previous intense sound exposure. All instances of altered behavior were included in the statistical summary. An example of the results is as follows: At 192 dB re 1 µPa exposure SPL, 7 of 13 white whale sessions and 16 of 32 dolphin sessions were categorized as altered behavior. The pooled percentage is therefore 51%, or 23 of 45 total sessions.

Exposure levels corresponding to sessions with 25, 50, and 75% altered behavior were 180, 190, and 199 dB re 1 µPa SPL (or 180, 190, and 199 dB re 1 µPa2-s EL), respectively, for the frequency range of 3 to 20 kHz, which is the range of frequencies that will be used in the HRC. More detailed statistical results are provided in Finneran and Schlundt (2004).

The use of the 50% point (190 dB re 1 µPa^2-s) to estimate a single numeric "all-or-nothing" threshold from a psychometric function is a common and accepted psychophysical technique (e.g., Nachtigall et al., 2000; Yost, 1994). The 50% altered point from these data is one approach to predicting Level B harassment because it actually represents the sensory threshold point where the sound was strong enough to potentially result in altered behavior in the captive animals 50% of the time; however, it may not result in significantly altered behavior as is required to be considered Level B harassment as defined for military readiness operations.

Although wide-ranging in terms of sound sources, context, and type/extent of observations reported, NMFS believes that the large and growing body of literature regarding behavioral reactions of wild, naïve marine mammals to anthropogenic exposure generally suggests that wild animals are behaviorally affected at significantly lower levels than those determined for captive animals by Finneran and Schlundt (2004). For instance, cetaceans exposed to human noise sound sources, such as seismic airgun sounds and low frequency sonar signals, have been shown to exhibit avoidance behavior when the animals are exposed to noise levels of 140-160 dB re 1 µPa under certain conditions (Malme et al., 1983; 1984; 1988; Ljungblad et al., 1988; Tyack and Clark, 1998). Two specific situations for which exposure conditions and behavioral reactions of free-ranging marine mammals exposed to sounds somewhat similar to those proposed for use in the HRC were considered by Nowacek et al. and NMFS in 2004 (Nowacek et al., 2004 and National Marine Fisheries Service, Pacific Islands Fisheries Science

Center, 2004). Both suggest behavioral alterations, including the alteration of feeding, diving, and social behavior, occur at levels below the 190 dB re 1 μPa^2-s criterion (acknowledging differences in metrics). Nowacek et al. (2004) conducted controlled exposure experiments on North Atlantic right whales using ship noise, social sounds of con-specifics, and an alerting stimulus (frequency modulated tonal signals between 500 Hz and 4.5 kHz). Animals were tagged with acoustic sensors (D-tags) that simultaneously measured movement in three dimensions. Whales reacted strongly to alert signals at received levels of 133-148 dB SPL, mildly to conspecific signals, and not at all to ship sounds or actual vessels. The alert stimulus caused whales to immediately cease foraging behavior and swim rapidly to the surface. Although sound exposure level values were not directly reported, based on received exposure durations, approximate received values were on the order of 160 dB re 1 μPa^2-s. However, it is important to note that the frequencies used, the modulated tones, and the long duration of the alert stimuli are not comparable to Navy mid-frequency sonar and were designed specifically as an alert stimulus to create a behavioral reaction in North Atlantic right whales.

NMFS notes the fact that pure tone exposures in laboratory conditions differ physically in several substantive ways from received tactical sonar signals in real-world conditions. Although pure tone exposures used in the captive TTS studies are certainly more like tactical mid-frequency sonar than certain human sound sources (such as vessels or ice-breaking) involved in less-controlled behavioral studies of wild animals, there are some potentially significant differences between these laboratory noise exposures and the complex frequency modulation and multi-path propagation patterns of tactical sonars in operational environments. Last, there is considerable uncertainty regarding the validity of applying data collected from trained captives conditioned to not respond to noise exposure in setting thresholds for behavioral reactions of naïve wild individuals to a sound source that apparently evokes strong reactions in some marine mammals. However, it is also possible that prior experiences and resultant expectations may have made some trained subjects less tolerant of the sound exposures (see Domjan, 1998).

Given these considerations, NMFS believed that a more conservative acoustic behavioral disturbance threshold for sub-TTS behavioral disturbance than the 190 dB re 1 μPa^2-s criterion was necessary. Acknowledging the quantitative limitations of many of the field observations of marine mammals and the advantages in this regard of the Finneran and Schlundt (2004) analysis, NMFS had set the behavioral effects threshold at 173 dB re 1 μPa^2-s for the U.S. Navy's Undersea Warfare Training Range (USWTR) Draft EIS (2005), USWEX EA/OEA (U.S. Department of the Navy, 2005), RIMPAC EA/OEA (2006) and COMPTUEX/JTFEX EA/OEA (2007). For this the HRC EIS, the Navy will present both the 190 dB re 1 μPa^2-s and 173 dB re 1 μPa^2-s threshold criteria for sub-TTS behavioral Level B exposure.

In addition, establishment of a new methodology for analysis of Level B behavioral reactions (to replace the behavioral effects threshold at 173 dB re 1 μPa^2-s) has been coordinated between NMFS and the Navy for future actions undertaken pursuant to MMPA based on the advancement of science in this regard. As discussed in the following section, the proposed replacement methodology has been termed "Dose Response" and is based on sound pressure level (SPL) as a behavioral threshold metric vice the Energy Flux Density metric in use to this point to quantify sub-TTS behavioral Level B exposures.

4.1.2.3.6 Sound-Pressure-Level (SPL) "Dose Functions" for Estimating Behavioral Exposures

This section presents and explains the acoustic thresholds used to determine changes in marine mammal behavior, statistically, as a result of a received sonar signal. Background on thresholds used in the past is summarized, and then the rationale for the threshold function is explained. Finally, the threshold functions are given numerically, with examples of how they are used in determining behavioral effects for compliance documents (e.g., Environmental Assessments).

Emphasis is on the most powerful tactical sonars and the most abundant marine mammals as these account for the majority of effects.

4.1.2.3.6.1 Background

This subsection discusses current thresholds for tactical sonars and reasons for the adoption of a different threshold function for assessing behavioral harassment.

One of the principal issues for determining the effects of Navy tactical sonars on marine mammals is the methodology for estimating Marine Mammal Protection Act (MMPA) behavioral disturbance (Level B Harassment). Approaches to date for tactical sonars (such as used in the risk assessment analysis for RIMPAC 06 and USWTR) have used criteria for temporary hearing loss and for significant disturbance reactions. In those cases, the acoustic "threshold" (i.e., the sound level that might induce the disturbance) has been a single energy-type level or single sound pressure level (SPL) such that the marine mammal is counted as being significantly disturbed by sound levels above the threshold and not counted as significantly disturbed otherwise.

For example, the currently used energy threshold level for temporary hearing degradation for cetaceans is 195 dB. If the transmitted sonar energy, as received by the whale, is above 195 dB, then the animal is considered to have experienced temporary hearing degradation. If the received energy level is below 195 dB, then the animal is not counted for this type of Level B harassment.

The single-number (step-function) threshold does not explicitly account for any variability in response of the animal to the sonar signal. All animals are assumed to respond at the same levels - no matter what the acoustic conditions, animal species, animal gender, animal age, etc. For physiological effects, where there may be small variability in response, the single-number threshold can be a reasonable model. However, for behavioral disturbance (without direct physiological effects), the single-number threshold does not account for known variability in animals and their responses (depending, for example, on location, time, sonar type, signal waveform, animal disposition, grouping, etc.).

The Navy, in agreement with the National Marine Fisheries Service (NMFS) and with public input from draft Environmental Impact Statement for USWTR and the Environmental Assessment for RIMPAC 06, have concluded that the single-value, go/no-go metric for mid-frequency active sonar behavioral harassment under the Marine Mammal Protection Act (MMPA), for use with all marine mammal species, is inappropriate. Instead, an approach that is the basis for public policy for determining "safe" and "hazardous" levels and dosages for drugs, potential pollutants, and other substances that humans are exposed to appears to be a more appropriate metric. This methodology is the "dose function" relationship. In this case it describes the probability of change in effect/behavior on a marine mammal caused by differing levels of exposures (or doses) of received levels of mid-frequency active sonar. The "dose-function" approach allows for the variability and uncertainty in response of the marine mammal over time, space, conditions, and individual learned behaviors. This approach can also be referred to as "dose-response" or "risk-continuum."

Subsequent text presents methodology for estimating MMPA behavioral disturbances; it incorporates variability and improves on the single-number threshold approaches of the past. An important feature is the inclusion of effects at low sound levels. The adopted "dose-function" approach is ubiquitous in the health and sciences fields, and lends itself well to risk assessment for behavioral disruption by sonar on marine life.

The most powerful mid-frequency active sonar systems currently in use by the Navy (the SQS-53 surface ship and BQQ-5 sphere submarine sonars) are given priority consideration in implementing the "dose-function" behavioral criteria for estimation of the MMPA Level B behavioral harassment. This is due to the global use of both systems. In operation today, there are approximately 90 surface ships that are equipped with the SQS-53 and 54 submarines with the BQQ-5. Note, however, that the surface-ship sonar (SQS-53) is by far the most important of the two for compliance considerations, since the BQQ-5 sphere is seldom used in an active mode (the covert nature of submarine operations).

Emphasis here then is on the SQS- 53 surface-ship sonar on the most common marine mammals (dolphins and other small odontocetes). These account for the majority of harassment events in fleet sonar training operations. (It should be noted that no other tactical sonar or mid- to high-frequency projector begins to compete, nor are there other species that account for more than a small fraction of behavioral harassment or TTS).

The next two subsections address the two important aspects of the approach to estimating effects: the dose function and the Sound Pressure Level (SPL) metric.

4.1.2.3.6.2 Dose-Function Approach

Since the Navy is looking to move away from using the step function or the go/no-go metric, the dose function is the most logical methodology to follow to incorporate animal response variability. The dose function is not a new concept for sound effects in water. For example, the SURTASS-LFA EIS, the Department of the Navy (2001) and the NPAL EIS (2001) feature dose functions, and have been subjected to the full EIS permitting process, including public reviews. The approach is commonly used in many branches of science, and the reference list provides several citations related to medicine and ecology. The dose-function approach utilizes a statistical "model" to estimate the probability of acoustic effects from a specified received sound pressure level (SPL) in decibels referenced to a micro-pascal (dB//µPa).

The important point is that the dose-function approach accounts for the variability and uncertainty in response of a marine mammal over time, space, environmental conditions, etc. This allows statistical observations and scientific theory to be incorporated into the harassment threshold (now modeled as a probability function of received level).

As a simple example, consider the dose function that specifies a 0% chance of harassment for received levels below 140 dB, a 10% chance at 140-170 dB, a 50% chance at 170-180 dB, and 100% above 180 dB. It thus covers the full range of levels from 140 dB to 180 dB, prescribing probabilities of harassment for each level. On the other hand, the dose function with value 0% for levels below 195 dB and 100% for levels above 195 dB is the simplest case - and corresponds to the "single-number" threshold approach in common usage. This is the single-number step-function threshold in current use for some sonars. It could be viewed as a dose function with very small variability.

Hence, if there is not much variability in response to the stimulus, then a dose-function approach may not be appropriate. As presented in the example above, if chances of eardrum rupture from a large explosive range from 10% at 203 dB to 90% at 207 dB, then the dose function would approximate a step function, with small standard deviation (about 1 dB). Figure 4.1.2.3.6.2-1 below shows how the dose function depends on variability as represented by the standard deviation of a normal distribution.

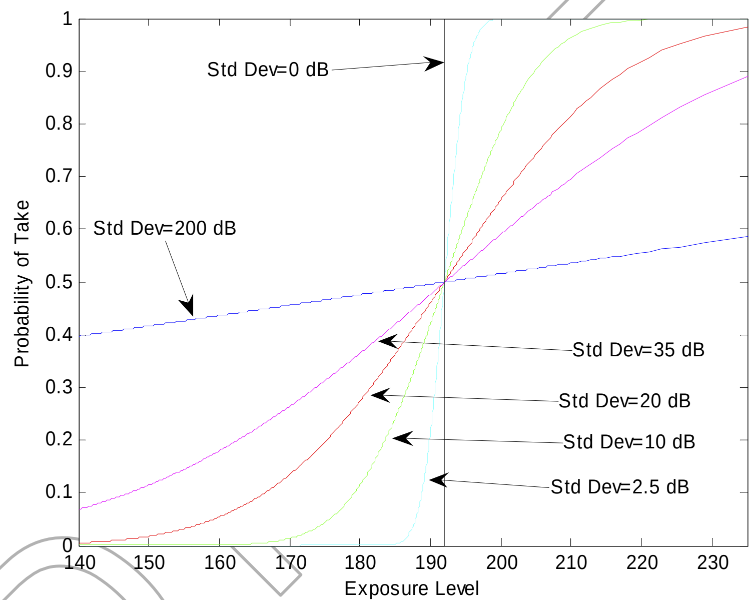


Figure 4.1.2.3.6.2-1: Normal-Distribution CDFs with Varying Standard Deviations

Given this concept of a dose function, the next subsection focuses on the sound level that is used by the dose function to determine the probability of an effect.

4.1.2.3.6.3 Use of Sound Pressure Level (SPL) as the Metric for the Behavioral Disturbance Threshold

In the past, energy-type metrics have been used as thresholds for behavioral disturbance from mid- or high-frequency sources in underwater sound. The preferred metric has been the short-term average RMS pressure level or SPL. While energy-type metrics have been favored for evaluating physiological effects of sound on hearing (such as Temporary Threshold Shift or TTS), SPL has historically been favored for behavioral disturbances in air and in water. (See Appendix K for definitions of SPL, intensity, and energy-type metrics for sound.)

Results of over 50 years of research on annoyance and disturbance of humans from aircraft and other in-air noise sources support the use of weighted averages of SPL and maximum sound pressure level (SPL) (but not accumulated energy) as the metric for behavioral disturbance. An agreement on the dose-function parameters for mid-frequency sonars and small odontocetes between NMFS and Navy specifies maximum SPL as the appropriate metric for behavioral disturbance.

Consider analogies for effects of in-air noise on humans. Metrics for annoyance of humans by aircraft noise are instantaneous maximum SPL, as well as weighted averages of SPL. In Appendix K-2, see the definitions (with references) that have become standards for community noise mitigation, based on SPL (e.g., L_{dn} and L_{eq}). Commercial noise meters for in-air measurements emphasize peak pressure and SPL, weighted to account for human hearing sensitivities (e.g., low weights for frequencies that mature humans hear poorly -- below 20-50 Hz and above 10 to 15 kHz - also included in the appendix). (See, for example, Fidell and Pearsons (1997) for a concise summary of in-air annoyance, with metrics.)

Note from Navy historical environmental documents that SPL has been used for years as the threshold metric for behavioral disturbance in underwater sound for sonars. See, for example, the LWAD series (having undergone multiple ESA Section 7 consultations) as well as environmental assessments for AUTEC, the Navy's Submarine Security program, SQQ-89 (with SQS 53 sonar as component), and TORPEX EAs.

Hence, precedent, current usage, and in-air experience support the use of SPL as the metric for behavioral disturbance of marine mammals by mid- and high-frequency sound sources, including tactical sonars.

4.1.2.3.6.4 Choice of Dose-Function Forms

The concept of the dose function using SPL has now been introduced and discussed above. But the actual form of the function and its values have not yet been presented. This subsection explains what properties the dose function should have - leading to the selection of the standard normal distribution function as the form. Subsequent sections show how the parameters for the dose functions are determined from data and experience in other technical fields.

The form of the dose function is driven by certain fundamental properties of the data and by statistical principles. Generally speaking, the dose function gives a probability of harassment as a function of received sound level.

For sound level L, let F(L) denote the dose function value (expressed as a probability in this paragraph). For example, F(L) might have a value of 0.5 for a SPL of 190 dB and a value of 0.01 for a SPL of 150 dB. Other levels produce other probabilities, but we expect that the dose function to be monotone increasing: i.e., the chance of impact increases with received level. The dose function must also have values between 0 and 1 (since the values are probabilities and are likewise required to have values between 0 and 1).

To be consistent with the SSC data (see Finneran and Schlundt 2003 and other SSC references) and with the dose function for NPAL (2001) and SURTASS-LFA (2001), the sonar dose function should have mirror-image symmetry about the mean when portrayed in decibels.

This symmetry can be viewed as a requirement that the mean equals the median, and that for the dose function F:

$$F(\text{Mean} - L) = 1 - F(\text{Mean} + L)$$

for L < Mean and "Mean" equal to the 0.5 probability point (mean or median) of F. Thus, if the median were 190 dB (i.e., F(190) = 0.5), then

$$F(190-10) = 1 – F(190 + 10).$$

See Figure 4.1.2.3.6.4-1 for an illustration of the symmetry.

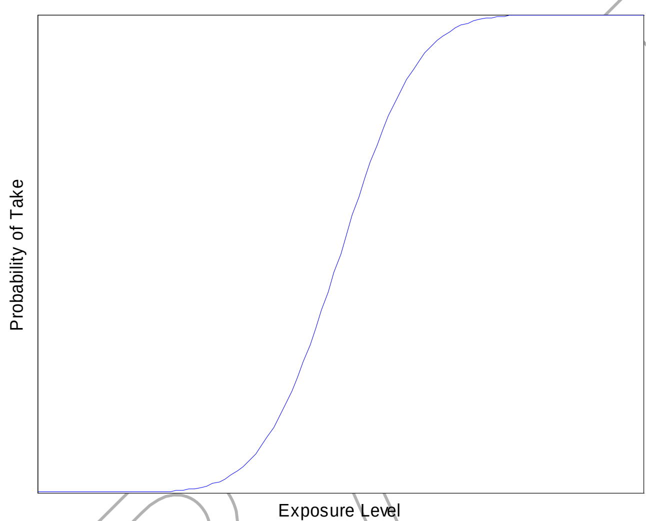


Figure 4.1.2.3.6.4-1: Normal Distribution CDF shape

Now, many types of functions can satisfy the requirements for a dose function (values between 0 and 1, monotone, mirror symmetric). It should be noted that the function is not necessarily related to a cumulative probability distribution function. However, a truncated normal distribution function is convenient, tabulated in spreadsheet programs, and spans the space (i.e., fits many sets of data). What is most important is that two parameters define the curve: mean and standard deviation. These parameters are used to fit the curves to the data. Almost as important is the low-end "cutoff" as a necessary third parameter. See Figure 4.1.2.3.6.4-1. The low-end "cutoff," the sound level below which no effect is expected, is the reason for the term "truncated" normal distribution function.

For a normal distribution with mean 190 dB and standard deviation 10 dB, the above example has values:

$$0.16 = F(190-10) = 1.00 – F(190 + 10) = 1.00 – 0.84 = 0.16.$$

In other words, the symmetry results in 0.16 and (1 – 0.16) = 0.84 for the probabilities associated with the normal distribution when the standard deviation (10 dB) is added or subtracted from the mean (190 dB).

The Navy/NOAA dose-function approach includes logical refinements and conventions (e.g., beaked-whale adjustments to allow for lower sound levels to be applied to these sensitive animals).

As mentioned earlier, formal Navy compliance documents have used dose functions in the past. The SURTASS-LFA (2001) and NPAL (2001) use the same dose function, which is approximately a truncated normal distribution functions with mean of 165 dB and standard deviation of 10 dB. Cutoff is 120 dB on the low end (probability 0.0) and 180 dB on the high end (probability 1.0). This dose function is not applicable to tactical sonars since it fits data for low-frequency (< 1 kHz) signals and pulses that are very long (e.g., 20 minutes for NPAL).

With the dose function form (normal distribution function) selected, the next subsections discuss how data and past Navy compliance documentation were used to determine the parameters of the dose function (particularly the mean, standard deviation and cutoff).

4.1.2.3.6.5 Key Data Sets for Determining Dose Functions for the SQS 53 Sonar and Small Odontocetes

Working with NMFS, Navy determined that for behavioral harassment there are two primary sources of information that apply to the 2-6 kHz sonar (the band roughly containing the transmissions of the SQS 53 sonar) and small odontocetes. These are the body of data collected by the Navy SPAWAR Systems Center (SSC) from 1995 to present, and the observations of reactions of orcas during SQS 53 sonar operations by Navy ship USS SHOUP in the Haro Straits (Puget sound area) in 2003. Both are well documented data sets (see references listed at the end). These two data sets in order are discussed below.

Fits of the "Dose" Functions to SSC Data for the SQS 53 Sonar and Small Odontocetes

Navy and NMFS worked to develop a dose function for the most important case (the SQS 53 sonar and small odontocetes) - the one responsible for over 99 % of potential estimated behavioral harassment in USWTR (Undersea Warfare Training Range, Onslow Bay, NC) and Navy training operations in RIMPAC 06 in Hawaii. A recent agreement between NMFS and Navy addressed this particular tactical sonar case.

The fit of the dose function to SSC's data is technically appropriate, and directly reflects the interpretation of the data that Navy and NMFS have made in the past. The curve-fitting approach is straightforward. The normal distribution function parameters were fit to the 25, 50, and 75 percentiles of the Finneran et al. (2003) data. See 4.1.2.3.6.5-1 for the 3 kHz (and other) fits. Because the number of measurements is large, but limited, extrapolation to lower probabilities was not possible without a generic assumption of the normal distribution shape. This extrapolation is common in the sciences, and has basis in "central limit theorem" arguments (e.g., textbooks by Cramer or Feller). Again, there are no data to apply to the low probabilities for low receive levels for sonars. Hence, extension to -3 and -4 standard deviations (s.d.) for cutoff are made without support of measured data, but is a reasonable statistical extrapolation. As a compelling argument for the choice of cutoffs for the dose function for sonars, consider the ranges at which effects are considered possible. For the SQS 53 sonar in search mode and for spherical spreading, the ranges to the 3 and 4 s.d. cutoffs are 30 and 150 km. Corresponding SPLs are 153 and 141 dB. There are no data to suggest that these ranges and levels are not reasonable limits for the influence of the Navy's mid-frequency sonars. Also note that the Nowacek et al. (2004) observations of the reactions of North Atlantic right whales to long-pulse signals in the 500 – 4000 Hz range are not inconsistent with the choice of cutoff standard deviations here (as well as for the dose functions for mysticetes -- covered in Section 4.1.2.3.6.7). That signals with SPLs in the 140 to 150 dB range might cause a marine mammal to be behaviorally affected is accounted for in the dose function tails.

USS SHOUP Analyses

The orca observations during USS SHOUP sonar operations in the Haro Straits in May 2003 are well known. There are three in-depth technical documents developed by Navy and NOAA (SHOUP 2004a; 2004b; 2004c).

Navy and NOAA agreed to include the SHOUP results in the dose-function development - keeping in mind the issues associated with an uncontrolled and non-scientific observation. The goal was to use SQS 53 data as available, and SHOUP is the only data set available (other than the large volume of SSC data), that have the advantage of in-situ observations of wild animal reactions to the SQS 53 sonar.

The Naval Research Laboratory (NRL) analyses of the SHOUP observations have been available since 2004 (see references, also including a CPF report). NMFS and Navy concurred that 186 dB SPL is a reasonable extrapolation of the median level in a dose function for possible behavioral disturbance. It is important to note that this value derived from sonar operations in track mode. It represents the SPL for the dominant direct path arrival—a "peak SPL." Because there are multipath arrivals and reverberation extending in time up to 19 seconds, the average SPL over all of the arrivals would be much smaller (as discussed in the reports) - as much as 13 dB.

The SHOUP sonar data observations and analyses are complex, and some of the relevant information (especially the SQS 53 sonar source level versus transmit angle) is classified. Published analyses used nominal, unclassified source levels. In addition, local measurements of sonar signals and noise levels were overloaded ("clipped" at about 140 dB).

Note well that the SHOUP data have a small influence on the dose function for the SQS 53 and small odontocetes. It does not influence the standard deviation, and it has a minor influence (3 dB) on the mean. The important point is that the SHOUP data have relevance and they have been applied ---to ensure that available information on animals in the wild has been included in the analysis.

Use of the SSC and SHOUP Analyses to Support Dose Function Parameters for the SQS 53 and Small Odontocetes

The 186 dB (short-term average SPL for strongest multipath arrival within about 2 km of the pod) median value for SHOUP was integrated into the analysis for the SQS 53 dose function for small odontocetes. The median 3 kHz value from the SSC data sets is 192 dB (SPL). Given uncertainties in acoustic propagation, sonar performance, animal densities, etc., a reasonable spread from 186 dB to 192 dB is represented by the median value of 189 dB (SPL). When the 12 dB standard deviation associated with the SSC results are considered, the 189 dB value is consistent with the statistical assumptions. See Figure 4.1.2.3.6.5-1 for the dose function plot.

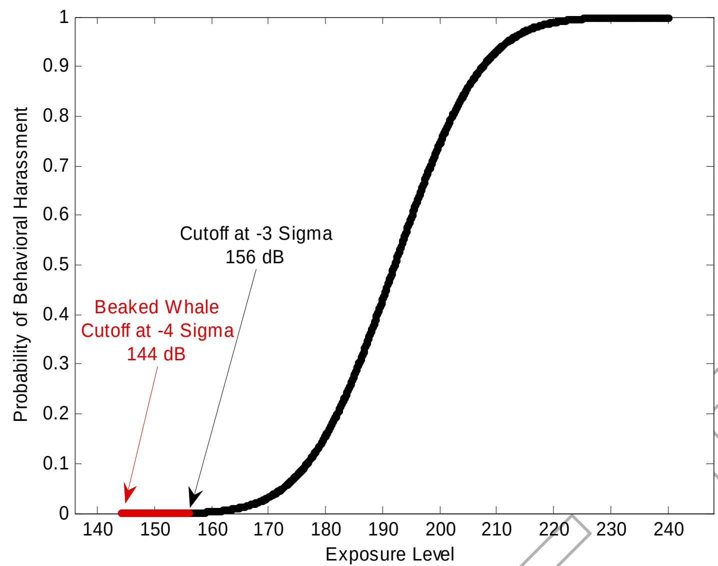


Figure 4.1.2.3.6.5-1: Dose Function with -3 and -4 Standard Deviation Cutoffs

The next subsections discuss how to apply the dose functions, and then give parameters for frequencies and species other than the 2-6 kHz and small odontocetes.

4.1.2.3.6.6 How Estimated Numbers of Behavioral Disturbances Are Calculated for the Dose-Function Approach

The dose function yields a probability of effect for each SPL. Application to the actual assessment process (to determine, for example, how many animals would be affected by a moving sonar ship over two hours in a range in spring) is discussed next. There are several possible calculation approaches, and some practical examples follow. Note that the assessment process requires advanced and detailed sonar, acoustic and animal computer models.

Basic Approach

At the most basic level, consider that the various assessment methods used for Navy compliance have the capability to estimate the area (or volume) ensonified for a particular range of SPLs. This has been done for USWTR, LWAD, etc. A “brute force” method for including the dose function in the estimate is to calculate the area (or volume) for a small range of SPLs (e.g., 170 to 171 dB), and multiply the area (or volume) by the dose function average (e.g., over 170-171 dB). This process is then repeated for all SPLs that have non-zero dose function probabilities. The resulting areas (volumes) are summed, and then multiplied by the animal densities too yield estimates of harassment effects.

In the simplest case of a single sonar transmission, a monotone decreasing SPL and symmetry about the source, the area ensonified as above can be visualized as the annulus of a circle. The area of each annulus is then multiplied by the value of the dose function, and then by animal density, as in Figure 4.1.2.3.6.6-1.

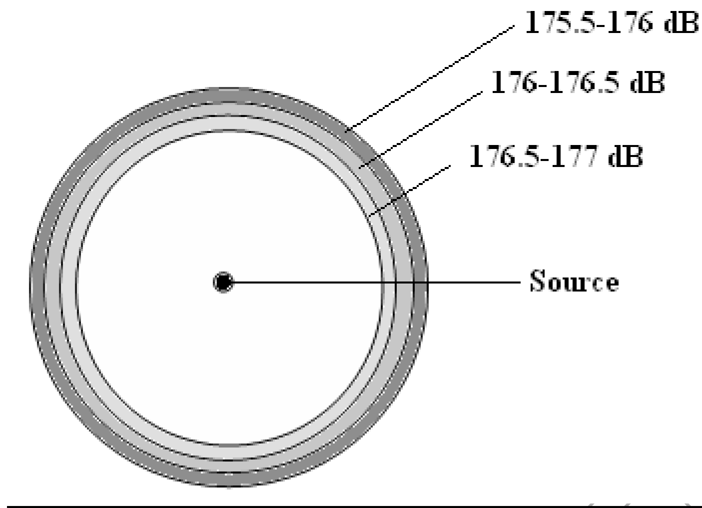


Figure 4.1.2.3.6.6-1 Ensonified Annulus

Numerical (Cell) Approach

A variation in current use divides the ocean area into cells (rectangles as small as 25 m on a side). For a moving source, the SPLs for each ping are estimated for each cell as the source moves, taking into account source directivity, propagation, multipath, repetition rate, and source speed. The maximum SPL in a given cell, over the event, determines the dose function value to be applied. That value times the cell area times the animal density per unit area gives the behavioral harassment estimate.

Others

Additionally, Monte Carlo methods have been used in the past (see SURTASS-LFA, 2001, and NPAL, 2001), as have closed form estimates for effects from fixed sources on moving animals. Other methods depend on geometries of the sources and animals (e.g., fixed sources). But the same principle holds - the maximum received SPL at a given animal determines a dose-function probability that the animal will be affected.

Double Counting of Harassment Events

Because the TTS and behavioral harassment calculations use different metrics (energy level and SPL), and because of the data base used, it is usually the case that the TTS area will be within the behavior harassment area. In that case, care must be taken to not count the same animal harassment twice.

As for this potential overlap of TTS and Behavioral Disturbance areas (or volumes), the “TTS area” will be well-defined by model calculations of energy level. For cetaceans, this is the area with energy levels above 195 dB. Estimates of numbers of animals exposed to TTS levels are then found from multiplication of the area by animal densities.

For estimation of the behavioral-disturbance effect area (weighted by the dose function), the TTS effect area is simply excluded. The number of animals estimated to experience behavioral disturbance will then not include any animals that have TTS exposures. Total Level B behavioral harassment counts are then found as the sum.

4.1.2.3.6.7 Fits for the Dose Functions to SSC Data for Other Cases

Note well that over 99 percent of estimated cetacean harassment events for USWTR and RIMPAC 06 were for small odontocetes and the SQS 53 sonar. Navy's dose functions for other than the SQS 53 and small odontocetes cases are given in the Table 4.1.2.3.6.7-1.

Since there are SSC data at 3, 10, 20, and 75 kHz, recommended dose functions for small odontocetes in appropriate bands (2-6 kHz, 6–15 kHz, 15–30 kHz, 30100 kHz) are included in the table. Plots are also shown for the SSC fit (see Figure 4.1.2.3.6.7-1). The bandwidths are about 2-3 octaves about the measurement frequency.

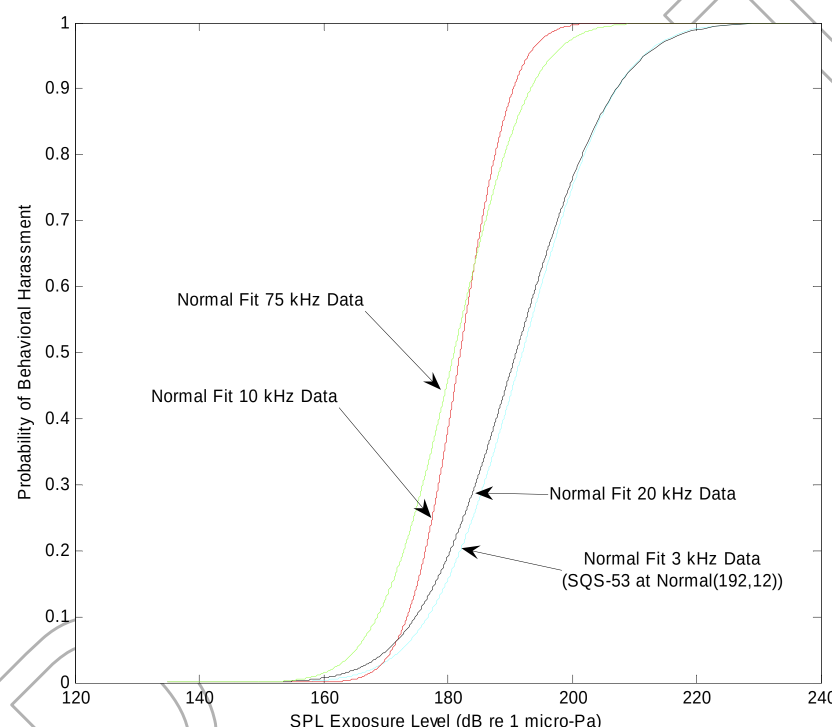


Figure 4.1.2.3.6.7-1: Normal Fits to SSC Data at 3, 10, 20, and 75 kHz

Table 4.1.2.3.6.7-1. SSC Data for Behavioral Reactions (Finneran and Schlundt, 2004)

Frequency (kHz)	25-percentile	50-percentile	75-percentile
3	184	192	200
10	177	182	186
20	183	191	200
75	175	181	188

*Values in dB re 1 μPa for 1-second pulses.

The methodology is the same as for the SQS 53 case discussed above (fitting the normal curve to the 25, 50, and 75 percentile of the Finneran et al. [SSC 2004] data and extending to 3 or 4 standard deviations.). The data are shown in Table 4.1.2.3.6.7-1.

For cases other than the 2-6 kHz sonars and small odontocetes, the approach is to retain the symmetric dose-function form (with truncated normal distribution function as convenient), and to modify the mean, standard deviation, and cutoff (low end) for each case. Parameters are given in Table 4.1.2.3.6.7-2. See Figure 4.1.2.3.6.7-1 for normal distribution function fits to SSC (2004) data sets.

Assumptions for the table include:

- SPL is the threshold metric (in dB re 1 μPa)
- The SSC tests on dolphins and beluga whales (see references for SSC) are the key data for odontocetes.
- Frequency bands use the SSC measurement frequencies (3, 10, 20, 75 kHz) and apply them to bands of size about one octave, but without overlap. Sonar frequency bands are usually less than one octave.
- Mysticete values use precedent for (uncontrolled) observations -- as found in the LWAD EA series, including ESA Section 7 Consultations – with observations discussed in Richardson et al. (1995) for mysticete reactions to machinery and other noise in the polar seas.
- The Kastak et al. (1999a; 1999b) pinniped TTS experiments are taken account of. These do not have behavioral analyses, so TTS is the starting point.
- Statistical estimates from observations of opportunity (especially SHOUP, 2004) are taken into account.

Table 4.1.2.3.6.7-2. SPL Dose-Function Parameters for Behavioral Disturbance from Sonars and Projectors

Animals	Center Frequency for Sonar or Projector	Dose-Function Mean (SPL*)	Dose-Function Standard Deviation (SPL*)	Cutoff (standard deviations and SPL)
Odontocetes (except beaked whales and harbor porpoises)	2 – 6 kHz	189 dB	12 dB	-3 (153 dB)
Beaked whales	2 – 6 kHz	189 dB	12 dB	-4 (141 dB)
Odontocetes (except beaked whales and harbor porpoises)	6 –15 kHz	182 dB	10 dB	-3 (152 dB)
Beaked whales	6 –15 kHz	182 dB	10 dB	-4 (142 dB)
Odontocetes (except beaked whales and harbor porpoises)	15 –30 kHz	189 dB	12 dB	-3 (153 dB)
Beaked whales	15 –30 kHz	189 dB	12 dB	-4 (141 dB)
Mysticetes	2 –30 kHz	175 dB	10 dB	-3 (145 dB)
Pinnipeds	2 –30 kHz	180 dB	10 dB	-3 (150 dB)
Odontocetes (except beaked whales and harbor porpoises)	30–100 kHz	180 dB	12 dB	-3 (144 dB)
Beaked whales	30–100 kHz	180 dB	12 dB	-4 (136 dB)
Mysticetes	30–100 kHz	175 dB	10 dB	-3 (145 dB)
Pinnipeds	30–100 kHz	180 dB	10 dB	-3 (150 dB)

* re 1 μPa Note that maximum or peak SPL is used to test for exceeding the threshold.
Also note that pilot whales may be included with beaked whales for dose function purpose.
kHz = kilohertz
dB = decibel
SPL = Sound Pressure Level

Controlled experiments of marine-mammal behavioral disturbances are limited (and non-existent for wild animals) – so that extrapolations to other cases are generally required. Nonetheless, the above dose-function estimates are based on the available science.

Cutoffs at –3 and –4 standard deviations are also based on rough estimates of range from a powerful sonar source (especially the SQS 53 shipboard sonar) at which an animal might be behaviorally harassed. For spherical spreading, the ranges are of order 30 km for –3 standard deviations, and 150 km for –4 standard deviations. There are no controlled data to test these assumptions, but the approach does account for reactions out to 150 km for beaked whales. SPLs at the cutoff are shown in the table, and range from 136 to 153 dB. The dose function thus accounts for very low level exposures that have the potential for behavioral harassment. It is emphasized here that, for shipboard sonars, resulting effects ranges are not very sensitive to the choice of cutoff level or range.

4.1.2.3.7 Application of Effect Thresholds to Beaked Whales

Recent beaked whale strandings have prompted inquiry into the relationship between high-amplitude continuous-type sound and the cause of those strandings. For example, in the one stranding in the Bahamas in 2000, the Navy mid-frequency sonar has been identified as the most plausible contributory source to the stranding event. The Bahamas exercise entailed multiple ships using mid-frequency sonar during transits of a long constricted channel. The Navy participated in an extensive investigation of the stranding with the National Marine Fisheries Service (NMFS).

The Navy analyzed the known range of operational, biological, and environmental factors involved in the Bahamas stranding and focused on the interplay of these factors to reduce risks to beaked whales from ASW training operations. These factors do not occur in the Hawaiian Islands and there has not been a stranding of beaked whales in the Hawaiian Islands associated with the 30-year use history of the present sonar systems. Beaked whales are present at PMRF and the channel where ASW training has occurred for years. Recently Baird et al. (2006) and McSweeney et al. (2007) reported on the occurrence of resident beaked whales in the area off of the Island of Hawaii and the Alenuihaha Channel between the Island of Hawaii and Maui where ASW sonar operations occur regularly. Therefore, the continued use of sonar in the HRC is not likely to result in effects to beaked whales.

The interaction of unique environmental factors involved in the Bahamas and at the sites of other beaked whale stranding events are not present in the HRC. The "Joint Interim Report, Bahamas Marine Mammal Stranding Event of 15-16 March 2000" (U.S. Department of Commerce and U.S. Department of the Navy, 2001) concluded that environmental and biological factors, including the presence of a strong surface duct, unusual underwater bathymetry, a constricted channel with limited egress, and the presence of beaked whales were contributory factors to the stranding. Beaked whales are expected in the deeper portions of the HRC; however, the combination of environmental factors contributing to the Bahamas stranding event are not present in the HRC.

Since the exact causes of the Bahamas stranding events are unknown (i.e., whether there are behavioral or physiological impacts), separate, meaningful impact thresholds cannot be derived specifically for beaked whales. The Navy, will treat all behavioral disturbances of beaked whales as a potential injury. Therefore, all predicted Level B exposures of beaked whales were counted as a Level A exposures based on the current Navy policy. This provides a more conservative approach to potential effects on beaked whales until more definitive information is provided by ongoing and future studies and as noted the combination of environmental conditions most likely to have contributed to the Bahamas stranding do not occur in the HRC.

4.1.2.3.8 Cetacean Stranding Events

The Navy is very concerned and thoroughly investigates each stranding to better understand these interactions. Strandings can be a single animal but several to hundreds may be involved. An event where animals are found out of their normal habitat is considered a stranding even though animals do not necessarily end up beaching (such as the July 2004 Hanalei Mass

Stranding Event; see Southall et al, 2006). Several hypotheses have been given for the mass strandings which include the impact of shallow beach slopes on odontocete sonar, disease or parasites, geomagnetic anomalies that affect navigation, following a food source in close to shore, avoiding predators, social interactions that cause other cetaceans to come to the aid of stranded animals, and from human actions. Generally inshore species do not strand in large numbers but generally just as a single animal. This may be due to their familiarity with the coastal area whereas pelagic species that are unfamiliar with obstructions or sea bottom tend to strand more often in larger numbers (Woodings, 1995). For the period from 1990 to 2000 cetaceans stranded 800 to 1, 500 times a year with increases during periods of El Niño events (National Marine Fisheries Service, 2006). The main cause of human related strandings was due to fisheries interactions (National Marine Fisheries Service, 2006).

In a review of 70 reports of mass stranding events between 1960 and 2006, 48 (68 percent) involved beaked whales, 3 (4 percent) involved dolphins, and 14 (20 percent) involved whale species. Cuvier's beaked whales were involved in the greatest number of these events (48 or 68 percent), followed by sperm whales (7 or 10 percent), and Blainville and Gervais' beaked whales (4 each or 6 percent). Naval operations that might have involved tactical sonars are reported to have coincided with 9 (13 percent) or 10 (14 percent) of those stranding events. Between the mid-1980s and 2003 (the period reported by the IWC), we identified reports of 44 mass cetacean stranding events of which at least 7 have been correlated with naval operations that were using mid-frequency sonar.

Rim of the Pacific exercises have occurred every second year since 1968 and anti-submarine warfare operations have occurred in each of the 19 exercises that have occurred thus far. If the mid-frequency sonar employed during those exercises killed or injured whales whenever the whales encountered the sonar, it seems likely that some mass strandings would have occurred at least once or twice over the 38-year period since 1968. With one exception, there is little evidence of a pattern in the record of strandings reported for the main Hawaiian Islands. This may be an artifact of the number of observers relative to the area being observed — although strandings have been reported in the Hawaiian Islands since 1937, no toothed whales were found until 1950 — or it may be because only a fraction of the whales that are killed or injured in Hawaiian waters strand (as opposed to sinking, being transported to the open ocean by the strong currents that flow across the northern shore of the islands, or being eaten by predators like sharks). Or, it may suggest that mid-frequency sonar transmissions pose a hazard to some marine mammals in certain rare circumstances but not in others.

Melon-Headed Whale Event in Hawaii, July 2004

The majority of the following information on the stranding event was provided by Dr. Robert Braun, NMFS Pacific Islands Fisheries Science Center in Honolulu, Hawaii. At Hanalei Bay, Kauai on the morning of July 3, 2004, two individuals attending a canoe blessing ceremony noted that as the ceremony began (on time at 7 a.m.); melon-headed whales were seen entering the bay (Braun, 2005). They reported that the whales entered across the center of the bay in a "wave" as if they were chasing fish (Braun, 2005). The whales were moving fast, but not at maximum speed. The whales stopped in the southwest portion of the bay grouping tightly with lots of spy hopping and tail slapping. As people went in the water among the whales, spy hopping increased and the pod separated into two groups with individual animals moving between the two clusters (Braun, 2005). This continued through most of the day, with the animals slowly moving south and then southeast within the bay (Braun, 2005). By about 3 p.m. police arrived and kept people from interacting with the animals. At 4:45 p.m. on July 3, 2004, the RIMPAC Battle Watch Captain received a call from a National Marine Fisheries representative in Honolulu, Hawaii, reporting the sighting of as many as 200 melon-headed whales in Hanalei Bay. At 4:47 p.m., out of caution, the Battle Watch Captain directed all ships in the area to cease all active sonar transmissions.

A National Marine Fisheries Service representative arrived at Hanalei Bay at 7:20 p.m. on July 3, 2004, and observed a tight single pod 75 yards from the southeast side of the bay (Braun, 2005). The pod was circling in a tight group and there was frequent tail slapping and minimal spy hopping. Occasionally one or two sub-adult sized animals broke from the tight pod and came nearer the shore to apparently chase fish and be in the shore break (Braun, 2005). The pod stayed in the bay through the night of July 3, 2004.

On July 4, 2004, a 700–800-foot rope was constructed by weaving together beach morning glory vines. This vine rope was tied between two canoes and with the assistance of 30 to 40 kayaks, by about 11:30 a.m. on July 4, 2004, the pod was coaxed out of the bay (Braun, 2005).

The following morning on July 5, 2004, a very young melon-headed whale was found stranded dead on the beach at Hanalei. NMFS undertook a necropsy to attempt to determine cause of death. Preliminary findings indicated the cause of death was starvation (Farris 2004) and this was later confirmed upon completion of the NMFS stranding report (Southall et al., 2006).

Description of Navy Operations During the Stranding Event

Three ships conducted sonar operations south and southwest of Oahu at 10:15 a.m. to 10:25 a.m., 11:00 to 11:30 a.m., and 13:18 to 13:51 p.m. respectively. Beginning at 4:30 p.m. on July 2, 2004, through 12:27 a.m. on July 3, 2004, six ships conducted sonar operations at various times between the islands of Oahu and Kauai. Hanalei Bay, located on the north shore of Kauai, would have been in the acoustic shadow of any sound propagating from this event. The ships' course resembled the lower two portions of the letter "Z" starting from the lower right-hand corner at 4:30 p.m. and concluding sonar operations at the upper right-hand part of the letter at 12:27 a.m. At approximately 8 p.m., the ships reached the lower left-hand corner of the letter 18 nm (20.71 miles [mi]) southeast of the island of Kauai. The three remaining ships that conducted sonar operations then headed northeast and then east-northeast before heading north during the final 26 minutes of sonar activity. When the ships concluded sonar operations at 12:27 a.m., they were about 60 nm (69 mi) east of Hanalei Bay, which would still be in the acoustic shadow. The maximum number of ships operating sonar at any one time was three.

At 6:45 a.m. on July 3, 2004, on PMRF, approximately 25 nm from Hanalei Bay, active sonar was tested prior to the start of an ASW event; this was about fifteen minutes before the whales were seen in Hanalei Bay. Subsequent concerns were raised that sonar use during RIMPAC may have been causal to the stranding, but it is unlikely the use of active sonar caused the melon-headed whales to enter the bay. In addition, they did not leave the bay when the active sonar use ceased on July 3 at 4:47 p.m.

At the nominal swim speed for melon-headed whales (5 to 6 knots), the whales had to be within 1.5 to 2 nm of Hanalei Bay before the sonar at PMRF was activated. The whales were not in their open ocean habitat but had to be close to shore at 6:45 a.m. when the sonar was activated, to have been observed in Hanalei Bay by 7:00 a.m.

The calculated received level at Hanalei Bay from the sonar at PMRF was approximately 147.5 dB re 1 µPa^2-s at 1 m. This is very far below the behavioral reaction threshold being used in this HRC analysis (173 dB re 1 µPa^2-s at 1 m). Although it is not impossible, it is unlikely that the sound level from the sonar caused the whales to enter the bay.

The area between the islands of Oahu and Kauai, and the PMRF training range have been used in past RIMPAC exercises and are used year-round for ASW training using mid frequency active sonar. Melon-headed whales inhabiting the waters around Kauai are likely not naive to the sound of sonar and there has never been another stranding event associated in time with ASW training at Kauai or in the Hawaiian Islands. Marine mammal strandings in Hawaii are relatively rare. Two melon-headed whales stranded at Hauula Beach on Oahu in August, 2003 (Honolulu Advertiser July 6, 2004). A report of a pod entering Hilo Bay in the 1870s indicates that on at least one other occasion, melon-headed whales entered a bay in a manner similar to the occurrence at Hanalei Bay in July 2004. It should also be noted that a simultaneous “stranding” of 500-700 melon headed whales and Risso’s dolphins occurred at Sasanhaya Bay, Rota, in the Northern Marianas Islands on the same morning as the Hanalei stranding (Jefferson et al., 2006). There was no sonar being used anywhere in the region.

There are many possible causes for whales appearing in Hanalei Bay (such as following prey as initial reports suggested) and many possible causes for stranding, including sick individual members of a pod. Clearly the starvation death of a newborn whale was not caused by RIMPAC naval operations.

There will be no definitive answers to why the whales entered Hanalei Bay on the morning of July 3, 2004. NMFS produced a report on this stranding in April 2006 (Southall et al., 2006). That report concluded that sonar use was a, “plausible, if not likely, contributing factor in what may have been a confluence of events” (Southall et al., 2006). Since that time the primary author has attempted to clarify that the NMFS Hanalei Report, “did not conclude that active military sonar caused this event” (Southall, 2006).

The authors of the NMFS report were unaware, at the time of publication, of the simultaneous Rota stranding and had partially based their “plausible, if not likely” finding on the “anomalous nature of the stranding” and “the absence of other compelling causative explanation” (Southall et al., 2006). In light of the simultaneous Rota stranding, the Hanalei stranding is no longer anomalous in nature. In addition, the presence of a full moon on the date of the stranding as subsequently noted by Southall (2006) and the whales having entering Hanalei Bay as if they were chasing fish, it would seem that in retrospect there are other more compelling reasons for this event to have occurred in July of 2004.

Key questions regarding the possibility that sonar transmissions were responsible for the stranding event remain unanswered. For instance, why would a single cetacean species exclusively respond in such a dramatic and coherent manner when, based on the analyses conducted by NOAA and by the Navy, and knowledge of Hawaiian cetacean abundance, many other marine mammals in the areas surrounding Kauai were also exposed to sonar signals on July 2-3 2004? Another pressing question is why, given the apparent historical frequency of active, military sonar use in and around the Hawaiian Islands, such exposures have apparently not triggered similar events previously? There are hypothetical explanations for these and other lingering questions (e.g., lack of previous concerted observational effort and the physical nature of the coastline and strong current patterns in the Hawaiian Islands that may limit the likelihood of detecting stranding events), but they too are strongly limited by the lack of information about both nominal behavior of this species and their reaction to natural and human sound sources.

Harbor Porpoise Unusual Mortality Event, Haro Strait, Washington, May–June 2003

On 5 May 2003, the USS SHOUP had its mid-frequency sonar activated during a training evolution while moving through the eastern Strait of Juan de Fuca and Haro Strait. Subsequently SHOUP was accused of having caused the strandings of numerous harbor porpoise in the region.

Beginning in May and through July 2003, off the Pacific coast and around the Strait of Juan de Fuca there were 15 harbor porpoise (*Phocoena phocoena*) strandings, 11 of which were collected for analysis and one Dall's porpoise (*Phocoenoides dalli*) that was observed dead on a beach on 25 May but was not collected. Of the total of sixteen porpoises that stranded, seven died prior to sonar operations, one fresh harbor porpoise was collected on May 6th and the remaining porpoises were collected 1-3 weeks after sonar operations. The number of documented stranded porpoises was higher than the average reported during 1992 to 2002 but with the publicized sonar activity, the unusually early spring weather, and the extra effort NMFS put towards fielding stranding teams, the search for stranded animals was more intense than usual. Most specimens were considered in a moderate to advanced state of decomposition and cause of death could only be determined for five porpoises. The causes listed were blunt force trauma, a fibrinous peritonitis, salmonellosis, and pneumonia. There were no definitive signs of acoustic trauma in any of the porpoises (Norman et al., 2004).

It was also alleged that killer whales and a minke whale in the area were behaviorally affected by the SHOUP's use of MFAS (Normal et al., 2004). A group of marine mammal experts from the U.S. Navy's Marine Mammal Program at SPAWAR reviewed a video tape of killer whale behavior during the sonar activates. They concluded that the killer whales were displaying behaviors that were within normal range of behaviors. Other observers on scene also reported the killer whales were unaffected. Also complicating the observations is that there were approximately 7 boats engaged in whale-watching in close proximity to the killer whales (DON, 2003). Analysis of the sonar output and the location of the whales calculated that the received level of sonar sound for the killer whales at the closest approach to USS Shoup was 171 dB (DON, 2003).

Mixed Species Stranding Event, North Carolina, January 2005

Since 1992, 31 species of cetaceans have stranded in North Carolina (Hohn 2006) suggesting that currents, bathymetry, substrate or weather factors may have influence or contributed to strandings. On 15 and 16 January 2005, there was a live stranding of 3 species of cetaceans, including 33 short-finned pilot whales (*Globicephala macrorhynchus*), 1 minke whale (*Balaenoptera acutorostrata*) and 2 dwarf sperm whales (*Kogia sima*) occurred on the beaches of North Carolina during a significant storm event. None of the stranded animals survived. The Navy was conducting tactical mid-frequency sonar operations from vessels over small areas for short periods of time a very long distance from the stranding locations. No marine mammals were detected by marine mammal observers on board the Navy vessels (Hohn et al., 2005).

Necropsies were conducted within 1 to 2 days on 27 pilot whales, 2 dwarf sperm whales, the minke whale (Hohn, 2005). Samples were collected for standard clinical pathology, parasitology, histopathology, microbiology, and serology. Three of the pilot whales and one of the dwarf sperm whales had debilitating disease that may have caused their stranding, and the minke whale was a calf that was emaciated. It is possible that the pilot whales followed the sick whales in to shallow water where they stranded. Given the environmental conditions at the time of the stranding including high winds and rough seas associated with a significant storm event and a gently sloping beach that may compromise sonar use by cetaceans, those conditions may have caused or contributed to the stranding of the other pilot whales (Hohn, 2005). It is much more probable given the distance of sonar use from the stranding location and the weather conditions at the time of the stranding, that the use of sonar far to the north had nothing to do with this stranding event.

4.1.2.3.9 Other Effects Considered

Acoustically Mediated Bubble Growth

One suggested cause of injury to marine mammals is by rectified diffusion (Crum and Mao, 1996).The process of increasing the size of a bubble by exposing it to a sound field. This process is facilitated if the environment in which the ensonified bubbles exist is supersaturated with a gas, such as nitrogen which makes up approximately 78 percent of air (remainder of air is about 21 percent oxygen with some carbon dioxide). Repetitive diving by marine mammals can cause the blood and some tissues to accumulate gas to a greater degree than is supported by the surrounding environmental pressure (Ridgway and Howard, 1979). Deeper and longer dives of some marine mammals (for example, beaked whales) are theoretically predicted to induce greater super saturation (Houser et al., 2001). Conversely, studies have shown that marine mammal lung structure (both pinnipeds and cetaceans) facilitates collapse of the lungs at depths below approximately 162 ft (Kooyman, et al., 1970). Collapse of the lungs would force air in to the non-air exchanging areas of the lungs (into the bronchioles away from the alveoli) thus significantly decreasing nitrogen diffusion into the body. Deep diving pinnipeds such as the northern elephant (*Mirounga angustirostris*) and Weddell seals (*Leptonychotes weddellii*) typically exhale before long deep dives, further reducing air volume in the lungs (Kooyman, et al., 1970). If rectified diffusion were possible in marine mammals exposed to high-level sound, conditions of tissue supersaturation could theoretically speed the rate and increase the size of bubble growth. Subsequent effects due to tissue trauma and emboli would presumably mirror those observed in humans suffering from decompression sickness.

It is unlikely that the short duration of sonar pings would be long enough to drive bubble growth to any substantial size, if such a phenomenon occurs. However, an alternative but related hypothesis has also been suggested: stable bubbles could be destabilized by high-level sound exposures such that bubble growth then occurs through static diffusion of gas out of the tissues. In such a scenario the marine mammal would need to be in a gas-supersaturated state for a long enough period of time for bubbles to become of a problematic size.

Another hypothesis suggests that rapid ascent to the surface following exposure to a startling sound might produce tissue gas saturation sufficient for the evolution of nitrogen bubbles (Jepson et al., 2003). In this scenario, the rate of ascent would need to be sufficiently rapid to compromise behavioral or physiological protections against nitrogen bubble formation. Cox et al. (2006), with experts in the field of marine mammal behavior, diving, physiology, respiration physiology, pathology, anatomy, and bio-acoustics considered this to be a plausible hypothesis but requires further investigation. Conversely Fahlman et al. (2006) suggested that diving bradycardia (reduction in heart rate and circulation to the tissues), lung collapse and slow ascent rates would reduce nitrogen uptake and thus reduce the risk of decompression sickness by 50 percent in models of marine mammals. Recent information on the diving profiles of

Cuvier's (*Ziphius cavirostris*) and Blaineville's (*Mesoplodon densirostris*) beaked whales in Hawaii (Baird et al., 2006) and in the Ligurian Sea in Italy (Tyack et al., 2006) showed that while these species do dive deeply (regularly exceed depths of 437 fathoms) and for long periods (48-68 minutes), they have significantly slower ascent rates than descent rates. This fits well with Fahlman et al. (2006) model of deep and long duration divers that would have slower ascent rates to reduce nitrogen saturation and reduce the risk of decompression sickness. Therefore, if nitrogen saturation remains low, then a rapid ascent in response to sonar should not cause decompression sickness. Currently it is not known if beaked whales do rapidly ascend in response to sonar or other disturbances. It may be that deep diving animals would be better protected diving to depth to avoid predators, such as killer whales, rather than ascending to the surface where they may be more susceptible to predators.

Although theoretical predictions suggest the possibility for acoustically mediated bubble growth, there is considerable disagreement among scientists as to its likelihood (Piantadosi and Thalmann, 2004; Evans and Miller, 2003). To date, ELs predicted to cause in vivo bubble formation within diving cetaceans have not been evaluated (National Oceanic and Atmospheric Administration, 2002b). Further, although it has been argued that traumas from recent beaked whale strandings are consistent with gas emboli and bubble-induced tissue separations (Jepson et al., 2003), there is no conclusive evidence of this and complicating factors associated with introduction of gas into the venous system during necropsy. Because evidence supporting it is debatable, no marine mammals addressed in this EIS/OEIS are given special treatment due to the possibility for acoustically mediated bubble growth. Beaked whales are, however, assessed differently from other species to account for factors that may have contributed to prior beaked whale strandings as set out in the previous section.

Resonance

Another suggested cause of injury in marine mammals is air cavity resonance due to sonar exposure. Resonance is a phenomenon that exists when an object is vibrated at a frequency near its natural frequency of vibration—the particular frequency at which the object vibrates most readily. The size and geometry of an air cavity determine the frequency at which the cavity will resonate. Displacement of the cavity boundaries during resonance has been suggested as a cause of injury. Large displacements have the potential to tear tissues that surround the air space (for example, lung tissue).

Understanding resonant frequencies and the susceptibility of marine mammal air cavities to resonance is important in determining whether certain sonars have the potential to affect different cavities in different species. In 2002, NMFS convened a panel of government and private scientists to address this issue (National Oceanic and Atmospheric Administration, 2002b). They modeled and evaluated the likelihood that Navy mid-frequency active sonar caused resonance effects in beaked whales that eventually led to their stranding (U.S. Department of Commerce and U.S. Department of the Navy, 2001). The conclusions of that group were that resonance in air-filled structures. The frequencies at which resonance was predicted to occur were below the frequencies utilized by the sonar systems employed. Furthermore, air cavity vibrations due to the resonance effect were not considered to be of sufficient amplitude to cause tissue damage. This EIS/OEIS assumes that similar phenomenon would not be problematic in other cetacean species.

Likelihood of Masking

Natural and artificial sounds can disrupt behavior by masking, or interfering with an animal's ability to hear other sounds. Masking occurs when the receipt of a sound is interfered with by a second sound at similar frequencies and at similar or higher levels. If the second sound were artificial, it could be potentially harassing if it disrupted hearing-related behavior such as communications or echolocation. It is important to distinguish TTS and PTS, which persist after the sound exposure, from masking, which occurs during the sound exposure.

Historically, principal masking concerns have been with prevailing background noise levels from natural and manmade sources (for example, Richardson et al., 1995). Dominant examples of the latter are the accumulated noise from merchant ships and noise of seismic surveys. Both cover a wide frequency band and are long in duration.

HRC ASW operations occur in areas that are away from harbors or heavily traveled shipping lanes. The loudest underwater sounds in the proposed operations area are those produced by sonars and other acoustic sources that are in the mid-frequency or higher range. The sonar signals are likely within the audible range of most cetaceans, but are very limited in the temporal, frequency, and spatial domains. In particular, the pulse lengths are short, the duty cycle low (number of pings per minute are low), the total number of hours of operation per year small, and the tactical sonars transmit within a narrow band of frequencies (typically less than one-third octave). Finally, high levels of sound are confined to a volume around the source and are constrained by propagation attenuation rates at mid- and high frequencies, and relative short pulse lengths.

For the reasons outlined above, the chance of sonar operations causing masking effects is considered negligible.

4.1.2.3.10 Marine Mammal Protective Measures Related To Acoustic Effects

Effective training in the HRC dictates that ship, submarine, and aircraft participants utilize their sensors and train with their weapons to their optimum capabilities as required by the mission. The Navy recognizes that such use has the potential to cause behavioral disruption of some marine mammal species in the vicinity of an operation. As part of their SOPs, the Navy has developed protective measures that would be implemented to protect marine mammals and Federally listed species during ASW operations. These protective measures include the establishment of a safety zone and procedures to power down or shut off sonar if animals are detected within the safety zone and are a part of the No-action Alternative. For detail list of protective measures see Chapter 6.0. While conducting ASW operations, Navy ships always have two, although usually more, personnel on watch serving as lookouts. In addition to the qualified lookouts, the bridge team is present at a minimum also includes an Officer of the Deck and one Junior Officer of the Deck include observing the waters in the vicinity of the ship. At night, personnel engaged in ASW events may also use night vision goggles and infra-red detectors, as appropriate, which can aid in the detection of marine mammals. Passive acoustic detection of vocalizing marine mammals is used to alert bridge lookouts to the potential presence of marine mammals in the vicinity.

Navy lookouts undergo extensive training to qualify as a watchstander. This training includes on-the-job instruction under the supervision of an experienced watchstander, followed by completion of the Personal Qualification Standard program. The Navy includes marine species awareness as part of its training for its bridge lookout personnel on ships and submarines as required training for Navy lookouts. This training addresses the lookout's role in environmental protection, laws governing the protection of marine species, Navy stewardship commitments, and general observation information to aid in avoiding interactions with marine species.

Operating procedures are implemented to maximize the ability of personnel to recognize instances when marine mammals are close aboard and avoid adverse effects. These procedures include measures such as decreasing the source level and then shutting down active tactical sonar operations when marine mammals are encountered in the vicinity of a training event. Although these protective measures are SOPs, their use is also reinforced through promulgation of an Environmental Annex to the Operational Order for an operation. Sonar operators on ships, submarines, and aircraft use both passive and active sonar detection indicators of marine mammals as a measure of estimating when marine mammals are close. When marine mammals are detected nearby, all ships, submarines, and aircraft engaged in ASW will reduce mid-frequency active sonar power levels in accordance with specific guidelines developed for each type of training event.

The Navy has coordinated with NMFS regarding the effectiveness of protective measures and the likelihood that the protective measures will reduce potential acoustic effects on marine mammals. NMFS has approved the protective measures detailed in Chapter 6.0.

Long-Term Effects

Navy Operations are conducted in the same general areas throughout the HRC, so marine mammal populations can be exposed to repeated operations over time. However, as described earlier, this HRC EIS/OEIS assumes that short-term non-injurious sound exposure levels predicted to cause TTS or temporary behavioral disruptions qualify as Level B harassment. Application of this criterion assumes an effect even though it is highly unlikely that all behavioral disruptions or instances of TTS will result in long term significant impacts. Add in species doing well. Resident populations of spinner dolphins, increasing humpbacks at PMRF. There will be long term monitoring program of the marine mammal populations within the HRC. This will also include monitoring of short term operations.

Likelihood of Prolonged Exposure

The proposed ASW operations in the HRC would not result in prolonged exposure because the vessels are constantly moving, and the flow of the activity in the HRC when ASW training occurs reduces the potential for prolonged exposure. The implementation of the protective measures described in Chapter 6.0 would further reduce the likelihood of any prolonged exposure.

4.1.2.4 NO-ACTION ALTERNATIVE

The discussion regarding potential impacts to fish (Section 4.1.2.1) and sea turtles (Section 4.1.2.2),as well as the discussion of non-acoustic impacts (Section 4.1.2.3.1) apply to the No-action Alternative.

4.1.2.4.1 Marine Mammal Modeling – No-action Alternative

Sonar Modeling

Modeling of the effects of mid frequency sonar and underwater detonations was conducted using methods described in brief below. A detailed description of the representative modeling areas, sound sources, model assumptions, acoustic and oceanographic parameters, underwater sound propagation and transmission models, and diving behavior of species modeled are presented in Appendix K.

The approach for estimating potential acoustic effects from HRC ASW training operations on cetacean species makes use of the methodology that was developed in cooperation with NOAA for the Navy's USWTR DEIS (2005), USWEX EA/OEA (U.S. Department of the Navy, 2005), RIMPAC EA/OEA (2006) and COMPTUEX/JTFEX EA/OEA (2007). The methodology is provided here to determine the number and species of marine mammals for which incidental take authorization is requested.

In order to estimate acoustic effects from the HRC ASW operations, acoustic sources to be used were examined with regard to their operational characteristics. Systems with acoustic source levels below 205 dB re 1 µPa @ 1 m were not included in the analysis given that at this source level (205 dB re 1 µPa @ 1 m) or below, a 1-second ping would attenuate below the sub-TTS behavioral disturbance threshold of 173 dB within a distance of about 1000 yards, which is the Navy's current sonar mitigation safety zone. As additional verification, sources at this level were examined typically using simple spreadsheet calculations to ensure that they did not need to be considered further. For example, a sonobuoy's typical use yielded an exposure area that produced 0 marine mammal exposures based on the maximum marine mammal density. Such a source was called non-problematic and was not modeled in the sense of running its parameters through the environmental model (CASS), generating an acoustic footprint, etc. The proposed counter measures source level was less than 205 dB but its operational modes were such that a simple "look" was not applicable, and a separate study was conducted to ensure it did not need to be considered further.

In addition, systems with an operating frequency greater than 100 kHz were not analyzed in the detailed modeling as these signals attenuate rapidly resulting in very short propagation distances. Acoustic countermeasures were previously examined and found not to be problematic. The AN/AQS 13 (dipping sonar) used by carrier-based helicopters was determined in the *Environmental Assessment/Overseas Environmental Assessment of the SH-60R Helicopter/ALFS Test Program*, October 1999 not to be problematic due to its limited use and very short pulse length (2-5 pulses of 3.5-700 millisecond). The Directional Command Activated Sonobuoy System (DICASS) sonobuoy was determined not to be problematic having a source level at 201 dB re 1 µPa @ 1m. These acoustic sources, therefore, did not require further examination in this analysis.

Based on the information above, only AN/SQS 53C hull-mounted mid-frequency active tactical sonar, Directional Command Activated Sonobuoy System (DICASS) sonobuoy, MK 48 torpedo, and AN/AQS 21 (dipping sonar) were determined to have the potential to affect marine mammals protected under the MMPA and ESA during HRC ASW training events.

Every active sonar operation includes the potential to harass marine animals in the neighboring waters. The number of animals exposed to potential harassment in any such action is dictated by the propagation field and the manner in which the sonar is operated (i.e., source level, depth, frequency, pulse length, directivity, platform speed, repetition rate). For the HRC, the sole relevant measure of potential harm to the marine wildlife due to sonar operation is the accumulated (summed over all source emissions) energy flux density received by the animal over the duration of the activity.

The modeling for surface ship active tactical sonar occurred in five broad steps, listed below. Results were calculated based on the typical ASW operations planned for the HRC. Acoustic propagation and mammal population data are analyzed for both the summer and winter timeframe. Marine mammal survey data for the offshore area beyond 25 nautical miles (nm) (Barlow, 2006) and survey data for nearshore areas within 25 nm (Mobley et al., 2000) provided marine mammal species density for modeling.

Step 1. Environmental Provinces. The HRC operating area is divided into six marine modeling areas, and each has a unique combination of environmental conditions. These are addressed by defining eight fundamental environments in two seasons that span the variety of depths, bottom types, sound speed profiles, and sediment thicknesses found in the HRC operating areas. Each marine modeling area can be quantitatively described as a unique combination of these environments.

Step 2. Transmission Loss. Since sound propagates differently in these eight environments, separate transmission loss calculations must be made for each, in both seasons. The transmission loss is predicted using CASS-GRAB sound modeling software.

Step 3. Exposure Volumes. The transmission loss, combined with the source characteristics, gives the energy field of a single ping. The energy of over 10 hours of pinging is summed, carefully accounting for overlap of several pings, so an accurate average exposure of an hour of pinging is calculated for each depth increment. Repeating this calculation for each environment in each season gives the hourly ensonified volume, by depth, for each environment and season.

Step 4. Marine Mammal Densities. The marine mammal densities were given in two dimensions, but using sources such as the North Pacific Acoustic Laboratory EIS, the depth regimes of these marine mammals are used to project the two dimensional densities into three dimensions.

Step 5. Exposure Calculations. Each marine mammal's three dimensional density is multiplied by the calculated impact volume—to that marine mammal depth regime. This is the number of exposures per hour for that particular marine mammal. In this way, each marine mammal's exposure count per hour is based on its density, depth habitat, and the ensonified volume by depth.

The movement of various units during an ASW event is largely unconstrained and dependent on the developing tactical situation presented to the commander of the forces. The planned sonar hours, by ASW operation type, are given in the discussion for each type of operation for each alternative. The product of the hours of sonar and the hourly exposure count from the model provides the total exposures.

The modeling input includes a total of 3,134 hours of AN/AQS 53C mid-frequency active tactical sonar and the associated DICASS sonobuoy, MK 48 torpedo, and dipping sonar modeling inputs. These exposure numbers are generated by the model without consideration of protective measures that would reduce the potential for marine mammal exposures to sonar. Table 4.1.2.4.1-1 provides a summary of the total sonar exposures from all No-action Alternative ASW operations that would be conducted over the course of a year.

Table 4.1.2.4.1-1. No-action Alternative Sonar Modeling Summary - Yearly Marine Mammal Exposures From all ASW (TRACKEX, TORPEX, RIMPAC, USWEX)

Marine Mammals	Dose Response Behavioral	173 dB NMFS Behavioral	190 dB Navy Behavioral	195 dB TTS	215 dB PTS
Bryde's whale	150	313	12	2	0
Fin whale[1, 2]	47	402	17	3	0
Sei Whale[1, 2]	82	402	17	3	0
Humpback_whale[1]	16,000	38,729	2,144	232	0
Sperm whale[1]	2,229	4,888	131	21	0
Dwarf sperm whale	1,424	11,977	513	81	0
Pygmy sperm whale	582	4,892	209	33	0
Cuvier's beaked whale	903	4,791	119	12	0
Longman's beaked whale	99	644	21	4	0
Blainville's beaked whale	337	2,024	87	14	0
Unidentified beaked whale	29	155	4	0	0
Bottlenose dolphin	784	6,038	269	41	0
False killer whale	47	402	17	3	0
Killer whale	47	402	17	3	0
Pygmy killer whale	187	1,607	67	12	0
Shortfinned pilot whale	1,781	14,332	695	96	0
Risso's dolphin	495	3,981	193	27	0
Melonheaded whale	594	4,777	232	32	0
Roughtoothed dolphin	749	5,946	267	42	0
Fraser's dolphin	865	7,042	293	49	0

Table 4.1.2.4.1-1. No-action Alternative Sonar Modeling Summary - Yearly Marine Mammal Exposures From all ASW (TRACKEX, TORPEX, RIMPAC, USWEX) (Continued)

Marine Mammals	Dose Response Behavioral	173 dB NMFS Behavioral	190 dB Navy Behavioral	195 dB TTS	215 dB PTS
Pantropical spotted dolphin	2,463	18,476	838	120	0
Spinner dolphin	291	2,312	104	17	0
Striped dolphin	3,595	26,965	1,222	175	0
Monk seal[1]	2,691	7,013	326	54	0
TOTAL	36,471	168,511	7,811	1,075	0

Note: [1] Endangered Species
[2] Due to a lack of density data for fin and sei whales, false killer whale results were used
Dose Response Curve
173 dB - sub-TTS (NMFS) 173- 195 dB re 1 μPa^2
190 dB – sub-TTS (Navy) 190- 195 dB re 1 μPa^2
195 dB – TTS 195-215 dB re 1 μPa^2
215 dB- PTS > 215 dB re 1 μPa^2
dB = decibel
NMFS = National Marine Fisheries Service
TTS = temporary threshold shift
PTS = permanent threshold shift
μPa^2 squared micropascal-second

Explosive Source Modeling

Explosive Source Criteria

As described in Section 4.1.2.2 for sea turtles there are several criterions for mortality, injury and TTS. The criterion for mortality for marine mammals used in the *CHURCHILL Final EIS* is "onset of severe lung injury." This is conservative in that it corresponds to a 1 percent chance of mortal injury, and yet any animal experiencing onset severe lung injury is counted as a lethal exposure.

- The threshold is stated in terms of the Goertner (1982) modified positive impulse with value "indexed to 31 psi-ms.'" Since the Goertner approach depends on propagation, source/animal depths, and animal mass in a complex way, the actual impulse value corresponding to the 31-psi-ms index is a complicated calculation. Again, to be conservative, *CHURCHILL* used the mass of a calf dolphin (at 12.2 kg), so that the threshold index is 30.5 psi-ms.

Two criteria are used for injury: onset of slight lung hemorrhage and 50% eardrum rupture (tympanic membrane [TM] rupture). These criteria are considered indicative of the onset of injury.

- The threshold for onset of slight lung injury is calculated for a small animal (a dolphin calf weighing 27 lb), and is given in terms of the "Goertner modified positive impulse," indexed to 13 psi-ms in the (U.S. Department of the Navy, 2001a). This threshold is conservative since the positive impulse needed to cause injury is proportional to animal mass, and therefore, larger animals require a higher impulse to cause the onset of injury.

- The threshold for TM rupture corresponds to a 50 percent rate of rupture (i.e., 50 percent of animals exposed to the level are expected to suffer TM rupture); this is stated in terms of an EL value of 205 dB re 1 μPa^2-s. The criterion reflects the fact that TM rupture is not necessarily a serious or life-threatening injury, but is a useful index of possible injury that is well correlated with measures of permanent hearing impairment (e.g., Ketten, 1998 indicates a 30 percent incidence of permanent threshold shift [PTS] at the same threshold).

Two criteria are considered for non-injurious harassment temporary threshold shift (TTS), which is a temporary, recoverable, loss of hearing sensitivity (National Marine Fisheries Service, 2001; U.S. Department of the Navy, 2001a).

- The first criterion for TTS is 182 dB re 1 μPa^2-s maximum EL level in any 1/3-octave band at frequencies >100 hertz (Hz) for sea turtles.
- The second criterion for estimating TTS threshold is 12 psi peak pressure. The appropriate application of this second TTS criterion is currently under debate, as this 12-psi criterion was originally established for estimating the impact of a 10,000-lb explosive to be employed for the Navy's shock trial. It was introduced to provide a more conservative safety zone for TTS when the explosive or the animal approaches the sea surface (for which case the explosive energy is reduced but the peak pressure is not).

Explosive Source and Live Fire Procedures

As part of the required clearance before an underwater detonation or live fire exercise, the target area must be inspected visually (from vessels and available aircraft) and determined to be clear. The required clearance zone at the target areas, and operations within controlled ranges, minimizes the risk to marine mammals. Open ocean clearance procedures are the same for live or inert ordnance. Whenever ships and aircraft use the ranges for missile and gunnery practice, the weapons are used under controlled circumstances involving clearance procedures to ensure cetaceans, pinnipeds, or sea turtles are not present in the target area. These involve, at a minimum, a detailed visual search of the target area by aircraft reconnaissance, range safety boats, and range controllers and passive acoustic monitoring.

Ordnance cannot be released until the target area is determined clear. Operations are immediately halted if cetaceans, pinnipeds, or sea turtles are observed within the target area. Operations are delayed until the animal clears the target area. All observers are in continuous communication in order to have the capability to immediately stop the operations. The operation can be modified as necessary to obtain a clear target area. If the area cannot be cleared, it is canceled. All of these factors serve to avoid the risk of harming cetaceans, pinnipeds, or sea turtles. Most underwater detonations take place in sandy areas that are generally not used by marine mammals. All of these factors serve to avoid the risk of harming cetaceans, pinnipeds, or sea turtles. Post event monitoring of underwater detonations have not observed any mortality.

The weapons used in most missile and live fire exercises pose little risk to marine mammals unless they were to be near the surface at the point of impact. Machine guns (50 caliber), 5 in guns, 76mm guns, and close-in weapons systems (anti missile systems) exclusively fire non-explosive ammunition. The same applies to larger weapons firing inert ordnance for training operations. The rounds pose an extremely low risk of a direct hit and potential to directly affect a marine species. Target area clearance procedures would again reduce this risk. A SINKEX uses a variety of live fire weapons. These rounds pose a risk only at the point of impact. Target area clearance procedures would again reduce this risk. Modeling results of the potential exposures of marine mammals to underwater noise from a SINKEX is included in the summary presented in Table 4.1.2.4.1-2.

The Navy has developed a mitigation plan to maximize the probability of sighting any ships or protected species in the vicinity of an operation. In order to minimize the likelihood of taking any threatened or endangered species that may be in the area, the following monitoring plan would be adhered to:

- All weapons firing would be conducted during the period 1 hour after official sunrise to 30 minutes before official sunset.
- Extensive range clearance operations would be conducted in the hours prior to commencement of the operation, ensuring that no shipping is located within the hazard range of the longest-range weapon being fired for that event.
- An exclusion zone with a radius of 1.0 nm would be established around each target. This exclusion zone is based on calculations using a 990 lb H6 net explosive weight high explosive source detonated 5 feet below the surface of the water, which yields a distance of 0.85 nm (cold season) and 0.89 nm (warm season) beyond which the received level is below the 182 dB re: 1 μPa^2-s threshold established for the WINSTON S. CHURCHILL (DDG 81) shock trials. An additional buffer of 0.5 nm would be added to account for errors, target drift, and animal movements. Additionally, a safety zone, which extends from the exclusion zone at 1.0 nm out an additional 0.5 nm, would be surveyed. Together, the zones extend out 2 nm from the target.

A series of surveillance over-flights would be conducted within the exclusion and the safety zones, prior to and during the operation, when feasible. Survey protocol would be as follows:

- All visual surveillance operations would be conducted by Navy personnel trained in visual surveillance. In addition to the over flights, the exclusion zone would be monitored by passive acoustic means, when assets are available.
- If a protected species observed within the exclusion zone is diving, firing would be delayed until the animal is re-sighted outside the exclusion zone, or 30 minutes has elapsed. After 30 minutes, if the animal has not been re-sighted it would be assumed to have left the exclusion zone. This is based on a typical dive time of 30 minutes for traveling listed species of concern. The OCE would determine if the listed species is in danger of being adversely affected by commencement of the operation.

Table 4.1.2.4.1-2. No-action Alternative Explosives Modeling Summary - Yearly Marine Mammal Exposures From all Explosive Sources

Marine Mammal Species	TTS Modeled at < 182 dB re 1 μPa^2–s or 23 psi							Total Exposures		
	Mine Neutralization	Air to Surface Missile Exercise	Surface to Surface Missile Exercise	Bombing Exercise	Sinking Exercise	Surface to surface Gunnery Exercise	Naval Surface Fire Support	TTS 182 dB, 23 psi	Slight Lung/ TM Injury	Onset Massive Lung Injury
Bryde's whale	0	0	0	0	0	0	0	0	0	0
Fin_whale[1, 2]	0	0	0	0	0	0	0	0	0	0
Sei whale	0	0	0	0	0	0	0	0	0	0
Humpback_whale[1]	1	0	0	6	0	0	0	7	1	0
Sperm_whale[1]	0	0	0	2	3	0	0	5	0	0
Dwarf sperm whale	0	0	0	3	4	0	0	7	0	0
Pygmy sperm whale	0	0	0	1	2	0	0	3	0	0
Cuvier's beaked whale	0	0	0	5	5	0	0	10	0	0
Longman's beaked whale	0	0	0	0	0	0	0	0	0	0
Blainville's beaked whale	0	0	0	1	1	0	0	2	0	0
Unidentified beaked whale	0	0	0	0	0	0	0	0	0	0
Bottlenose dolphin	0	0	0	0	0	0	0	0	0	0
False killer whale	0	0	0	0	0	0	0	0	0	0
Killer whale	0	0	0	0	0	0	0	0	0	0
Pygmy killer whale	0	0	0	0	0	0	0	0	0	0
Shortfinned pilot whale	0	0	0	1	1	0	0	2	0	0
Risso's dolphin	0	0	0	0	0	0	0	0	0	0
Melonheaded whale	0	0	0	0	0	0	0	0	0	0
Roughtoothed dolphin	0	0	0	2	1	0	0	3	0	0
Fraser's dolphin	0	0	0	2	2	0	0	4	0	0
Pantropical spotted dolphin	0	0	0	1	0	0	0	1	0	0
Spinner dolphin	0	0	0	1	1	0	0	2	0	0
Striped dolphin	0	0	0	1	1	1	0	3	0	0
Monk seal[1]	0	0	0	1	1	0	0	2	0	0
Total	1	0	0	27	22	1	0	51	1	0

Note:
[1] Endangered Species
2 Due to a lack of density data for fin and sei whales, false killer whale results were used
dB = decibel
NMFS = National Marine Fisheries Service
TTS = temporary threshold shift
PTS = permanent threshold shift
μPa^2 = squared micropascal-second

There is a long lead time for set up and clearance of the impact area before any event using explosives takes place (may be one to several hours). There will, therefore, be a long period of area monitoring before any detonation or live-fire event begins. Ordinance cannot be released until the target area is determined clear. Operations are immediately halted if marine mammals are observed within the target area. Operations are delayed until the animal clears the target area.

Modeling results for explosives demolition, gunnery exercises, missile exercises, and SINKEX, without consideration of protective measures, resulted in the exposures summarized in Table 4.1.2.4.1-2. Target area clearance procedures would again reduce to a level that potential impacts to marine species are highly unlikely. Post event monitoring of live fire events (to assess the accuracy) have not observed any mortality.

4.1.2.4.2 Estimated Effects on ESA Listed Species - No-action Alternative

The endangered species that may be affected as a result of implementation of the HRC No-action Alternative operations include the blue whale (*Balaenoptera musculus*), fin whale (*Balaenoptera physalus*), Hawaiian monk seal (*Monachus schauinslandi*) humpback whale (*Megaptera novaeangliae*), north Pacific right whale (*Eubalaena japonica*), sei whale (*Balaenoptera borealis*) and sperm whale (*Physeter macrocephalus*).

For the No-action Alternative, modeling results predict that if there were no protective measures in place exposures that that are temporary, non-injurious physiological effects (TTS) or behavioral effects would occur. The modeling predicts one exposure to energy in excess of 215 dB re 1 μPa^2-s, which is the threshold indicative of onset PTS.

The following sections discuss the exposure of ESA listed species to sonar from all No-action ASW exercises per year. The exposure numbers are given without consideration of protective measures. However, protective measures that are implemented during the ASW exercises would reduce the potential for marine mammal exposures to sonar.

Blue Whale (*Balaenoptera musculus*)

There is no density information available for blue whales in Hawaiian waters given they have not been seen during any surveys. Given they are so few in number, it is unlikely that HRC mid-frequency active sonar training events will result in the exposure of any blue whales to accumulated acoustic energy in excess of any energy flux threshold or a SPL in excess of 145 dB. No blue whales would be exposed to impulsive noise or pressures from underwater detonations that would cause TTS or physical injury.

Given the large size (up to 98 ft) of individual blue whales (Leatherwood et al., 1982), pronounced vertical blow, and aggregation of approximately two to three animals in a group (probability of track line detection = 0.90; Barlow, 2003), it is likely that lookouts will detect a group of blue whales at the surface. Additionally, protective measures call for continuous visual observation during operations with active sonar; therefore, blue whales that migrate into the operating area will be detected by visual observers. Implementation of protective measures and increased probability of detecting a large blue whale reduces the likelihood of exposure and potential effects.

In the unlikely event that blue whales are exposed to mid-frequency sonar, the anatomical information available on blue whales suggests that they are not likely to hear mid-frequency (1 kHz–10 kHz) sounds (Ketten, 1997). There are no audiograms of baleen whales, but blue whales tend to react to anthropogenic sound below 1 kHz (e.g., seismic air guns), and most of their vocalizations are also in that range, suggesting that they are more sensitive to low frequency sounds (Richardson et al., 1995; Croll, 2002). Based on this information, if they do not hear these sounds, they are not likely to respond physiologically or behaviorally to those received levels.

Based on the model results, behavioral patterns, acoustic abilities of blue whales, results of past training operations, and the implementation of protective measures, the Navy finds that the HRC training events will not likely result in any death or injury to blue whales.

Fin Whale (*Balaenoptera physalus*)

There is no density information for fin whales in the Hawaiian Islands (Barlow 2006). For purposes of acoustic effects analysis, it was assumed that the number and density of fin whales did not exceed that of false killer whales and the modeled number of exposures for both species would therefore be the same.

Based on this assumption, the previous EFD modeling results in 402 exposures annually to accumulated acoustic energy between 173 dB and 195 dB re 1 μPa^2-s the sub-TTS behavioral threshold range. Using the new DR methodology to replace the EFD modeling methodology and sub-TTS behavioral threshold, 47 exposures exceed the SPL dose response curve as potentially resulting in behavioral harassment.

Modeling also indicates, there would be 3 exposures to accumulated acoustic energy between 195 dB and 215 dB re 1 μPa^2-s, which is the threshold established indicative of onset TTS. Modeling indicates no exposures for fin whales to accumulated acoustic energy above 215 dB re 1 μPa^2-s, which is the threshold indicative of onset PTS. No fin whales would be exposed to impulsive noise or pressures from underwater detonations that would cause TTS or physical injury (Table 4.1.2.4.1-2).

Given the large size (up to 78 ft) of individual fin whales (Leatherwood et al., 1982), pronounced vertical blow, and mean aggregation of three animals in a group (probability of trackline detection = 0.90; Barlow, 2003), it is likely that lookouts will detect a group of fin whales at the surface. Additionally, protective measures call for continuous visual observation during operations with active sonar. Therefore, fin whales in the vicinity of operations will be detected by visual observers. Implementation of protective measures and probability of detecting a large fin whale reduces the likelihood of exposure and potential effects.

In the unlikely event that fin whales are exposed to mid-frequency sonar, the anatomical information available on fin whales suggests that they are not likely to hear mid-frequency (1 kHz–10 kHz) sounds (Richardson et al., 1995; Ketten, 1997). Fin whales primarily produce low frequency calls (below 1 kHz) with source levels up to 186 dB re 1µPa at 1 m, although it is possible they produce some sounds in the range of 1.5 to 28 kHz (review by Richardson et al., 1995; Croll et al., 2002). There are no audiograms of baleen whales, but they tend to react to anthropogenic sound below 1 kHz, suggesting that they are more sensitive to low frequency sounds (Richardson et al., 1995). Based on this information, if they do not hear these sounds, they are not likely to respond physiologically or behaviorally to those received levels.

In the St. Lawrence estuary area, fin whales avoided vessels with small changes in travel direction, speed and dive duration, and slow approaches by boats usually caused little response (MacFarlane, 1981). Fin whales continued to vocalize in the presence of boat noise (Edds and MacFarlane, 1987). Even though any undetected fin whales transiting the HRC may exhibit a reaction when initially exposed to active acoustic energy, field observations indicate the effects would not cause disruption of natural behavioral patterns to a point where such behavioral patterns would be abandoned or significantly altered.

Based on the model results, behavioral patterns, acoustic abilities of fin whales, results of past HRC training, and the implementation of protective measures, the Navy finds that the HRC training events will likely not result in any death or injury to fin whales. The proposed ASW exercises may affect fin whales.

Humpback Whale (*Megaptera novaeangliae*)

The acoustic effects analysis predicts that that without consideration of mitigation, mid-frequency active sonar training events will result in 38,729 annual exposures to humpback whales to an accumulated acoustic energy between 173 dB and 195 dB re 1 µPa^2-s, the sub-TTS behavioral threshold range. Using the new DR methodology to replace the EFD modeling methodology and the sub-TTS behavioral threshold, 16,036 exposures exceed the SPL dose response curve as potentially resulting in behavioral harassment.

Modeling indicates there would be 232 exposures to accumulated acoustic energy between of 195 dB and 215 dB re 1 µPa^2-s, which is the threshold established indicative of onset TTS. Modeling indicates there would be no exposures for humpback whales to accumulated acoustic energy above 215 dB re 1 µPa^2-s, which is the threshold indicative of onset PTS.

Without consideration of clearance procedures, there would be seven exposures from impulsive noise or pressures from underwater detonations that would exceed the TTS threshold, one exposure that would exceed the slight injury threshold and no exposures that would exceed the massive lung injury threshold (Table 4.1.2.4.1-2). Target area clearance procedures described in Section 4.1.2.4.1 would make sure there are no humpback whales within the safety zone, and therefore potential exposure of humpback whales to noise levels that exceed TTS or injury levels are highly unlikely.

Given the large size (up to 53 ft) of individual humpback whales (Leatherwood et al., 1982), and pronounced vertical blow, it is very likely that lookouts would detect humpback whales at the surface. Additionally, protective measures call for continuous visual observation during operations with active sonar, therefore, humpback whales that are present in the vicinity of ASW operations would be detected by visual observers reducing the likelihood of exposure, such that effects would be discountable.

There are no audiograms of baleen whales, but they tend to react to anthropogenic sound below 1 kHz, suggesting that they are more sensitive to low frequency sounds (Richardson et al., 1995). Based on this information, if they do not hear these sounds, they are not likely to respond physiologically or behaviorally to those received levels, such that effects would be insignificant. A single study suggested that humpback whales responded to mid frequency sonar (3.1-3.6 kHz re 1 μPa^2-s) sound (Maybaum, 1989). The hand held sonar system had a noise artifact below 1000 Hz which caused a response to the control playback (a blank tape) and may have affected the response to sonar (i.e., the humpback whale responded to the low frequency artifact rather than the mid-frequency sonar sound).

Based on the model results, behavioral patterns, acoustic abilities of humpback whales, results of past training, and the implementation of procedure protective measures, the Navy finds that the HRC training events would not likely result in any death or injury to humpback whales. The proposed ASW exercises may affect humpback whales.

There are no audiograms of baleen whales, but they tend to react to anthropogenic sound below 1 kHz, suggesting that they are more sensitive to low frequency sounds (Richardson et al., 1995). Based on this information, if they do not hear these sounds, they are not likely to respond physiologically or behaviorally to those received levels, such that effects would be insignificant. A single study suggested that humpback whales responded to mid frequency sonar (3.1-3.6 kHz re 1 μPa^2-s) sound (Maybaum, 1989). The hand held sonar system had a noise artifact below 1000 Hz which caused a response to the control playback (a blank tape) and may have affected the response to sonar (i.e., the humpback whale responded to the low frequency artifact rather than the mid frequency sonar sound).

While acoustic modeling results indicate mid-frequency active sonar may expose humpback whales to accumulated acoustic energy levels resulting in temporary behavioral effects, these exposures would have negligible impact on annual survival, recruitment, and birth rates. Protective measures presented in Chapter 6.0 would further reduce the potential acoustic exposure. The final determination of affect will be discussed through the ESA Section 7 process.

North Pacific Right Whale (*Eubalaena japonica*)

There is no density information available for North Pacific right whales in Hawaiian waters since they have not been seen during survey. Given they are so few in number, it is unlikely that HRC mid-frequency active sonar training events will result in the exposure of any right whales to accumulated acoustic energy in excess of any energy flux threshold or a SPL in excess of 145 dB. No right whales would be exposed to impulsive noise or pressures from underwater detonations that would cause TTS or physical injury. Given their large size (up to 56 ft) of individual north Pacific right whales (Leatherwood et al., 1982), surface behavior (e.g., breaching), pronounced blow, and mean group size of approximately three animals (probability of trackline detection = 0.90; Barlow 2003), it is likely that lookouts would detect a group of north Pacific right whales at the surface. Additionally, protective measures call for continuous visual observation during operations with active sonar. Therefore, large whales that are present in the operating area would be detected by visual observers. Implementation of protective measures and probability of detecting a large north Pacific right whale reduces the likelihood of exposure and potential effects.

In the unlikely event that north Pacific right whales are exposed to mid-frequency sonar, the information available on north Pacific right suggests that they may hear the lower range of mid-frequency (1 kHz–10 kHz) sounds (Richardson et al., 1995; Ketten, 1997). There are no audiograms for baleen whales but they are estimated to hear from 15 Hz to 20 kHz with good sensitivity from 20 Hz to 2 kHz (Ketten, 1998).

Active sonars may temporarily mask some sounds in the range of north Pacific right whale hearing and may also cause a temporary behavioral response (i.e., diving or swimming away from the sound source). Even though any undetected north Pacific right whales transiting HRC may exhibit a reaction when initially exposed to active acoustic energy, these observations indicate the effects will not cause disruption of natural behavioral patterns to a point where such behavioral patterns will be abandoned or significantly altered.

Based on the model results, behavioral patterns, acoustic abilities of north Pacific right whales, results of past training, and the implementation of protective measures, the Navy finds that the HRC training events would likely not result in any death or injury to north Pacific right whales.

Sei Whale (*Balaenoptera borealis*)

For purposes of the acoustic effects analysis, the same assumptions made previously regarding fin whales are also made for sei whales. It was therefore assumed that the number and density of sei whales did not exceed that of false killer whales and the modeled number of exposures for both species would therefore be the same.

Based on this assumption, the previous EFD modeling results in 402 exposures annually to accumulated acoustic energy between 173 dB and 195 dB re 1 μPa^2-s, the sub-TTS behavioral threshold range. Using the new DR methodology to replace the EFD modeling methodology and sub-TTS behavioral threshold, 47 exposures exceed the SPL dose response curve as potentially resulting in behavioral harassment.

Modeling also indicates, there would 3 exposures to accumulated acoustic energy between 195 dB and 215 dB re 1 μPa^2-s, which is the threshold established indicative of onset TTS. Modeling indicates no exposures for sei whales to accumulated acoustic energy above 215 dB re 1 μPa^2-s, which is the threshold indicative of onset PTS. No sei whales would be exposed to impulsive noise or pressures from underwater detonations that would cause TTS or physical injury (Table 4.1.2.4.1-2).

Given the large size (up to 53 ft) of individual sei whales (Leatherwood et al., 1982), pronounced vertical blow, and aggregation of approximately three animals (probability of trackline detection = 0.90; Barlow, 2003), it is likely that lookouts will detect a group of sei whales at the surface. Additionally, protective measures call for continuous visual observation during operations with active sonar. Therefore, sei whales that migrate into the operating area would be detected by visual observers. Implementation of protective measures and probability of detecting a large sei whale reduces the likelihood of exposure and potential effects.

There is little information on the acoustic abilities of sei whales or their response to human activities. The only recorded sounds of sei whales are frequency modulated sweeps in the range of 1.5 to 3.5 kHz (Thompson et al., 1979; Knowlton et al., 1991) but it is likely that they also vocalized at frequencies below 1 kHz as do fin whales. There are no audiograms of baleen whales, but they tend to react to anthropogenic noise below 1 kHz, suggesting that they are more sensitive to low frequency sounds (Richardson et al., 1995). Sei whales were more difficult to approach than were fin whales and moved away from boats but were less responsive when feeding (Gunther, 1949).

Based on the model results, behavioral patterns, acoustic abilities of sei whales, results of past training, and the implementation of protective measures, the Navy finds that the HRC training events would not likely result in any death or injury to sei whales. The proposed ASW exercises may affect sei whales.

Sperm Whales (*Physeter macrocephalus*)

The acoustic effects analysis predicts that HRC mid-frequency sonar training events will result in 4,888 exposures of sperm whales to accumulated acoustic energy between 173 dB and 195 dB re 1 µPa^2-s, the sub-TTS behavioral threshold range. Using the new DR methodology to replace the EFD modeling methodology and sub-TTS behavioral threshold, 684 exposures exceed the SPL dose response curve as potentially resulting in behavioral harassment.

Modeling indicates there would 21 exposures to accumulated acoustic energy between of 195 dB and 215 dB re 1 µPa^2-s, which is the threshold established indicative of onset TTS. Modeling indicates no exposures for sperm whales to accumulated acoustic energy above 215 dB re 1 µPa^2-s, which is the threshold indicative of onset PTS.

Without consideration of clearance procedures, there would be five exposures from impulsive noise or pressures from underwater detonations that would exceed the TTS threshold (Table 4.1.2.4.1-2). Target area clearance procedures described in Section 4.1.2.4.1 would make sure there are no sperm whales within the safety zone, and therefore potential exposure of sperm whales to noise levels that exceed TTS are highly unlikely.

Given the large size (up to 56 ft) of individual sperm whales (Leatherwood et al., 1982), pronounced blow (large and angled), mean group size of approximately seven animals (probability of trackline detection = 0.87; Barlow, 2003; 2006), it is likely that lookouts would detect a group of sperm whales at the surface. Additionally, protective measures call for continuous visual observation during operations with active sonar. Therefore, sperm whales that migrate into the operating area will be detected by visual observers. Implementation of protective measures and probability of detecting a large sperm whale reduces the likelihood of exposure and potential effects.

In the unlikely event that sperm whales are exposed to mid-frequency sonar, the information available on sperm whales exposed to received levels of active mid-frequency sonar suggests that the response to mid-frequency (1 kHz to 10 kHz) sounds is variable (Richardson et al., 1995). While Watkins et al. (1985) observed that sperm whales exposed to 3.25 kHz to 8.4 kHz pulses interrupted their activities and left the area, other studies indicate that, after an initial disturbance, the animals return to their previous activity. During playback experiments off the Canary Islands, André et al. (1997) reported that foraging whales exposed to a 10 kHz pulsed signal did not exhibit any general avoidance reactions. When resting at the surface in a compact group, sperm whales initially reacted strongly, then ignored the signal completely (André et al., 1997).

Based on the model results, behavioral patterns, acoustic abilities of sperm whales, results of past training, and the implementation of procedure protective measures, the Navy finds that the HRC training events would not result in any death or injury to sperm whales. The proposed ASW exercises may affect sperm whales.

Hawaiian Monk Seal (*Monachus schauinslandi*)

The acoustic effects analysis predicts that mid-frequency active sonar training events will result in 7,013 exposures to Hawaiian monk seals in accumulated acoustic energy between 173 dB and 195 dB re 1 μPa^2-s the sub-TTS behavioral threshold range. Using the new DR methodology to replace the EFD modeling methodology and sub-TTS behavioral threshold, 2,691 exposures exceed the SPL dose response curve as potentially resulting in behavioral harassment.

Modeling indicates there would 54 exposures to accumulated acoustic energy between of 195 dB and 215 dB re 1 μPa^2-s, which is the threshold established indicative of onset TTS. Modeling indicates there would be no exposures for monk seals to accumulated acoustic energy above 215 dB re 1 μPa^2-s, which is the threshold indicative of onset PTS.

Without consideration of clearance procedures, there would be two exposures from impulsive noise or pressures from underwater detonations that would exceed the TTS threshold and no exposures that would exceed the injury threshold (Table 4.1.2.4.1-2). Target area clearance procedures described in Section 4.1.2.4.1 would make sure there are no monk seals within the safety zone, and therefore potential exposure of monk seals to noise levels that exceed TTS is highly unlikely.

Additionally, protective measures call for continuous visual observation during operations with active sonar; therefore, Hawaiian monk seals that move into the operating area would be insignificant. Critical habitat was designated 1986 as the area extending out to the 10 fathom depth (60 ft) for the Northwest Hawaiian Islands (National Marine Fisheries Service, 1986). Critical habitat was extended out to the 20-fathom depth in 1988 (National Marine Fisheries Service, 1988).

Based on the model results, behavioral patterns, acoustic abilities of monk seals, results of past training, and the implementation of procedure protective measures, the Navy finds that the training events would not likely result in any death or injury to Hawaiian monk seals. The proposed ASW exercises may affect monk seals.

4.1.2.4.3 Summary of Compliance with MMPA and ESA - No-action Alternative

Endangered Species Act

Based on analytical modeling results, five endangered marine mammal species occurring within the operating area may be exposed to acoustic energy that could result in TTS or behavioral modification, including the fin whale, humpback whale, sei whale, sperm whale and Hawaiian monk seal. Modeling results also indicate a potential for PTS exposures (under the ESA level of >.05). However, even the sum of exposures at 215 dB from all operations over a year does not exceed 0.32 exposures for any ESA species. Implementation of protective measures would further reduce the potential for TTS and PTS exposures. Based on the analysis presented in the previous section the Navy concludes that HRC ASW operations may affect fin whale, humpback whale, sei whale, sperm whale and Hawaiian monk seal.

Two other listed cetaceans, the blue whale and north Pacific right whale may be found in the HRC. Due to the lack of density data for the blue whale and the North Pacific right whale, they were not included in the acoustic effects exposure model. Very few sightings have been recorded in the Hawaiian Islands, and they are not expected to be encountered during ASW operations. Therefore, there is a low probability of exposure to mid-frequency active tactical sonar. Available information on blue whale and North Pacific right whale vocalizations indicate a variety of low frequency sounds in the 10-300 Hz band for blue whales and low frequency sounds less than 400 Hz for North Pacific right whales. Because the mid-frequency active tactical sonar proposed for HRC ASW training is outside the frequency typically used by these whales, they are not likely to hear or have a physiological or behavioral response to the sonar (National Oceanic and Atmospheric Administration, 2006). HRC ASW operations would therefore result in no effect to blue whales and North Pacific right whales.

Protective measures would be implemented to prevent exposure of marine mammals to impulsive noise or sound pressures from underwater detonations that would cause injury.

Five species of sea turtles could potentially occur within the HRC. All are protected under the ESA. All available acoustic information suggests that sea turtles are likely not capable of hearing mid-frequency (2.6 kHz and 3.3 kHz) sounds in the range produced by the active tactical sonar. Protective measures would be implemented to prevent exposure of sea turtles to impulsive noise or sound pressures from underwater detonations that would cause injury.

In accordance with ESA requirements, the Navy will initiate informal Section 7 consultation with NMFS on the potential that HRC operations affect fin whales, Hawaiian monk seals, humpback whales, sei whales and sperm whales.

Marine Mammal Protection Act

Level A Harassment of Cetaceans

Modeling results for the sum of exposures for all ASW operations for a year indicate one humpback exposure that exceeds the Level A harassment threshold. However, given implementation of protective measures, it is unlikely that ASW operations would result in injury to marine mammals. Therefore, the Navy concludes that HRC operations would not result in Level A harassment of humpback whales. All predicted Level B exposure of beaked whales is treated as non-lethal Level A exposure per Section 4.1.2.3.2.5. However, given implementation of protective measures, it is unlikely that training operations would injure marine mammals. Therefore, the Navy concludes that HRC operations would not result in Level A harassment of beaked whales. In addition, the following considerations further reduce the potential for injury from tactical sonar and underwater explosions:

- Level A zone of influence radii for tactical sonar are so small that on-board observers would readily observe an approaching marine mammal.
- Species are large or travel in large pods and are easily visible from an elevated platform; a ship or aircraft would readily see a marine mammal in time to implement protective measures.

Level B Harassment of Cetaceans

As shown in Table 4.1.2.4.1-1, quantitative modeling results indicate potential for exposures at thresholds that equate to Level B harassment of cetaceans (TTS and sub-TTS behavioral). However, modeling assumptions are very conservative, and overestimate the number of level B exposures. Protective measures will be in place to further minimize the potential for temporary harassment, although there is currently no data to quantify the mitigation efforts to successfully reduce the number of marine mammal exposures. The Navy has begun development of a comprehensive Monitoring Plan to determine the effectiveness of these measures. Many species of small cetaceans travel in very large pods, and therefore would be easily observed from an elevated platform. In addition, large baleen whales travel slowly and are easily observed on the surface. In the years of conducting major operations in the HRC, there have been no documented incidences of harassments or beach strandings of marine mammals associated with active sonar or underwater explosives. In the one event associated with RIMPAC 2004, sonar was suggested to be a plausible contributing factor (Southall et al., 2006) although a similar event occurred on the same day in a bay at Rota Island, Northern Marianas Islands with no associated sonar (Jefferson et al., 2006) and may be related to oceanographic changes that influenced prey distribution (Southall 2006; Ketten 2006). The HRC open ocean waters continue to support diverse and stable populations of cetaceans.

4.1.2.4.4 HRC Training Operations

The HRC training operations involving sonar include ASW Tracking Exercise and ASW Torpedo Exercise as described in Tables 2.2.2.1-1 and 2.2.2.3-1, and Appendix D. The No-action Alternative modeling included 1,440 hours of 53C surface ship sonar and associated sonobuoys per year. The modeled exposures for marine mammals during TRACKEX and TORPEX training operations, without consideration of protective measures are presented in Tables 4.1.2.4.4-1 and 4.1.2.4.4-2. Effects on marine mammals from these exposures are included in the discussion in Sections 4.1.2.4.1 and 4.1.2.4.2. Exposures from underwater detonations (i.e., SINKEX), air to surface missile exercise, surface to surface missile exercise, bombing exercise, surface to surface gunnery exercise and naval surface fire support are included in the summary numbers in Table 4.1.2.4.1-2.

Table 4.1.2.4.4-1. No-action Alternative Sonar Modeling Summary - Yearly Marine Mammal Exposures from Tracking Exercises

Marine Mammals	Dose Response Behavioral	173 dB NMFS Behavioral	190 dB Navy Behavioral	195 dB TTS	215 dB PTS
Bryde's whale	69	149	6	1	0
Fin whale[1, 2]	22	191	8	1	0
Sei Whale[1, 2]	22	191	8	1	0
Humpback_whale[1]	6,742	16,492	880	98	0
Sperm whale[1]	313	2,263	65	9	0
Dwarf sperm whale	670	5,747	252	36	0
Pygmy sperm whale	274	2,348	103	15	0
Cuvier's beaked whale	407	2,229	55	5	0
Longman's beaked whale	46	305	11	2	0
Blainville's beaked whale	156	971	43	6	0
Unidentified beaked whale	13	72	2	0	0
Bottlenose dolphin	363	2,854	137	19	0
False killer whale	22	191	8	1	0
Killer whale	22	191	8	1	0
Pygmy killer whale	88	764	34	5	0
Shortfinned pilot whale	830	6,778	355	43	0
Risso's dolphin	230	1,883	99	12	0
Melonheaded whale	277	2,259	118	14	0
Roughtoothed dolphin	352	2,865	131	19	0
Fraser's dolphin	407	3,389	145	22	0
Pantropical spotted dolphin	1,137	8,694	429	54	0
Spinner dolphin	137	1,114	51	7	0
Striped dolphin	1,659	12,689	626	79	0
Monk seal[1]	1,255	3,342	161	25	0
TOTAL	15,510	77,590	3717	475	0

Note: [1] Endangered Species
[2] Due to a lack of density data for fin and sei whales, false killer whale results were used
Dose Response Curve
173 dB - sub-TTS (NMFS) 173- 195 dB re 1 μPa^2-s
190 dB – sub-TTS (Navy) 190- 195 dB re 1 μPa^2-s
195 dB – TTS 195-215 dB re 1 μPa^2-s
215 dB- PTS > 215 dB re 1 μPa^2-s
dB = decibel
NMFS = National Marine Fisheries Service
TTS = temporary threshold shift
PTS = permanent threshold shift
1 μPa^2-s = squared micropascal-second

Table 4.1.2.4.4-2. No-action Alternative Sonar Modeling Summary - Yearly Marine Mammal Exposures from Torpedo Exercises

Marine Mammals	Dose Response Behavioral	173 dB NMFS Behavioral	190 dB Navy Behavioral	195 dB TTS	215 dB PTS
Bryde's whale	15	35	1	0	0
Fin whale[1, 2]	6	47	2	0	0
Sei Whale[1, 2]	6	47	2	0	0
Humpback_whale[1]	2,161	4,991	246	41	0
Sperm whale[1]	78	596	16	2	0
Dwarf sperm whale	166	1,355	65	9	0
Pygmy sperm whale	68	554	27	4	0
Cuvier's beaked whale	83	553	14	1	0
Longman's beaked whale	10	74	3	0	0
Blainville's beaked whale	35	229	11	2	0
Unidentified beaked whale	3	18	0	0	0
Bottlenose dolphin	91	744	36	5	0
False killer whale	6	47	2	0	0
Killer whale	6	47	2	0	0
Pygmy killer whale	22	190	9	1	0
Shortfinned pilot whale	214	1,781	94	11	0
Risso's dolphin	59	495	26	3	0
Melonheaded whale	71	594	31	4	0
Roughtoothed dolphin	87	676	34	5	0
Fraser's dolphin	100	802	37	6	0
Pantropical spotted dolphin	287	2,325	111	14	0
Spinner dolphin	34	263	13	2	0
Striped dolphin	419	3,393	162	20	0
Monk seal[1]	277	1,214	61	10	0
TOTAL	4,302	21,070	1,007	141	0

Note: [1] Endangered Species
[2] Due to a lack of density data for fin and sei whales, false killer whale results were used
Dose Response Curve
173 dB - sub-TTS (NMFS) 173- 195 dB re 1 μPa^2-s
190 dB – sub-TTS (Navy) 190- 195 dB re 1 μPa^2-s
195 dB – TTS 195-215 dB re 1 μPa^2-s
215 dB- PTS > 215 dB re 1 μPa^2-s
dB = decibel
NMFS = National Marine Fisheries Service
TTS = temporary threshold shift
PTS = permanent threshold shift
μPa^2-s = squared micropascal-second

4.1.2.4.5 HRC RDT&E Operations

Other sources such as unmanned aerial vehicles (UAVs), underwater communications, and electronic warfare systems that may be deployed in the ocean are beyond the frequency range or intensity level to affect marine animals. Other RDT&E operations identified as antisubmarine warfare do not include sonar or include very limited use of sonar and short durations (<1.5 hours). These operations would have minimal effects on fish, sea turtles, and marine mammals.

4.1.2.4.6 Major Exercises

RIMPAC

The operations and impacts to marine mammals from RIMPAC exercises have been summarized in the RIMPAC 2006 Supplement to the 2002 Rim of the Pacific (RIMPAC) Environmental Assessment (U.S. Department of the Navy, 2006). The No-action Alternative modeling included 532 hours of 53C surface ship sonar and associated dipping sonar, sonobuoys, and MK-48 torpedoes per RIMPAC (conducted every other year). The modeled exposures for marine mammals during RIMPAC, without consideration of protective measures are presented in Table 4.1.2.4.6-1. Effects on marine mammals from these exposures are included in the discussion in Sections 4.1.2.4.1 and 4.1.2.4.2. Exposures from underwater detonations (i.e., SINKEX), air to surface missile exercise, surface to surface missile exercise, bombing exercise, surface to surface gunnery exercise and naval surface fire support are included in the summary numbers in Table 4.1.2.4.6-2. Sections 4.1.2.1 and 4.1.2.2 discuss the potential effects on fish and sea turtles respectively.

USWEX

The operations and impacts to marine mammals from USWEX exercises have been summarized in the Undersea Warfare Exercise Programmatic Environmental Assessment (EA/OEA) (U.S. Department of the Navy, 2007). The No-action Alternative modeling included 806 hours of 53C surface ship sonar and associated dipping sonar and sonobuoys per year. The modeled exposures for marine mammals during up to 4 USWEX per year, without consideration of protective measures are presented in table 4.1.2.4.6-2. Effects on marine mammals from these exposures are included in the discussion in Sections 4.1.2.4.1 and 4.1.2.4.2. Exposures from underwater detonations (i.e., SINKEX), air to surface missile exercise, surface to surface missile exercise, bombing exercise, surface to surface gunnery exercise and naval surface fire support are included in the summary numbers in Table 4.1.2.4.6-2. Sections 4.1.2.1 and 4.1.2.2 discuss the potential effects on fish and sea turtles respectively.

Table 4.1.2.4.6-1. No-action Alternative Sonar Modeling Summary - Yearly Marine Mammal Exposures for RIMPAC (Conducted Every Other Year)

Marine Mammals	Dose Response Behavioral	173 dB NMFS Behavioral	190 dB Navy Behavioral	195 dB TTS	215 dB PTS
Bryde's whale	24	47	2	0	0
Fin whale[1, 2]	7	61	2	0	0
Sei Whale[1, 2]	7	61	2	0	0
Humpback_whale[1]	-	-	-	-	-
Sperm whale[1]	115	806	17	4	0
Dwarf sperm whale	218	1,747	71	14	0
Pygmy sperm whale	89	714	29	6	0
Cuvier's beaked whale	157	772	19	2	0
Longman's beaked whale	16	99	3	1	0
Blainville's beaked whale	54	295	12	2	0
Unidentified beaked whale	5	25	1	0	0
Bottlenose dolphin	128	948	34	7	0
False killer whale	7	61	2	0	0
Killer whale	7	61	2	0	0
Pygmy killer whale	30	246	9	2	0
Shortfinned pilot whale	289	2,254	87	16	0
Risso's dolphin	80	626	24	5	0
Melonheaded whale	96	751	29	5	0
Roughtoothed dolphin	115	854	37	7	0
Fraser's dolphin	133	1,019	40	9	0
Pantropical spotted dolphin	409	2,957	103	21	0
Spinner dolphin	45	332	15	3	0
Striped dolphin	596	4,316	150	30	0
Monk seal[1]	423	1,148	49	10	0
TOTAL	3,051	20,202	739	146	0

Note: [1] Endangered Species
[2] Due to a lack of density data for fin and sei whales, false killer whale results were used
Dose Response Curve
173 dB - sub-TTS (NMFS) 173- 195 dB re 1 μPa^2-s
190 dB – sub-TTS (Navy) 190- 195 dB re 1 μPa^2-s
195 dB – TTS 195-215 dB re 1 μPa^2-s
215 dB- PTS > 215 dB re 1 μPa^2-s
dB = decibel
NMFS = National Marine Fisheries Service
TTS = temporary threshold shift
PTS = permanent threshold shift
μPa^2-s = squared micropascal-second

Table 4.1.2.4.6-2. No-action Alternative Sonar Modeling Summary - Yearly Marine Mammal Exposures from USWEX

Marine Mammals	Dose Response Behavioral	173 dB NMFS Behavioral	190 dB Navy Behavioral	195 dB TTS	215 dB PTS
Bryde's whale	42	82	3	1	0
Fin whale[1, 2]	12	101	4	1	0
Sei Whale[1, 2]	12	101	4	1	0
Humpback_whale[1]	7,098	16,724	1,015	92	0
Sperm whale[1]	178	1,218	33	6	0
Dwarf sperm whale	370	3,116	124	22	0
Pygmy sperm whale	151	1,273	51	9	0
Cuvier's beaked whale	256	1,235	31	3	0
Longman's beaked whale	27	167	5	1	0
Blainville's beaked whale	92	527	21	4	0
Unidentified beaked whale	8	40	1	0	0
Bottlenose dolphin	201	1,484	63	11	0
False killer whale	12	101	4	1	0
Killer whale	12	101	4	1	0
Pygmy killer whale	48	406	16	3	0
Shortfinned pilot whale	448	3,502	160	25	0
Risso's dolphin	124	973	44	7	0
Melonheaded whale	149	1,167	53	8	0
Roughtoothed dolphin	195	1,545	65	11	0
Fraser's dolphin	225	1,826	71	13	0
Pantropical spotted dolphin	631	4,476	194	31	0
Spinner dolphin	76	601	25	4	0
Striped dolphin	921	6,533	284	45	0
Monk seal[1]	736	1,298	54	10	0
TOTAL	12,023	48,597	2,328	309	0

Note: [1] Endangered Species
[2] Due to a lack of density data for fin and sei whales, false killer whale results were used
Dose Response Curve
173 dB - sub-TTS (NMFS) 173- 195 dB re 1 μPa^2-s
190 dB – sub-TTS (Navy) 190- 195 dB re 1 μPa^2-s
195 dB – TTS 195-215 dB re 1 μPa^2-s
215 dB- PTS > 215 dB re 1 μPa^2-s
dB = decibel
NMFS = National Marine Fisheries Service
TTS = temporary threshold shift
PTS = permanent threshold shift
μPa^2-s = squared micropascal-second

4.1.2.5 ALTERNATIVE 1

The discussion under the No-action Alternative regarding potential non-acoustic impacts (Section 4.1.2.4.1) and potential ASW Impacts (Section 4.1.2.4.2) also apply for Alternative 1.

4.1.2.5.1 Marine Mammal Modeling – Alternative 1

The increased operations under alternative 1 result in an increase in the number of hours of ASW training. The modeling input includes a total of 4,027 hours of AN/AQS 53C mid-frequency active tactical sonar and the associated DICASS sonobuoy, MK 48 torpedo, and dipping sonar modeling inputs. These exposure numbers are generated by the model without consideration of protective measures that would reduce the potential for marine mammal exposures to sonar. Table 4.1.2.5.1-1 provides a summary of the total sonar exposures from all Alternative 1 ASW exercises that would be conducted over the course of a year.

Table 4.1.2.5.1-1. Alternative 1 Sonar Modeling Summary - Yearly Marine Mammal Exposures From all ASW (TRACKEX, TORPEX, RIMPAC, USWEX)

Marine Mammals	Dose Response Behavioral	173 dB NMFS Behavioral	190 dB Navy Behavioral	195 dB TTS	215 dB PTS
Bryde's whale	198	413	15	2	0
Fin whale[1, 2]	61	516	22	4	0
Sei Whale[1, 2]	61	516	22	4	0
Humpback whale[1]	28,359	76,586	4,451	444	1
Sperm whale[1]	863	6,268	176	27	0
Dwarf sperm whale	1,871	15,855	675	105	0
Pygmy sperm whale	764	6,476	276	43	0
Cuvier's beaked whale	1,182	6,236	155	16	0
Longman's beaked whale	130	845	28	5	0
Blainville's beaked whale	444	2,680	114	18	0
Unidentified beaked whale	38	201	5	1	0
Bottlenose dolphin	1,015	7,791	357	53	0
False killer whale	61	524	22	4	0
Killer whale	61	524	22	4	0
Pygmy killer whale	243	2,096	88	15	0
Shortfinned pilot whale	2,301	18,472	922	123	0

Table 4.1.2.5.1-1 Alternative 1 Sonar Modeling Summary - Yearly Marine Mammal Exposures From all ASW (TRACKEX, TORPEX, RIMPAC, USWEX) (Continued)

Marine Mammals	Dose Response Behavioral	173 dB NMFS Behavioral	190 dB Navy Behavioral	195 dB TTS	215 dB PTS
Risso's dolphin	639	5,131	256	34	0
Melonheaded whale	767	6,157	307	41	0
Roughtoothed dolphin	984	7,884	351	55	0
Fraser's dolphin	1,136	9,326	387	63	0
Pantropical spotted dolphin	3,179	23,687	1,115	153	0
Spinner dolphin	383	3,066	136	21	0
Striped dolphin	4,639	34,570	1,628	224	0
Monk seal[1]	3,561	9,212	424	71	0
TOTAL	52,938	245,031	11,956	1,526	1

Note: [1] Endangered Species
[2] Due to a lack of density data for fin and sei whales, false killer whale results were used
Dose Response Curve
173 dB - sub-TTS (NMFS) 173- 195 dB re 1 μPa^2-s
190 dB – sub-TTS (Navy) 190- 195 dB re 1 μPa^2-s
195 dB – TTS 195-215 dB re 1 μPa^2-s
215 dB- PTS > 215 dB re 1 μPa^2-s
dB = decibel
μPa^2-s = squared micropascal-second
NMFS = National Marine Fisheries Service
TTS = temporary threshold shift
PTS = permanent threshold shift

Modeling results for Alternative 1 explosives demolition, gunnery exercises, missile exercises, and SINKEX, without consideration of protective measures, resulted in the exposures summarized in Table 4.1.2.5.1-2.

Table 4.1.2.5.1-2. Alternative 1 Explosives Modeling Summary - Yearly Marine Mammal Exposures From all Explosive Sources

Marine Mammal Species	TTS Modeled at < 182 dB re 1 μPa^2–s or 23 psi							Total Exposures		
	Mine Neutralization	Air to Surface Missile Exercise	Surface to Surface Missile Exercise	Bombing Exercise	Sinking Exercise	Surface to surface Gunnery Exercise	Naval Surface Fire Support	TTS 182 dB, 23 psi	Slight Lung/TM Injury	Onset Massive Lung Injury
Bryde's whale	0	0	0	0	0	0	0	0	0	0
Fin_whale[1, 2]	0	0	0	0	0	0	0	0	0	0
Sei whale	0	0	0	0	0	0	0	0	0	0
Humpback_whale[1]	1	0	0	6	0	0	0	7	1	0
Sperm_whale[1]	0	0	0	2	3	0	0	5	0	0
Dwarf sperm whale	0	0	0	3	4	1	0	8	0	0
Pygmy sperm whale	0	0	0	1	2	0	0	3	0	0
Cuvier's beaked whale	0	0	0	5	5	0	0	10	0	0
Longman's beaked whale	0	0	0	0	0	0	0	0	0	0
Blainville's beaked whale	0	0	0	1	1	0	0	2	0	0
Unidentified beaked whale	0	0	0	0	0	0	0	0	0	0
Bottlenose dolphin	0	0	0	0	0	0	0	0	0	0
False killer whale	0	0	0	0	0	0	0	0	0	0
Killer whale	0	0	0	0	0	0	0	0	0	0
Pygmy killer whale	0	0	0	0	0	0	0	0	0	0
Shortfinned pilot whale	0	0	0	1	1	0	0	2	0	0
Risso's dolphin	0	0	0	0	0	0	0	0	0	0
Melonheaded whale	0	0	0	0	0	0	0	0	0	0
Roughtoothed dolphin	0	0	0	2	1	0	0	3	0	0
Fraser's dolphin	0	0	0	2	2	0	0	4	0	0
Pantropical spotted dolphin	0	0	0	1	0	1	0	2	0	0
Spinner dolphin	0	0	0	1	1	0	0	2	0	0
Striped dolphin	0	0	0	1	1	1	0	3	0	0
Monk_seal[1]	0	0	0	1	1	0	0	2	0	0
Total	1	0	0	27	22	3	0	53	1	0

Note:
[1] Endangered Species
2 Due to a lack of density data for fin and sei whales, false killer whale results were used
dB = decibel
μPa^2-s = square micropascal-second

4.1.2.5.2 Estimated Effects on ESA Listed Species - Alternative 1

The endangered species that may be affected as a result of implementation of the HRC Alternative 1 operations include the blue whale (*Balaenoptera musculus*), fin whale (*Balaenoptera physalus*), Hawaiian monk seal (*Monachus schauinslandi*) humpback whale (*Megaptera novaeangliae*), north Pacific right whale (*Eubalaena japonica*), sei whale (*Balaenoptera borealis*) and sperm whale (*Physeter macrocephalus*).

For Alternative 1, modeling results predict that if there were no protective measures in place exposures that that are temporary, non-injurious physiological effects (TTS) or behavioral effects would occur. The modeling predicts one exposure to energy in excess of 215 dB re 1 μPa^2-s, which is the threshold indicative of onset PTS.

The following sections discuss the exposure of ESA listed species to sonar from all Alternative 1 ASW exercises per year. The exposure numbers are given without consideration of protective measures. However, protective measures that are implemented during the ASW exercises would reduce the potential for marine mammal exposures to sonar.

Blue Whale (*Balaenoptera musculus*)

There is no density information available for blue whales in Hawaiian waters given they have not been seen during survey. Given they are so few in number, it is unlikely that HRC mid-frequency active sonar training events will result in the exposure of any blue whales to accumulated acoustic energy in excess of any energy flux threshold or a SPL in excess of 145 dB. No blue whales would be exposed to impulsive noise or pressures from underwater detonations that would cause TTS or physical injury.

Based on the model results, behavioral patterns, acoustic abilities of blue whales, results of past training operations, and the implementation of protective measures, the Navy finds that the HRC training events would not likely result in any death or injury to blue whales.

Fin Whale (*Balaenoptera physalus*)

There is no density information for fin whales in the Hawaiian Islands (Barlow 2006). For purposes of acoustic effects analysis estimates, it was assumed that the number and density of fin whales did not exceed that of false killer whales and the modeled number of exposures for both species would therefore be the same.

Based on this assumption, the modeling results in 516 exposures annually to accumulated acoustic energy between 173 dB and 195 dB re 1 μPa^2-s, the sub-TTS behavioral threshold range. Using the new DR methodology to replace the EFD modeling methodology and sub-TTS behavioral threshold, 61 exposures exceed the SPL dose response curve as potentially resulting in behavioral harassment.

Modeling also indicates, there would be 4 exposures to accumulated acoustic energy between 195 dB and 215 dB re 1 μPa^2-s, which is the threshold established indicative of onset TTS. Modeling indicates no exposures for fin whales to accumulated acoustic energy above 215 dB re 1 μPa^2-s, which is the threshold indicative of onset PTS. No fin whales would be exposed to impulsive noise or pressures from underwater detonations that would cause TTS or physical injury (Table 4.1.2.5.1-2).

Based on the model results, behavioral patterns, acoustic abilities of fin whales, results of past HRC training, and the implementation of procedure protective measures, the Navy finds that the HRC training events would likely not result in any death or injury to fin whales. The proposed ASW exercises may affect fin whales.

Humpback Whale (*Megaptera novaeangliae*)

The acoustic effects analysis for Alternative 1 predicts that that without consideration of mitigation, mid-frequency active sonar training events will result in 76,586 annual exposures to humpback whales to an accumulated acoustic energy between 173 dB and 195 dB re 1 μPa^2-s, the sub-TTS behavioral threshold range. Using the new DR methodology to replace the EFD modeling methodology and the sub-TTS behavioral threshold, 28,359 exposures exceed the SPL dose response curve as potentially resulting in behavioral harassment.

Modeling indicates there would be 444 exposures to accumulated acoustic energy between of 195 dB and 215 dB re 1 μPa^2-s, which is the threshold established indicative of onset TTS. Modeling indicates one exposure for humpback whales to accumulated acoustic energy above 215 dB re 1 μPa^2-s, which is the threshold indicative of onset PTS.

Without consideration of clearance procedures, there would be seven exposures from impulsive noise or pressures from underwater detonations that would exceed the TTS threshold, one exposure that would exceed the injury threshold and no exposures that would exceed the massive injury threshold (Table 4.1.2.5.1-2). Target area clearance procedures described in Section 4.1.2.4.4.1 would make sure there are no humpback whales within the safety zone, and therefore potential exposure of humpback whales to noise levels that exceed TTS or injury levels are highly unlikely.

Based on the model results, behavioral patterns, acoustic abilities of humpback whales, results of past training, and the implementation of procedure protective measures, the Navy finds that the HRC training events would not likely result in any death or injury to humpback whales. The proposed ASW exercises may affect humpback whales.

North Pacific Right Whale (*Eubalaena japonica*)

There is no density information available for North Pacific right whales in Hawaiian waters given they have not been seen during survey. Given they are so few in number, it is unlikely that HRC mid-frequency active sonar training events will result in the exposure of any right whales to accumulated acoustic energy in excess of any energy flux threshold or a SPL in excess of 145 dB. No right whales would be exposed to impulsive noise or pressures from underwater detonations that would cause TTS or physical injury.

Based on the model results, behavioral patterns, acoustic abilities of north Pacific right whales, results of past training, and the implementation of procedure protective measures, the Navy finds that the HRC training events would not likely result in any death or injury to north Pacific right whales.

Sei Whale (*Balaenoptera borealis*)

For purposes of the acoustic effects analysis, the same assumptions made previously regarding fin whales are also made for sei whales. It was therefore assumed that the number and density of sei whales did not exceed that of false killer whales and the modeled number of exposures for both species would therefore be the same. Based on this assumption, the modeling predicts 516 exposures annually to accumulated acoustic energy between 173 dB and 195 dB re 1 μPa^2-s, the sub-TTS behavioral threshold range. Using the new DR methodology to replace the EFD modeling methodology and sub-TTS behavioral threshold, 61 exposures exceed the SPL dose response curve as potentially resulting in behavioral harassment.

Modeling also predicts 4 exposures to accumulated acoustic energy between 195 dB and 215 dB re 1 μPa^2-s, which is the threshold established indicative of onset TTS. Modeling predicts no exposures for sei whales to accumulated acoustic energy above 215 dB re 1 μPa^2-s, which is the threshold indicative of onset PTS. No sei whales would be exposed to impulsive noise or pressures from underwater detonations that would cause TTS or physical injury (Table 4.1.2.5.1-2).

Based on the model results, behavioral patterns, acoustic abilities of sei whales, results of past training, and the implementation of procedure protective measures, the Navy finds that the HRC training events would not likely result in any death or injury to sei whales. The proposed ASW exercises may affect sei whales.

Sperm Whales (*Physeter macrocephalus*)

The EFD modeling acoustic effects analysis predicts that HRC mid-frequency sonar training events will result in 6,268 exposures of sperm whales to accumulated acoustic energy between 173 dB and 195 dB re 1 μPa^2-s, the sub-TTS behavioral threshold range. Using the new DR methodology to replace the EFD modeling methodology and sub-TTS behavioral threshold, 863 exposures exceed the SPL dose response curve as potentially resulting in behavioral harassment.

Modeling predicts 27 exposures to accumulated acoustic energy between of 195 dB and 215 dB re 1 μPa^2-s, which is the threshold established indicative of onset TTS. Modeling predicts no exposures for sperm whales to accumulated acoustic energy above 215 dB re 1 μPa^2-s, which is the threshold indicative of onset PTS.

Without consideration of clearance procedures, there would be five exposures from impulsive noise or pressures from underwater detonations that would exceed the TTS threshold (Table 4.1.2.5.1-2). Target area clearance procedures described in Section 4.1.2.4.1 would make sure there are no sperm whales within the safety zone, and therefore potential exposure of sperm whales to noise levels that exceed TTS are highly unlikely.

Based on the model results, behavioral patterns, acoustic abilities of sperm whales, results of past training, and the implementation of procedure protective measures, the Navy finds that the HRC training events would not result in any death or injury to sperm whales. The proposed ASW exercises may affect sperm whales.

Hawaiian Monk Seal (*Monachus schauinslandi*)

The acoustic effects analysis predicts that mid-frequency active sonar training events will result in 9,212 annual exposures to Hawaiian monk seals in accumulated acoustic energy between 173 dB and 195 dB re 1 μPa^2-s the sub-TTS behavioral threshold range. Using the new DR methodology to replace the EFD modeling methodology and sub-TTS behavioral threshold, 3,561 exposures exceed the SPL dose response curve as potentially resulting in behavioral harassment.

Modeling predicts 71 exposures to accumulated acoustic energy between 195 dB and 215 dB re 1 µPa^2-s, which is the threshold established indicative of onset TTS. Modeling predicts there would be no exposures for monk seals to accumulated acoustic energy above 215 dB re 1 µPa^2-s, which is the threshold indicative of onset PTS.

Without consideration of clearance procedures, there would be two exposures from impulsive noise or pressures from underwater detonations that would exceed the TTS threshold and no exposures that exceed the injury threshold (Table 4.1.2.5.1-2). Target area clearance procedures described in Section 4.1.2.4.1 would make sure there are no monk seals within the safety zone, and therefore potential exposure of monk seals to noise levels that exceed TTS is highly unlikely.

Additionally, protective measures call for continuous visual observation during operations with active sonar, therefore, Hawaiian monk seals that move into the operating area would be insignificant. Critical habitat was designated 1986 as the area extending out to the 10 fathom depth (60 ft) for the Northwest Hawaiian Islands (National Marine Fisheries Service, 1986). Critical habitat was extended out to the 20-fathom depth in 1988 (National Marine Fisheries Service, 1988).

Based on the model results, behavioral patterns, acoustic abilities of monk seals, results of past training, and the implementation of procedure protective measures, the Navy finds that the training events would not likely result in any death or injury to Hawaiian monk seals. The proposed ASW exercises may affect monk seals.

4.1.2.5.3 Summary of Compliance with MMPA and ESA – Alternative 1

Endangered Species Act

Based on analytical modeling results, five endangered marine mammal species occurring within the operating area may be exposed to acoustic energy that could result in TTS or behavioral modification, including the fin whale, humpback whale, sei whale, sperm whale and Hawaiian monk seal. Modeling results also indicate a potential for PTS exposures (under the ESA level of >.05). However, even the sum of exposures at 215 dB from all operations over a year does not exceed 0.55 exposures for any ESA species. Implementation of protective measures would further reduce the potential for TTS and PTS exposures. Based on the analysis presented in the previous section the Navy concludes that HRC ASW exercises may affect fin whale, humpback whale, sei whale, sperm whale and Hawaiian monk seal.

As described in the No-action Alternative, Two other listed cetaceans, the blue whale and north Pacific right whale may be found in the HRC. Very few sightings have been recorded in the Hawaiian Islands, and they are not expected to be encountered during ASW exercises. Because the mid-frequency active tactical sonar proposed for HRC ASW training is outside the frequency typically used by these whales, they are not likely to hear or have a physiological or behavioral response to the sonar (National Oceanic and Atmospheric Administration, 2006). HRC ASW operations would therefore result in no effect to blue whales and North Pacific right whales.

Protective measures would be implemented to prevent exposure of marine mammals to impulsive noise or sound pressures from underwater detonations that would cause injury.

Five species of sea turtles could potentially occur within the HRC. All are protected under the ESA. All available acoustic information suggests that sea turtles are likely not capable of hearing mid-frequency (2.6 kHz and 3.3 kHz) sounds in the range produced by the active tactical sonar. Protective measures would be implemented to prevent exposure of sea turtles to impulsive noise or sound pressures from underwater detonations that would cause injury.

Marine Mammal Protection Act

Level A Harassment of Cetaceans

Modeling results for the sum of exposures for all ASW exercises for a year indicate one humpback exposure that exceeds the Level A harassment threshold. However, given implementation of protective measures, it is unlikely that ASW operations would result in injury to marine mammals. Therefore, the Navy concludes that HRC operations would not result in Level A harassment of humpback whales. All predicted Level B exposure of beaked whales is treated as non-lethal Level A exposure per Section 4.1.2.4.2.5. However, given implementation of protective measures, it is unlikely that training operations would injure marine mammals. Therefore, the Navy concludes that HRC operations would not result in Level A harassment of beaked whales. In addition, the following considerations further reduce the potential for injury from tactical sonar and underwater explosions:

- Level A zone of influence radii for tactical sonar are so small that on-board observers would readily observe an approaching marine mammal.
- Species are large or travel in large pods and are easily visible from an elevated platform; a ship or aircraft would readily see a marine mammal in time to implement protective measures.

Level B Harassment of Cetaceans

As shown in Table 4.1.2.5.1-1, quantitative modeling results indicate potential for exposures at thresholds that equate to Level B harassment of cetaceans (TTS and sub-TTS behavioral). However, modeling assumptions are very conservative, and overestimate the number of level B exposures. Protective measures will be in place to further minimize the potential for temporary harassment, although there is currently no data to quantify the mitigation efforts to successfully reduce the number of marine mammal exposures. The Navy has begun development of a comprehensive Monitoring Plan to determine the effectiveness of these measures. Many species of small cetaceans travel in very large pods, and therefore would be easily observed from an elevated platform. In addition, large baleen whales travel slowly and are easily observed on the surface. In the years of conducting major exercises in the HRC, there have been no documented incidences of harassments or beach strandings of marine mammals associated with active sonar or underwater explosives. In the one event associated with RIMPAC 2004, sonar was suggested to be a plausible contributing factor (Southall et al., 2006) although a similar event occurred on the same day in a bay at Rota Island, Northern Marianas Islands with no associated sonar (Jefferson et al., 2006) and may be related to oceanographic changes that influenced prey distribution (Southall 2006; Ketten, 2006). The HRC open ocean waters continue to support diverse and stable populations of cetaceans.

4.1.2.5.4 Increased Tempo and Frequency of Training Operations

The HRC training operations for Alternative 1 involving sonar include ASW Tracking Exercise and ASW Torpedo Exercise as described in Tables 2.2.2.1-1 and 2.2.2.3-1, and Appendix D. The number of hours of sonar modeled for Alternative 1 is the same as the No-action Alternative which included 1,440 hours of 53C surface ship sonar and associated sonobuoys per year. The modeled exposures for marine mammals during TRACKEX and TORPEX training operations, without consideration of protective measures are presented in the No-action Alternative Tables 4.1.2.4.3-1 and 4.1.2.4.3-2. Effects on marine mammals from these exposures are included in the discussion in Sections 4.1.2.5.1 and 4.1.2.5.2. Exposures from underwater detonations (i.e. SINKEX), air to surface missile exercise, surface to surface missile exercise, bombing exercise, surface to surface gunnery exercise and naval surface fire support are included in the summary numbers in Table 4.1.2.5.1-2.

4.1.2.5.5 Enhanced RDT&E Operations

There are no new RDT&E operations that would affect marine animals. Sources such as UAVs, underwater communications, and electronic warfare systems that may be deployed in the ocean are beyond the frequency range or intensity level to affect marine animals. Other RDT&E operations identified as antisubmarine warfare do not include sonar or include very limited use of sonar and short durations (< 1.5 hours). These operations would have minimal effects on fish, sea turtles, and marine mammals.

4.1.2.5.6 Future RDT&E Operations

There are no future RDT&E operations that would affect marine animals. Sources such as UAVs, underwater communications, and electronic warfare systems that may be deployed in the ocean are beyond the frequency range or intensity level to affect marine animals. Other RDT&E operations identified as antisubmarine warfare do not include sonar or include very limited use of sonar and short durations (< 1.5 hours). These operations would have minimal effects on fish, sea turtles, and marine mammals.

4.1.2.5.7 HRC Enhancements

There are no new HRC enhancement operations that would affect marine animals. Other sources such as underwater communications and electronic warfare systems that may be deployed in the ocean are beyond the frequency range or intensity level to affect marine animals.

4.1.2.5.8 Major Exercises

RIMPAC

The operations and impacts to marine mammals from RIMPAC exercises have been summarized in the RIMPAC 2006 Supplement to the 2002 Rim of the Pacific (RIMPAC) Environmental Assessment (U.S. Department of the Navy, 2006). The Alternative 1 modeling assumes two strike groups and included 1064 hours of 53C surface ship sonar and associated dipping sonar, sonobuoys, and MK-48 torpedoes per RIMPAC (conducted every other year). The modeled exposures for marine mammals during RIMPAC, without consideration of protective measures are presented in Table 4.1.2.5.8-1. Effects on marine mammals from these exposures are included in the discussion in Sections 4.1.2.5.1 and 4.1.2.5.2. Exposures from underwater detonations (i.e., SINKEX), air to surface missile exercise, surface to surface missile exercise, bombing exercise, surface to surface gunnery exercise and naval surface fire support are included in the summary numbers in Table 4.1.2.5.1-2. Sections 4.1.2.1 and 4.1.2.2 discuss the potential effects on fish and sea turtles respectively.

Table 4.1.2.5.8-1. Alternative 1 Sonar Modeling Summary - Yearly Marine Mammal Exposures for RIMPAC (Conducted Every Other Year)

Marine Mammals	Dose Response Behavioral	173 dB NMFS Behavioral	190 dB Navy Behavioral	195 dB TTS	215 dB PTS
Bryde's whale	49	94	3	1	0
Fin whale[1, 2]	15	123	4	1	0
Sei Whale[1, 2]	15	123	4	1	0
Humpback_whale[1]	-	-	-	-	-
Sperm whale[1]	230	1,613	34	7	0
Dwarf sperm whale	436	3,495	142	28	0
Pygmy sperm whale	178	1,428	58	12	0
Cuvier's beaked whale	314	1,544	39	4	0
Longman's beaked whale	32	197	6	1	0
Blainville's beaked whale	108	591	24	5	0
Unidentified beaked whale	10	50	1	0	0
Bottlenose dolphin	256	1,896	67	14	0
False killer whale	15	123	4	1	0
Killer whale	15	123	4	1	0
Pygmy killer whale	59	491	17	4	0
Shortfinned pilot whale	578	4,508	174	33	0
Risso's dolphin	160	1,252	48	9	0
Melonheaded whale	193	1,503	58	11	0
Roughtoothed dolphin	229	1,709	75	15	0
Fraser's dolphin	265	2,037	80	17	0
Pantropical spotted dolphin	817	5,914	206	41	0
Spinner dolphin	89	665	29	6	0
Striped dolphin	1,193	8,632	301	60	0
Monk seal[1]	846	2,296	97	20	0
TOTAL	6,102	40,405	1,478	292	0

Note: [1] Endangered Species
[2] Due to a lack of density data for fin and sei whales, false killer whale results were used
Dose Response Curve
173 dB - sub-TTS (NMFS) 173- 195 dB re 1 μPa^2-s
190 dB – sub-TTS (Navy) 190- 195 dB re 1 μPa^2-s
195 dB – TTS 195-215 dB re 1 μPa^2
215 dB- PTS > 215 dB re 1 μPa^2-s
dB = decibel μPa^2-s= squared micropascal-second NMFS = National Marine Fisheries Service
TTS = temporary threshold shift PTS = permanent threshold shift

USWEX

The operations and impacts to marine mammals from USWEX exercises have been summarized in the Undersea Warfare Exercise Programmatic Environmental Assessment (EA/OEA) (U.S. Department of the Navy, 2007). The Alternative 1 modeling included 1167 hours of 53C surface ship sonar and associated dipping sonar and sonobuoys per year. The modeled exposures for marine mammals during up to six USWEX per year, without consideration of protective measures are presented in Table 4.1.2.5.8-2. Effects on marine mammals from these exposures are included in the discussion in Sections 4.1.2.5.1 and 4.1.2.5.2. Exposures from underwater detonations (i.e., SINKEX), air to surface missile exercise, surface to surface missile exercise, bombing exercise, surface to surface gunnery exercise and naval surface fire support are included in the summary numbers in Table 4.1.2.5.1-2. Sections 4.1.2.1 and 4.1.2.2 discuss the potential effects on fish and sea turtles respectively.

Table 4.1.2.5.8-2. Alternative 1 Sonar Modeling Summary - Yearly Marine Mammal Exposures for USWEX

Marine Mammals	Dose Response Behavioral	173 dB NMFS Behavioral	190 dB Navy Behavioral	195 dB TTS	215 dB PTS
Bryde's whale	65	135	5	1	0
Fin whale[1, 2]	19	162	7	1	0
Sei Whale[1, 2]	19	162	7	1	0
Humpback_whale[1]	19,421	47,157	2,856	261	0
Sperm whale[1]	242	1,792	61	8	0
Dwarf sperm whale	599	5,246	215	31	0
Pygmy sperm whale	244	2,143	88	13	0
Cuvier's beaked whale	378	1,908	47	5	0
Longman's beaked whale	41	269	9	1	0
Blainville's beaked whale	145	887	36	5	0
Unidentified beaked whale	12	62	2	0	0
Bottlenose dolphin	305	2,289	118	15	0
False killer whale	19	162	7	1	0
Killer whale	19	162	7	1	0
Pygmy killer whale	74	649	28	4	0
Shortfinned pilot whale	679	5,388	300	35	0
Risso's dolphin	189	1,497	83	10	0
Melonheaded whale	226	1,796	100	12	0
Roughtoothed dolphin	315	2,628	112	16	0
Fraser's dolphin	363	3,091	124	19	0

Table 4.1.2.5.8-2 Alternative 1 Sonar Modeling Summary - Yearly Marine Mammal Exposures for USWEX (Continued)

Marine Mammals	Dose Response Behavioral	173 dB NMFS Behavioral	190 dB Navy Behavioral	195 dB TTS	215 dB PTS
Pantropical spotted dolphin	938	6,730	369	44	0
Spinner dolphin	122	1,022	43	6	0
Striped dolphin	1,368	9,822	538	64	0
Monk seal[1]	1,182	2,349	104	16	0
TOTAL	26,985	97,506	5,267	571	0

Note: [1] Endangered Species
[2] Due to a lack of density data for fin and sei whales, false killer whale results were used
Dose Response Curve
173 dB - sub-TTS (NMFS) 173- 195 dB re 1 µPa^2
190 dB – sub-TTS (Navy) 190- 195 dB re 1 µPa^2
195 dB – TTS 195-215 dB re 1 µPa^2
215 dB- PTS > 215 dB re 1 µPa^2
dB = decibel
µPa^2-s = squared micropascal-second
NMFS = National Marine Fisheries Service
TTS = temporary threshold shift
PTS = permanent threshold shift

4.1.2.6 ALTERNATIVE 2

The discussion under the No-action Alternative regarding potential non-acoustic impacts (Section 4.1.2.4.1) and potential ASW Impacts (Section 4.1.2.4.2) also apply for Alternative 1.

The increased operations under alternative 2 result in an increase in the number of hours of ASW training. The modeling input includes a total of 5,179 hours of AN/AQS 53C mid-frequency active tactical sonar and the associated DICASS sonobuoy, MK 48 torpedo, and dipping sonar modeling inputs. These exposure numbers are generated by the model without consideration of protective measures that would reduce the potential for marine mammal exposures to sonar. Table 4.1.2.6-1 provides a summary of the total sonar exposures from all Alternative 2 ASW exercises that would be conducted over the course of a year.

Modeling results for Alternative 2 explosives demolition, gunnery exercises, missile exercises, and SINKEX, without consideration of protective measures, resulted in the exposures summarized in Table 4.1.2.6-2.

Table 4.1.2.6-1. Alternative 2 Sonar Modeling Summary - Yearly Marine Mammal Exposures From all ASW (TRACKEX, TORPEX, RIMPAC, USWEX, Multi Strike Group)

Marine Mammals	Dose Response Behavioral	173 dB NMFS Behavioral	190 dB Navy Behavioral	195 dB TTS	215 dB PTS
Bryde's whale	273	567	21	3	0
Fin whale[1, 2]	82	705	31	5	0
Sei Whale[1, 2]	82	705	31	5	0
Humpback_whale[1]	34,797	82,597	4,714	482	1
Sperm whale[1]	1,154	8,078	254	35	0
Dwarf sperm whale	2,565	22,016	938	134	0
Pygmy sperm whale	1,048	8,992	383	55	0
Cuvier's beaked whale	1,593	8,297	205	20	0
Longman's beaked whale	176	1,147	40	6	0
Blainville's beaked whale	613	3,721	159	23	0
Unidentified beaked whale	51	268	7	1	0
Bottlenose dolphin	1,348	10,245	512	67	0
False killer whale	82	705	31	5	0
Killer whale	82	705	31	5	0
Pygmy killer whale	328	2,819	125	19	0
Shortfinned pilot whale	3,046	24,238	1,317	157	0
Risso's dolphin	846	6,733	366	44	0
Melonheaded whale	1,015	8,079	439	52	0
Roughtoothed dolphin	1,348	10,994	487	70	0
Fraser's dolphin	1,556	12,971	540	81	0
Pantropical spotted dolphin	4,184	30,692	1,605	196	0
Spinner dolphin	524	4,276	189	27	0
Striped dolphin	6,106	44,794	2,342	287	1
Monk seal[1]	4,941	10,524	486	80	0
TOTAL	67,840	304,868	15,253	1,859	2

Note: [1] Endangered Species
[2] Due to a lack of density data for fin and sei whales, false killer whale results were used
Dose Response Curve
173 dB - sub-TTS (NMFS) 173- 195 dB re 1 μPa^2-s
190 dB – sub-TTS (Navy) 190- 195 dB re 1 μPa^2-s
195 dB – TTS 195-215 dB re 1 μPa^2-s
215 dB- PTS > 215 dB re 1 μPa^2-s
Assumes 3 Strike Group Exercise in winter
dB = decibel
μPa^2-s = squared micropascal-second
NMFS = National Marine Fisheries Service
TTS = temporary threshold shift
PTS = permanent threshold shift

Table 4.1.2.6-2. Alternative 2 Explosives Modeling Summary - Yearly Marine Mammal Exposures From all Explosive Sources

Marine Mammal Species	TTS Modeled at < 182 dB re 1 μPa^2–s or 23 psi							Total Exposures		
	Mine Neutralization	Air to Surface Missile Exercise	Surface to Surface Missile Exercise	Bombing Exercise	Sinking Exercise	Surface to surface Gunnery Exercise	Naval Surface Fire Support	TTS 182 dB, 23 psi	Slight Lung/TM Injury	Onset Massive Lung Injury
Bryde's whale	0	0	0	0	0	0	0	0	0	0
Fin_whale[1, 2]	0	0	0	0	0	0	0	0	0	0
Sei whale	0	0	0	0	0	0	0	0	0	0
Humpback_whale[1]	1	0	0	7	0	0	0	8	1	0
Sperm_whale[1]	0	0	0	2	3	0	0	5	0	0
Dwarf sperm whale	0	0	0	4	4	1	0	9	0	0
Pygmy sperm whale	0	0	0	2	2	0	0	4	0	0
Cuvier's beaked whale	0	0	0	5	5	0	0	10	0	0
Longman's beaked whale	0	0	0	0	0	0	0	0	0	0
Blainville's beaked whale	0	0	0	1	1	0	0	2	0	0
Unidentified beaked whale	0	0	0	0	0	0	0	0	0	0
Bottlenose dolphin	0	0	0	0	0	0	0	0	0	0
False killer whale	0	0	0	0	0	0	0	0	0	0
Killer whale	0	0	0	0	0	0	0	0	0	0
Pygmy killer whale	0	0	0	0	0	0	0	0	0	0
Shortfinned pilot whale	0	0	0	1	1	0	0	2	0	0
Risso's dolphin	0	0	0	0	0	0	0	0	0	0
Melonheaded whale	0	0	0	0	0	0	0	0	0	0
Roughtoothed dolphin	0	0	0	2	1	0	0	3	0	0
Fraser's dolphin	0	0	0	2	2	0	0	4	0	0
Pantropical spotted dolphin	0	0	0	1	0	1	0	2	0	0
Spinner dolphin	0	0	0	1	1	0	0	2	0	0
Striped dolphin	0	0	0	1	1	1	0	3	0	0
Monk_seal[1]	0	0	0	1	1	0	0	2	0	0
Total	1	0	0	30	22	3	0	56	1	0

Note:
[1] Endangered Species
2 Due to a lack of density data for fin and sei whales, false killer whale results were used
dB = decibel
μPa^2-s = squared micropascal-second
NMFS = National Marine Fisheries Service
TTS = temporary threshold shift
PTS = permanent threshold shift

4.1.2.6.1 Estimated Effects on ESA Listed Species - Alternative 2

The endangered species that may be affected as a result of implementation of the HRC Alternative 2 operations include the blue whale (*Balaenoptera musculus*), fin whale (*Balaenoptera physalus*), Hawaiian monk seal (*Monachus schauinslandi*) humpback whale (*Megaptera novaeangliae*), north Pacific right whale (*Eubalaena japonica*), sei whale (*Balaenoptera borealis*) and sperm whale (*Physeter macrocephalus*).

For Alternative 2, modeling results predict that if there were no protective measures in place exposures that that are temporary, non-injurious physiological effects (TTS) or behavioral effects would occur. The modeling predicts one exposure to energy in excess of 215 dB re 1 μPa^2-s, which is the threshold indicative of onset PTS.

The following sections discuss the exposure of ESA listed species to sonar from all Alternative 2 ASW exercises per year. The exposure numbers are given without consideration of protective measures. However, protective measures that are implemented during the ASW exercises would reduce the potential for marine mammal exposures to sonar.

Blue Whale (*Balaenoptera musculus*)

There is no density information available for blue whales in Hawaiian waters given they have not been seen during survey. Given they are so few in number, it is unlikely that HRC mid-frequency active sonar training events will result in the exposure of any blue whales to accumulated acoustic energy in excess of any energy flux threshold or a SPL in excess of 145 dB. No blue whales would be exposed to impulsive noise or pressures from underwater detonations that would cause TTS or physical injury.

Based on the model results, behavioral patterns, acoustic abilities of blue whales, results of past training operations, and the implementation of protective measures, the Navy finds that the HRC training events would not likely result in any death or injury to blue whales.

Fin Whale (*Balaenoptera physalus*)

There is no density information for fin whales in the Hawaiian Islands (Barlow 2006). For purposes of acoustic effects analysis estimates, it was assumed that the number and density of fin whales did not exceed that of false killer whales and the modeled number of exposures for both species would therefore be the same.

Based on this assumption, the modeling results in 705 exposures annually to accumulated acoustic energy between 173 dB and 195 dB re 1 μPa^2-s, the sub-TTS behavioral threshold range. Using the new DR methodology to replace the EFD modeling methodology and sub-TTS behavioral threshold, 82 exposures exceed the SPL dose response curve as potentially resulting in behavioral harassment.

Modeling also indicates, there would be 5 exposures to accumulated acoustic energy between 195 dB and 215 dB re 1 μPa^2-s, which is the threshold established indicative of onset TTS. Modeling indicates no exposures for fin whales to accumulated acoustic energy above 215 dB re 1 μPa^2-s, which is the threshold indicative of onset PTS. No fin whales would be exposed to impulsive noise or pressures from underwater detonations that would cause TTS or physical injury (Table 4.1.2.6-2).

Based on the model results, behavioral patterns, acoustic abilities of fin whales, results of past HRC training, and the implementation of procedure protective measures, the Navy finds that the HRC training events would likely not result in any death or injury to fin whales. The proposed ASW exercises may affect fin whales.

Humpback Whale (*Megaptera novaeangliae*)

The acoustic effects analysis for Alternative 2 predicts that that without consideration of mitigation, mid-frequency active sonar training events will result in 82,597 annual exposures to humpback whales to an accumulated acoustic energy between 173 dB and 195 dB re 1 μPa^2-s, the sub-TTS behavioral threshold range. Using the new DR methodology to replace the EFD modeling methodology and the sub-TTS behavioral threshold, 34,797 exposures exceed the SPL dose response curve as potentially resulting in behavioral harassment.

Modeling indicates there would be 482 exposures to accumulated acoustic energy between of 195 dB and 215 dB re 1 μPa^2-s, which is the threshold established indicative of onset TTS. Modeling indicates one exposure for humpback whales to accumulated acoustic energy above 215 dB re 1 μPa^2-s, which is the threshold indicative of onset PTS.

Without consideration of clearance procedures, there would be eight exposures from impulsive noise or pressures from underwater detonations that would exceed the TTS threshold, one exposure that would exceed the slight injury threshold and no exposures that would exceed the massive injury threshold (Table 4.1.2.4.1-2). Target area clearance procedures described in Section 4.1.2.4.4 would make sure there are no humpback whales within the safety zone, and therefore potential exposure of humpback whales to noise levels that exceed TTS or injury levels are highly unlikely.

Based on the model results, behavioral patterns, acoustic abilities of humpback whales, results of past training, and the implementation of procedure protective measures, the Navy finds that the HRC training events would not likely result in any death or injury to humpback whales. The proposed ASW exercises may affect humpback whales.

North Pacific Right Whale (*Eubalaena japonica*)

There is no density information available for North Pacific right whales in Hawaiian waters given they have not been seen during survey. Given they are so few in number, it is unlikely that HRC mid-frequency active sonar training events will result in the exposure of any right whales to accumulated acoustic energy in excess of any energy flux threshold or a SPL in excess of 145 dB. No right whales would be exposed to impulsive noise or pressures from underwater detonations that would cause TTS or physical injury.

Based on the model results, behavioral patterns, acoustic abilities of north Pacific right whales, results of past training, and the implementation of procedure protective measures, the Navy finds that the HRC training events would not likely result in any death or injury to north Pacific right whales.

Sei Whale (*Balaenoptera borealis*)

For purposes of the acoustic effects analysis, the same assumptions made previously regarding fin whales are also made for sei whales. It was therefore assumed that the number and density of sei whales did not exceed that of false killer whales and the modeled number of exposures for both species would therefore be the same. Based on this assumption, the modeling predicts 705 exposures annually to accumulated acoustic energy between 173 dB and 195 dB re 1 μPa^2-s, the sub-TTS behavioral threshold range. Using the new DR methodology to replace the EFD modeling methodology and sub-TTS behavioral threshold, 82 exposures exceed the SPL dose response curve as potentially resulting in behavioral harassment.

Modeling also predicts 5 exposures to accumulated acoustic energy between 195 dB and 215 dB re 1 μPa^2-s, which is the threshold established indicative of onset TTS. Modeling predicts no exposures for sei whales to accumulated acoustic energy above 215 dB re 1 μPa^2-s, which is the threshold indicative of onset PTS. No sei whales would be exposed to impulsive noise or pressures from underwater detonations that would cause TTS or physical injury (Table 4.1.2.4.1-2).

Based on the model results, behavioral patterns, acoustic abilities of sei whales, results of past training, and the implementation of procedure protective measures, the Navy finds that the HRC training events would not likely result in any death or injury to sei whales. The proposed ASW exercises may affect sei whales.

Sperm Whales (*Physeter macrocephalus*)

The EFD modeling acoustic effects analysis predicts that HRC mid-frequency sonar training events will result in 8,078 exposures of sperm whales to accumulated acoustic energy between 173 dB and 195 dB re 1 μPa^2-s, the sub-TTS behavioral threshold range. Using the new DR methodology to replace the EFD modeling methodology and sub-TTS behavioral threshold, 1,154 exposures exceed the SPL dose response curve as potentially resulting in behavioral harassment.

Modeling predicts 35 exposures to accumulated acoustic energy between of 195 dB and 215 dB re 1 μPa^2-s, which is the threshold established indicative of onset TTS. Modeling predicts there would be no exposures for sperm whales to accumulated acoustic energy above 215 dB re 1 μPa^2-s, which is the threshold indicative of onset PTS.

Without consideration of clearance procedures, there would be five exposures from impulsive noise or pressures from underwater detonations that would exceed the TTS threshold (Table 4.1.2.6.1-2). Target area clearance procedures described in Section 4.1.2.4.1 would make sure there are no sperm whales within the safety zone, and therefore potential exposure of sperm whales to noise levels that exceed TTS are highly unlikely.

Based on the model results, behavioral patterns, acoustic abilities of sperm whales, results of past training, and the implementation of procedure protective measures, the Navy finds that the HRC training events would not result in any death or injury to sperm whales. The proposed ASW exercises may affect sperm whales.

Hawaiian Monk Seal (Monachus schauinslandi)

The acoustic effects analysis predicts that mid-frequency active sonar training events will result in 4,941 annual exposures to Hawaiian monk seals in accumulated acoustic energy between 173 dB and 195 dB re 1 μPa^2-s the sub-TTS behavioral threshold range. Using the new DR methodology to replace the EFD modeling methodology and sub-TTS behavioral threshold, 4,941 exposures exceed the SPL dose response curve as potentially resulting in behavioral harassment.

Modeling predicts 80 exposures to accumulated acoustic energy between 195 dB and 215 dB re 1 μPa^2-s, which is the threshold established indicative of onset TTS. Modeling predicts there would be no exposures for monk seals to accumulated acoustic energy above 215 dB re 1 μPa^2-s, which is the threshold indicative of onset PTS.

Without consideration of clearance procedures, there would be two exposures from impulsive noise or pressures from underwater detonations that would exceed the TTS threshold and no exposures that exceed the injury threshold (Table 4.1.2.6.1-2). Target area clearance procedures described in Section 4.1.2.4.1 would make sure there are no monk seals within the safety zone, and therefore potential exposure of monk seals to noise levels that exceed TTS is highly unlikely.

Additionally, protective measures call for continuous visual observation during operations with active sonar, therefore, Hawaiian monk seals that move into the operating area would be insignificant. Critical habitat was designated 1986 as the area extending out to the 10 fathom depth (60 ft) for the Northwest Hawaiian Islands (National Marine Fisheries Service, 1986). Critical habitat was extended out to the 20-fathom depth in 1988 (National Marine Fisheries Service, 1988).

Based on the model results, behavioral patterns, acoustic abilities of monk seals, results of past training, and the implementation of procedure protective measures, the Navy finds that the training events would not likely result in any death or injury to Hawaiian monk seals. The proposed ASW exercises may affect monk seals.

4.1.2.6.2 Summary of Compliance with MMPA and ESA – Alternative 2

Endangered Species Act

Based on analytical modeling results, five endangered marine mammal species occurring within the operating area may be exposed to acoustic energy that could result in TTS or behavioral modification, including the fin whale, humpback whale, sei whale, sperm whale and Hawaiian monk seal. Modeling results also indicate a potential for PTS exposures (under the ESA level of >.05). However, even the sum of exposures at 215 dB from all operations over a year does not exceed 0.66 exposures for any ESA species. Implementation of protective measures would further reduce the potential for TTS and PTS exposures. Based on the analysis presented in the previous section the Navy concludes that HRC ASW exercises may affect fin whale, humpback whale, sei whale, sperm whale and Hawaiian monk seal.

As described in the No-action Alternative, Two other listed cetaceans, the blue whale and north Pacific right whale may be found in the HRC. Very few sightings have been recorded in the Hawaiian Islands, and they are not expected to be encountered during ASW exercises. Because the mid-frequency active tactical sonar proposed for HRC ASW training is outside the frequency typically used by these whales, they are not likely to hear or have a physiological or behavioral response to the sonar (National Oceanic and Atmospheric Administration, 2006). HRC ASW operations would therefore result in no effect to blue whales and North Pacific right whales.

Protective measures would be implemented to prevent exposure of marine mammals to impulsive noise or sound pressures from underwater detonations that would cause injury.

Five species of sea turtles could potentially occur within the HRC. All are protected under the ESA. All available acoustic information suggests that sea turtles are likely not capable of hearing mid-frequency (2.6 kHz and 3.3 kHz) sounds in the range produced by the active tactical sonar. Protective measures would be implemented to prevent exposure of sea turtles to impulsive noise or sound pressures from underwater detonations that would cause injury.

In accordance with ESA requirements, the Navy will initiate Section 7 consultation with NMFS based on the Navy determination that HRC operations may affect fin whales, humpback whales, sei whales, sperm whales, and Hawaiian monk seals.

Marine Mammal Protection Act

Level A Harassment of Cetaceans

Modeling results for the sum of exposures for all ASW exercises for a year indicate one humpback exposure that exceeds the Level A harassment threshold. However, given implementation of protective measures, it is unlikely that ASW operations would result in injury to marine mammals. Therefore, the Navy concludes that HRC operations would not result in Level A harassment of humpback whales. All predicted Level B exposure of beaked whales is treated as non-lethal Level A exposure per Section 4.1.2.4.5. However, given implementation of protective measures, it is unlikely that training operations would injure marine mammals. Therefore, the Navy concludes that HRC operations would not result in Level A harassment of beaked whales. In addition, the following considerations further reduce the potential for injury from tactical sonar and underwater explosions:

- Level A zone of influence radii for tactical sonar are so small that on-board observers would readily observe an approaching marine mammal.
- Species are large or travel in large pods and are easily visible from an elevated platform; a ship or aircraft would readily see a marine mammal in time to implement protective measures.

Level B Harassment of Cetaceans

As shown in Table 4.1.2.4.1-1, quantitative modeling results indicate potential for exposures at thresholds that equate to Level B harassment of cetaceans (TTS and sub-TTS behavioral). However, modeling assumptions are very conservative, and overestimate the number of level B exposures. Protective measures will be in place to further minimize the potential for temporary harassment, although there is currently no data to quantify the mitigation efforts to successfully reduce the number of marine mammal exposures. The Navy has begun development of a comprehensive Monitoring Plan to determine the effectiveness of these measures. Many species of small cetaceans travel in very large pods, and therefore would be easily observed from an elevated platform. In addition, large baleen whales travel slowly and are easily observed on the surface. In the years of conducting major exercises in the HRC, there have been no documented incidences of harassments or beach strandings of marine mammals associated with active sonar or underwater explosives. In the one event associated with RIMPAC 2004, sonar was suggested to be a plausible contributing factor (Southall et al., 2006) although a similar event occurred on the same day in a bay at Rota Island, Northern Marianas Islands with no associated sonar (Jefferson et al., 2006) and may be related to oceanographic changes that influenced prey distribution (Southall, 2006; Ketten, 2006). The HRC open ocean waters continue to support diverse and stable populations of cetaceans. Based on the potential for level B harassment, the Navy will consult with NMFS and apply for a 5-year Letter of Authorization under the MMPA.

4.1.2.6.3 Increased Tempo and Frequency of Training Operations

The HRC training operations for Alternative 1 involving sonar include ASW Tracking Exercise and ASW Torpedo Exercise as described in Tables 2.2.2.1-1 and 2.2.2.3-1, and Appendix D. The number of hours of sonar modeled for Alternative 2 included 1,590 hours of 53C surface ship sonar and associated sonobuoys per year. The modeled exposures for marine mammals during TRACKEX and TORPEX training operations, without consideration of protective measures are presented in Tables 4.1.2.6.3-1 and 4.1.2.6.3-2. Effects on marine mammals from these exposures are included in the discussion in Sections 4.1.2.6.1 and 4.1.2.6.2. Exposures from underwater detonations (i.e., SINKEX), air to surface missile exercise, surface to surface missile exercise, bombing exercise, surface to surface gunnery exercise and naval surface fire support are included in the summary numbers in Table 4.1.2.6.1-2.

Table 4.1.2.6.3-1. Alternative 2 Sonar Modeling Summary - Yearly Marine Mammal Exposures from Tracking Exercises

Marine Mammals	Dose Response Behavioral	173 dB NMFS Behavioral	190 dB Navy Behavioral	195 dB TTS	215 dB PTS
Bryde's whale	76	165	6	1	0
Fin whale[1, 2]	24	211	9	1	0
Sei Whale[1, 2]	24	211	9	1	0
Humpback_whale[1]	7,470	18,298	977	109	0
Sperm whale[1]	345	2,502	72	10	0
Dwarf sperm whale	741	6,354	279	40	0
Pygmy sperm whale	302	2,595	114	16	0
Cuvier's beaked whale	449	2,465	61	6	0
Longman's beaked whale	50	337	12	2	0
Blainville's beaked whale	173	1,074	47	7	0
Unidentified beaked whale	14	80	2	0	0
Bottlenose dolphin	402	3,155	151	20	0
False killer whale	24	211	9	1	0
Killer whale	24	211	9	1	0
Pygmy killer whale	97	845	37	6	0
Shortfinned pilot whale	917	7,493	392	48	0
Risso's dolphin	255	2,081	109	13	0
Melonheaded whale	306	2,498	131	16	0
Roughtoothed dolphin	389	3,168	144	21	0
Fraser's dolphin	449	3,747	160	24	0
Pantropical spotted dolphin	1,256	9,612	474	60	0
Spinner dolphin	151	1,232	56	8	0
Striped dolphin	1,833	14,028	692	87	0
Monk seal[1]	1,388	3,698	179	27	0
TOTAL	17,162	86,271	4,132	528	0

Note: [1] Endangered Species
[2] Due to a lack of density data for fin and sei whales, false killer whale results were used
Dose Response Curve
173 dB - sub-TTS (NMFS) 173- 195 dB re 1 μPa^2-s
190 dB – sub-TTS (Navy) 190- 195 dB re 1 μPa^2-s
195 dB – TTS 195-215 dB re 1 μPa^2-s
215 dB- PTS > 215 dB re 1 μPa^2-s
dB = decibel
μPa^2-s = squared micropascal-second
NMFS = National Marine Fisheries Service
TTS = temporary threshold shift
PTS = permanent threshold shift

Table 4.1.2.6.3-2. Alternative 2 Sonar Modeling Summary - Yearly Marine Mammal Exposures from Torpedo Exercises

Marine Mammals	Dose Response Behavioral	173 dB NMFS Behavioral	190 dB Navy Behavioral	195 dB TTS	215 dB PTS
Bryde's whale	17	41	2	0	0
Fin whale[1, 2]	6	55	3	0	0
Sei Whale[1, 2]	6	55	3	0	0
Humpback_whale[1]	2,507	5,806	287	48	0
Sperm whale[1]	90	691	18	3	0
Dwarf sperm whale	192	1,572	76	11	0
Pygmy sperm whale	78	642	31	4	0
Cuvier's beaked whale	96	641	16	2	0
Longman's beaked whale	12	85	3	0	0
Blainville's beaked whale	40	266	13	2	0
Unidentified beaked whale	3	21	1	0	0
Bottlenose dolphin	106	864	41	6	0
False killer whale	6	55	3	0	0
Killer whale	6	55	3	0	0
Pygmy killer whale	26	220	10	2	0
Shortfinned pilot whale	248	2,067	109	13	0
Risso's dolphin	69	574	30	4	0
Melonheaded whale	83	689	36	4	0
Roughtoothed dolphin	101	784	39	6	0
Fraser's dolphin	116	930	43	6	0
Pantropical spotted dolphin	333	2,698	129	16	0
Spinner dolphin	39	305	15	2	0
Striped dolphin	485	3,938	189	24	0
Monk seal[1]	320	1,409	71	11	0
TOTAL	4,988	24,462	1,169	164	0

Note: [1] Endangered Species
[2] Due to a lack of density data for fin and sei whales, false killer whale results were used
Dose Response Curve
173 dB - sub-TTS (NMFS) 173- 195 dB re 1 μPa^2-s
190 dB – sub-TTS (Navy) 190- 195 dB re 1 μPa^2-s
195 dB – TTS 195-215 dB re 1 μPa^2
215 dB- PTS > 215 dB re 1 μPa^2
dB = decibel
μPa^2-s = square micropascal-second
NMFS = National Marine Fisheries Service
TTS = temporary threshold shift
PTS = permanent threshold shift

4.1.2.6.4 Enhanced RDT&E Operations

There are no new RDT&E operations that would affect marine animals. Sources such as UAVs, underwater communications, and electronic warfare systems that may be deployed in the ocean are beyond the frequency range or intensity level to affect marine animals. Other RDT&E operations identified as antisubmarine warfare do not include sonar or include very limited use of sonar and short durations (< 1.5 hours). These operations would have minimal effects on fish, sea turtles, and marine mammals.

4.1.2.6.5 Future RDT&E Operations

There are no future RDT&E operations that would affect marine animals. Sources such as UAVs, underwater communications, and electronic warfare systems that may be deployed in the ocean are beyond the frequency range or intensity level to affect marine animals. Other RDT&E operations identified as antisubmarine warfare do not include sonar or include very limited use of sonar and short durations (< 1.5 hours). These operations would have minimal effects on fish, sea turtles, and marine mammals.

4.1.2.6.6 HRC Enhancements

There are no new HRC enhancement operations that would affect marine animals. Other sources such as underwater communications and electronic warfare systems that may be deployed in the ocean are beyond the frequency range or intensity level to affect marine animals.

4.1.2.6.7 Additional Major Exercises - Multiple Strike Group Training

Up to three Strike Groups would conduct training operations simultaneously in the HRC. The Strike Groups would not be home ported in Hawaii, but would stop in Hawaii en route to a final destination. The Strike Groups would be in Hawaii for up to 10 days per exercise. Training would be provided to submarine, ship, and aircraft crews in tactics, techniques, and procedures for ASW, Defensive Counter Air, Maritime Interdiction, and operational level C2 of maritime forces. The three Strike Group marine mammal exposure modeling included 944 hours of 53 C surface ship sonar and associated dipping sonar, sonobuoys, and MK-48 torpedoes. The modeled exposures for marine mammals during the multiple strike group training exercise, without consideration of protective measures are presented in Table 4.1.2.6.7-1. Modeling assumed the exercise is conducted during the winter to account for potential humpback whale exposures. Effects on marine mammals from these exposures are included in the discussion in Sections 4.1.2.6.1 and 4.1.2.6.2.

Table 4.1.2.6.7-1. Alternative 2 Sonar Modeling Summary - Yearly Marine Mammal Exposures or Three Strike Group Exercise

Marine Mammals	Dose Response Behavioral	173 dB NMFS Behavioral	190 dB Navy Behavioral	195 dB TTS	215 dB PTS
Bryde's whale	66	133	5	1	0
Fin whale[1, 2]	18	153	8	1	0
Sei Whale[1, 2]	18	153	8	1	0
Humpback_whale[1]	5,364	10,814	593	63	0
Sperm whale[1]	227	1,476	68	6	0
Dwarf sperm whale	597	5,337	226	24	0
Pygmy sperm whale	244	2,180	92	10	0
Cuvier's beaked whale	355	1,738	42	4	0
Longman's beaked whale	41	258	10	1	0
Blainville's beaked whale	146	902	38	4	0
Unidentified beaked whale	11	56	1	0	0
Bottlenose dolphin	280	2,033	135	12	0
False killer whale	18	153	8	1	0
Killer whale	18	153	8	1	0
Pygmy killer whale	71	612	32	4	0
Shortfinned pilot whale	624	4,766	343	28	0
Risso's dolphin	173	1,324	95	8	0
Melonheaded whale	208	1,589	114	9	0
Roughtoothed dolphin	313	2,700	117	13	0
Fraser's dolphin	361	3,159	132	15	0
Pantropical spotted dolphin	840	5,715	426	35	0
Spinner dolphin	122	1,050	45	5	0
Striped dolphin	1,226	8,340	622	51	0
Monk seal[1]	1,204	761	36	5	0
TOTAL	12,545	55,555	3,203	301	0

Note: [1] Endangered Species
[2] Due to a lack of density data for fin and sei whales, false killer whale results were used
Dose Response Curve
173 dB - sub-TTS (NMFS) 173- 195 dB re 1 μPa^2-s
190 dB – sub-TTS (Navy) 190- 195 dB re 1 μPa^2-s
195 dB – TTS 195-215 dB re 1 μPa^2-s
215 dB- PTS > 215 dB re 1 μPa^2-s
dB = decibel
μPa^2-s = squared micropascal-second
NMFS = National Marine Fisheries Service
TTS = temporary threshold shift
PTS = permanent threshold shift

4.1.3 CULTURAL RESOURCES (UNDERWATER)—OPEN OCEAN

4.1.3.1 NO-ACTION ALTERNATIVE, ALTERNATIVE 1, AND ALTERNATIVE 2 (CULTURAL RESOURCES (UNDERWATER)—OPEN OCEAN)

There are numerous submerged cultural resources (primarily shipwrecks) widely scattered throughout the region of influence for open ocean operations. No known areas of dense concentration of shipwrecks are known to exist. In addition, there is no definitive count of shipwrecks in the Open Ocean and only limited documentation of locations. The majority of known shipwrecks are concentrated in the offshore areas of the Hawaiian Islands (see Figures 3.1.3-1 through 3.1.3-3). Cultural resources that do occur in the Open Ocean Area are deeply submerged and inherently protected from the effect of all types of activity.

Both the probability of encountering submerged resources and the probability of causing adverse effect on those resources are extremely low regardless of the action alternative being considered. To even further lower the probability of effect, areas where known submerged cultural resources exist could be avoided for operations involving debris dispersion or underwater detonation.

4.1.4 HAZARDOUS MATERIALS AND WASTES—OPEN OCEAN

4.1.4.1 NO-ACTION ALTERNATIVE (HAZARDOUS MATERIALS AND WASTES—OPEN OCEAN)

4.1.4.1.1 HRC Training Operations

Hazardous Materials

Navy training operations conducted under the No-action Alternative will require the use of a variety of solid and liquid hazardous materials. Hazardous materials required on the open ocean ranges can be broadly classified as shipboard materials necessary for normal operations and maintenance, such as fuel and paint, and training materials. Training materials include both live and practice munitions (considered to be hazardous materials because they contain explosives or propellants), and non-munition training materials. Table 4.1.4.1.1-1 lists training operations involving the use of hazardous materials.

Under the No-action Alternative, the use of hazardous materials for shipboard operations will not increase from baseline levels. Hazardous materials will continue to be controlled in compliance with OPNAVINST 5090.1B (2002), Chapter 19. The No-action Alternative will not affect hazardous materials management practices aboard ship.

Expended Training Materials

Various types of training items will be shot, launched, dropped, or placed within the Open Ocean Area under the No-action Alternative. Some training materials, including gun ammunition, bombs and missiles, targets, sonobuoys, chaff, and flares, will be expended on the range and not recovered. Items that are expended on the water, and fragments that are not recognizable as training debris (e.g., flare residue or candle mix), typically will not be recovered. A small percentage of training items containing energetic materials will fail to function properly, and—if not recovered—will remain on the range as unexploded ordnance.

Table 4.1.4.1.1-1: Navy Training Operations with Hazardous Materials No-action Alternative—Open Ocean Areas

Training Activity	Training Materials Containing Hazardous Material		
	Item	# per operation	Total #
VBSS	0.50 caliber gun ammunition	varies	varies
S-S GUNEX	5-in or 76-mm ammunition	20	1,380
	Smoke canister	0.52	36
	7.62-mm or .50-cal ammunition	150	10,400
A-S GUNEX	0.50-cal or 7.62-mm ammunition	400	51,200
	Smoke canister	1	128
BOMBEX (Sea)	MK-76	9	315
	MK-82	3	105
	BDU-45	1.7	60
	CBU	1	35
	MK-83	0.5	18
	Smoke canister	1	35
SINKEX	Varies depending on weapons and platform		
ASUW TORPEX (Submarine-Surface)	MK-48 torpedo	3	105
ASW TRACKEX	Sonobuoys	24-43	6,228
	Smoke canister	1-2	279
	MK-39	0-1	152
ASW TORPEX	REXTORP	1	397
	MK-39	1	397
ACM	Chaff	6	4,428
	Flare	3	2,214
S-A GUNEX	5" projectile	3	258
	7.62-mm projectile	3	258
	20-mm projectile	1,900	162,000
CHAFFEX	MK-36 super rapid bloom offboard chaff	7.5	255

Sonobuoys and flares, smoke buoys and markers, and other pyrotechnic training devices expended in the water can leak or leach small amounts of toxic substances as they degrade and decompose (see Table 4.1.4.1.1-2). These items will decompose very slowly, so the volume of decomposing training debris within the training areas, and the amounts of toxic substances being released to the environment, will gradually increase over the period of military use. Concentrations of some substances in sediments surrounding the disposed items will increase over time, possibly inhibiting benthic flora and fauna. Sediment transport via currents can eventually disperse these contaminants outside of the training areas, where they will be present at very low concentrations and, thus, have no effect on the environment.

Table 4.1.4.1.1-2. Hazardous Constituents of Training Materials

Training Application/ Munitions Element	Hazardous Constituent
Pyrotechnics Tracers Spotting Charges	Barium chromate Potassium perchlorate
Oxidizers	Lead oxide
Delay Elements	Barium chromate Potassium perchlorate Lead chromate
Propellants	Ammonium perchlorate
Fuses	Potassium perchlorate
Detonators	Fulminate of mercury Potassium perchlorate
Primers	Lead azide

<u>Sonobuoys</u>

Sonobuoys are electromechanical devices used for a variety of ocean sensing and monitoring tasks. Approximately 6,300 sonobuoys will be deployed annually for training under the No-action Alternative. Lead solder, lead weights, and copper anodes are used in the sonobuoys. Sonobuoys also may contain lithium sulfur dioxide, lithium, or thermal batteries.

During operation, a sonobuoy's seawater batteries can release copper, silver, lithium, or other metals to the surrounding marine environment, depending upon the type of battery used. Marine organisms in its vicinity can be exposed to battery effluents for up to 8 hours. Once expended and scuttled, the sonobuoys will sink to the ocean floor.

Various types of sonobuoys can be used, so the exact amounts of hazardous materials that will be expended on the ranges are not known. Table 4.1.4.1.1-3 provides estimates of potentially hazardous sonobuoy materials, based on the types of sonobuoys in use by the Navy on San Clemente Island.

<u>Pyrotechnic Residues</u>

About 300 smoke grenades and about 2,200 flares will be used annually under the No-action Alternative. Solid flare and pyrotechnic residues may contain, depending on their purpose and color, aluminum, magnesium, zinc, strontium, barium, cadmium, nickel, and perchlorates. At an average weight of about 0.85 lb per item, about 1.1 tons per year of these materials will be deposited on the range.

Hazardous constituents in pyrotechnic residues are typically present in small amounts or low concentrations, and are bound up in relatively insoluble compounds. As inert, incombustible solids with low concentrations of leachable metals, these materials typically do not meet the Resource Conservation and Recovery Act (RCRA) criteria for characteristic hazardous wastes. The perchlorate compounds present in the residues are relatively soluble, although persistent (i.e., do not break down readily into other compounds under natural conditions) in the environment, and should disperse quickly.

Table 4.1.4.1.1-3: Sonobuoy Hazardous Materials, No-action Alternative (based on average amounts of constituents)

Sonobuoy Constituent	Annual Amount	
	lb	Kilogram (kg)
Fluorocarbons	121	55
Copper	7,000	3,180
Lead	5,760	2,620
TOTAL	12,900	5,860

Note: values rounded to three significant digits.
Source: U.S. Department of the Navy San Clemente Island Ordnance Database

<u>Chaff</u>

Chaff is a thin polymer with a metallic (aluminum) coating used to decoy enemy radars. The chaff is shot out of launchers using a propellant charge. Under the No-action Alternative, it is estimated that 34 CHAFFEX and 738 ACMs will be held per year, releasing about 4,700 packages of chaff over the Open Ocean Area. The fine, neutrally buoyant chaff streamers act like particulates in the water, temporarily increasing the turbidity of the ocean's surface, but they quickly disperse, and the widely spaced operations would have no discernable effect on the marine environment.

Hazardous Wastes

Used hazardous materials and chemical byproducts generated at sea are not considered to be hazardous materials until offloaded in port. The accumulation of used hazardous materials aboard ship will not increase. Used and excess hazardous wastes will continue to be managed in compliance with OPNAVINST 5090.1B (2003), Chapter 12. The No-action Alternative will not affect hazardous materials management practices aboard ship.

4.1.4.1.2 HRC RDT&E Operations

HRC RDT&E operations under the No-action Alternative will consist of the Naval Undersea Warfare Center (NUWC) shipboard tests on the Fleet Operational Readiness (FORACS) and Shipboard Electronic Systems Evaluation Facility (SESEF) ranges. Navy vessels engaged in these operations will use minor quantities of hazardous materials and generate minor quantities of used hazardous materials during routine ship operations. These materials will be managed in accordance with OPNAVINST 5090.1B. Hazardous materials inventories will be replenished and used hazardous materials will be offloaded while the vessels are in port.

4.1.4.1.3 Major Exercises

Major Exercises under the No-action Alternative, such as RIMPAC and USWEX, include ongoing training operations and, in some cases, RDT&E operations. Potential impacts from Major Exercises will be similar to those described earlier for training operations and RDT&E operations.

4.1.4.2 ALTERNATIVE 1 (HAZARDOUS MATERIALS AND WASTES—OPEN OCEAN)

4.1.4.2.1 Increased Tempo and Frequency of Training Operations

Hazardous Materials

Increases in shipboard hazardous materials transport, storage, and use to support increased training operations under Alternative 1 would be managed in compliance with OPNAVINST 5090.1B (2002), Chapter 19. No new types of hazardous materials would be required under Alternative 1, and existing hazardous materials storage and handling facilities, equipment, supplies, and procedures would continue to provide for adequate management of these materials. No releases of hazardous materials to the environment and no unplanned exposures of personnel to hazardous materials are anticipated under this alternative.

Open Ocean Area training operations involving hazardous materials would increase by varying degrees from current levels in support of the Fleet Readiness Training Plan (FRTP). Those increases are described in Table 4.1.4.2.1-1. Only the number of training operations would increase; no new types of training would be introduced. Air-to-surface gunnery and air combat maneuvers would experience the largest percentage increases from baseline levels under Alternative 1. Amounts of expended training materials would increase in rough proportion to the overall increases in these training operations.

Hazardous Wastes

The amounts of hazardous wastes generated by normal vessel and aircraft operations and maintenance during training under Alternative 1 would be about the same as that generated under the No-action Alternative. The amounts of hazardous wastes generated by training operations under Alternative 1 would be incrementally greater than those under the No-action Alternative (see Table 4.1.4.2.1-1). All hazardous wastes would continue to be managed in compliance with OPNAVINST 5090.1B (2003), Chapter 12.

No substantial changes in hazardous waste management are anticipated for operating Navy assets under Alternative 1.

Table 4.1.4.2.1-1. Navy Training Operations with Hazardous Training Materials Alternative 1—Open Ocean Areas

Training Activity	Training Material			
	Item	Annual Quantity (#)		
		No-action	Alt 1	Change
VBSS	0.50 caliber gun ammunition	Varies		
S-S GUNEX	5" / 76 mm ammunition	1,380	1,820	440
	Smoke canister	36	47	11
	7.62mm / 0.50-cal ammunition	10,400	13,700	3,300
A-S GUNEX	7.62mm / 0.50-cal ammunition			
	Smoke canister	128	152	24
BOMBEX (Sea)	MK-76	315	315	0
	MK-82	105	105	0
	BDU-45	60	60	0
	CBU	35	35	0
	MK-83	18	18	0
	Smoke canister	35	35	0
SINKEX	varies, depending on weapons and platform			
ASUW TORPEX (Submarine-Surface)	MK-48 torpedo	105 105	105	0
ASW TRACKEX	Sonobuoy	6,228	6,228	0
	Smoke canister	279	279	0
	MK-39	152	152	0
ASW TORPEX	REXTORP	397	397	0
	MK-39	397	397	0
ACM	Chaff	4,428	4,644	216
	Flare	2,214	2,322	108
S-A GUNEX	5" projectile	258	324	66
	7.62-mm projectile	258	324	66
	20-mm projectile	162,000	203,000	41,000
CHAFFEX	MK-36 Super Rapid Bloom Offboard Chaff	255	255	0

Note: Training operations not listed above are assumed to have no hazardous materials associated with them.

4.1.4.2.2 Enhanced RDT&E Operations

RDT&E operations under Alternative 1 would consist of the NUWC shipboard tests on the FORACS and SESEF ranges. Navy vessels engaged in these operations would use minor quantities of hazardous materials and generate minor quantities of used hazardous materials during routine ship operations. These materials would be managed in accordance with OPNAVINST 5090.1B. Hazardous materials inventories would be replenished and used hazardous materials would be offloaded while the vessels are in port.

4.1.4.2.3 HRC Enhancements

None of the HRC Enhancements would have a substantial effect on hazardous materials use or hazardous waste generation under Alternative 1.

4.1.4.2.4 Major Exercises

Major Exercises consist of training operations and, in some cases, RDT&E operations, both addressed above. Potential impacts would be similar to those described earlier for training operations and RDT&E operations.

4.1.4.3 ALTERNATIVE 2 (HAZARDOUS MATERIALS AND WASTES—OPEN OCEAN)

4.1.4.3.1 Increased Tempo and Frequency of Training Operations

Hazardous Materials

Increases in shipboard hazardous materials transport, storage, and use to support increased training operations under Alternative 2 would be managed in compliance with OPNAVINST 5090.1B (2002), Chapter 19. No substantial changes in hazardous materials management practices for ordinary ship operations and maintenance are anticipated under Alternative 2.

Open-ocean training operations involving hazardous materials would increase by varying degrees from current levels in support of the FRTP. Only the number of training operations would increase; no new types of training would be introduced. Amounts of expended training materials would increase in rough proportion to the overall increase in these training operations (see Table 4.1.4.3.1-1). Table 4.1.4.3.1-2 shows the increase in releases of hazardous materials for sonobuoys.

Table 4.1.4.3.1-1. Navy Training Operations with Hazardous Training Materials Alternative 2—Open Ocean Areas

Training Activity	Training Material			
	Item	Annual Quantity (#)		
		No-action	Alt 2	Change
VBSS	0.50 caliber gun ammunition	varies		
S-S GUNEX	5" / 76 mm ammunition	1,380	1,820	440
	Smoke canister	36	47	11
	7.62mm / 0.50-cal ammunition	10,400	13,700	3,300
A-S GUNEX	7.62mm / 0.50-cal ammunition	51,200	60,800	9,600
	Smoke canister	128	152	24
BOMBEX (Sea)	MK-76	315	342	27
	MK-82	105	114	9
	BDU-45	60	65	5
	CBU	35	38	3
	MK-83	18	19	1
	Smoke canister	35	38	3
SINKEX	varies, depending on weapons and platform			
ASUW TORPEX (Submarine-Surface)	MK-48 torpedo	105	114	9
ASW TRACKEX	Sonobuoy	6,228	6,965	737
	Smoke canister	279	312	33
	MK-39	152	170	18
ASW TORPEX	REXTORP	397	440	43
	MK-39	397	440	43
ACM	Chaff	4,428	4,644	216
	Flare	2,214	2,322	108
S-A GUNEX	5" projectile	258	324	66
	7.62-mm projectile	258	324	66
	20-mm projectile	162,000	203,000	41,000
CHAFFEX	MK-36 Super Rapid Bloom Offboard Chaff	255	278	23

Note: Training operations not listed above are assumed to have no hazardous materials associated with them.

Table 4.1.4.3.1-2. Sonobuoy Hazardous Materials, Alternative 2 (based on average amounts of constituents)

Sonobuoy Constituent	Annual Amount		Increase Over Baseline (percent)
	lb	kg	
Fluorocarbons	135	61	11
Copper	7,780	3,540	11
Lead	6,410	2,910	11
TOTAL	14,300	6,510	11

Note: values rounded to three significant digits.
Source: U.S. Department of the Navy San Clemente Island Ordnance Database

Hazardous Wastes

The overall amount of hazardous waste generated by normal vessel and aircraft operation and maintenance during training under Alternative 2 would be more than that generated under the No-action Alternative. This increase would be due primarily to the increased number of training operations anticipated under Alternative 2. All hazardous wastes would continue to be managed in compliance with OPNAVINST 5090.1B (2003), Chapter 12. No substantial changes in hazardous materials management practices are anticipated under Alternative 2.

4.1.4.3.2 Enhanced RDT&E Operations

RDT&E operations under Alternative 2 would consist of the NUWC shipboard tests on the FORACS and SESEF ranges. Navy vessels engaged in these operations would use minor quantities of hazardous materials and generate minor quantities of used hazardous materials during routine ship operations. These materials would be managed in accordance with OPNAVINST 5090.1B. Hazardous materials inventories would be replenished and used hazardous materials would be offloaded while the vessels are in port.

4.1.4.3.3 Additional Major Exercises—Multiple Strike Group Training

Hazardous Materials

Up to three Strike Groups would be allowed to conduct training operations simultaneously in the HRC. Vessels, aircraft, and other military assets employed in these operations would carry and use hazardous materials for routine operation and maintenance. Increased hazardous materials storage, transport, or use resulting from these additional training operations would be managed in compliance with OPNAVINST 5090.1B (2002), Chapter 19.

Hazardous Wastes

Vessels, aircraft, and other military assets employed in the Strike Group exercises would generate hazardous wastes from routine operation and maintenance activities. Increased hazardous wastes storage, transport, and disposal resulting from these additional training operations would be managed in compliance with OPNAVINST 5090.1B (2002), Chapter 19. This Alternative would not affect hazardous materials management practices aboard ship.

4.1.5 HEALTH AND SAFETY—OPEN OCEAN

4.1.5.1 NO-ACTION ALTERNATIVE (HEALTH AND SAFETY—OPEN OCEAN)

4.1.5.1.1 HRC Training Operations

Public Safety

Training operations that occur over the Open Ocean Area will continue to be conducted mainly in Warning Areas. Range Safety officials will ensure that projectiles, lasers, targets, and missiles are operated safely, and that air operations and other potentially hazardous training operations are safely executed in controlled areas. The Navy's standard range safety procedures are designed to avoid risks to the public and to Navy operations and its personnel. Before any potentially hazardous training operation is allowed to proceed, the overwater target area will be determined to be clear using inputs from ship sensors, visual surveillance of the range from aircraft and range safety boats, and radar and acoustic data.

Target areas will be cleared of personnel prior to conducting training operations, so the only public health and safety issue will be if an operation exceeded the safety area boundaries. Risks to public health and safety are reduced, in part, by providing termination systems on some of the missiles and by determining that the target area—based on the distance the system can travel for those missiles without flight termination (typical air-to-air missile)—is clear. In those cases where a weapon system does not have a flight termination capability, the target area will be determined to be clear of unauthorized vessels and aircraft, based on the flight distance the vehicle can travel, plus a 5-mile (mi) area beyond the system performance parameters.

In addition, all training operations must comply with DoD Directive 4540.1, "Use of Airspace by U.S. Military Seas" (Department of Defense 1981) and OPNAVINST 3770.4A, "Use of Airspace by U.S. Military Aircraft and Firing Over the High Seas" (U.S. Department of the Navy 1981), which specify procedures for conducting aircraft operations and for firing missiles and projectiles. The missile and projectile firing areas are to be selected "so that trajectories are clear of established oceanic air routes or areas of known surface or air activity" (Department of Defense, 1981).

During use of ordnance from aircraft or surface vessels, range procedures and safety practices ensure that there are no vessels or aircraft in the intended path or impact area of the ordnance. For operations with a large hazard footprint (e.g., MISSILEXs), special sea and air surveillance measures are taken to search for, detect, and clear the area of intended operations. Aircraft are required to make a clearing pass over the intended target area to ensure that it is clear of boats, divers, or other non-participants. Aircraft carrying ordnance are not allowed to over-fly surface vessels. The remoteness of the island and its offshore ranges provides a large degree of isolation from population centers. The Navy establishes temporary access limitations for areas with risk of injury or property damage to the public. The Navy notifies the public of hazardous operations through the use of NOTAMs and NOTMARs.

Demolition operations would be conducted in accordance with Commander, Naval Surface Force, U.S. Pacific Fleet Instruction 3120.8F (U.S. Department of the Navy, 1993). Commander, Naval Surface Force, U.S. Pacific Fleet Instruction 3120.8F specifies detonation procedures for underwater ordnance to avoid endangering the public or impacting other non-military operations, such as possible shipping, recreational boating, diving, and commercial or recreational fishing.

Recreational diving within the Open Ocean Area takes place primarily at known diving sites. The locations of popular diving sites are well-documented, dive boats are typically well-marked, and diver-down flags will be visible from the ships conducting the proposed training, so possible interactions between training operations within the offshore areas and scuba diving will be minimized. The Navy will also notify the public of hazardous operations through NOTAMs and NOTMARs.

Offshore Operations include the use of mid-frequency sonar. The effect of sonar on humans varies with the frequency of sonar involved. Of the three types of sonar (high-, mid-, and low-frequency), mid- frequency and low-frequency are the two with the greatest potential to affect humans. Research was conducted for mid-frequency sonar at the Naval Submarine Medical Research Laboratory and the Navy Experimental Diving Unit to determine permissible limits of exposure to mid-frequency sonars. Based on this research, an unprotected diver could safely operate for over 1 hour at a distance of 1,000 yards (yd) from the Navy's most powerful sonar. At this distance, the sound pressure level would be approximately 190 dB. At 2,000 yd or approximately 1 nm, this same unprotected diver could operate for over 3 hours. Exposure to mid frequency sonar in excess of 190 dB could result in slight visual-field shifts, fogging of the faceplate, spraying of any water within the mask, and general ear discomfort associated with loud noise. In addition, the Navy has conducted a comprehensive, scientifically based research program on the potential effects of low-frequency sound on human divers. Medical doctors and clinical researchers have carried out extensive computer modeling and testing of human and animal subjects. Based on the data obtained from these studies, the Navy Bureau of Medicine and Surgery incorporated a safety margin and established a conservative limit of 145 dB for low-frequency received sound level for recreational and commercial divers. Navy sources of low-frequency active sonar are operated such that the sound level never exceeds 145 dB at known recreational or commercial dive sites. Low frequency sonar is currently not being used in Hawaii.

Prior public notification of Navy Training operations, use of known training areas, avoidance of non-military vessels and personnel, and the remoteness of the open ocean areas reduce the potential for interaction between the public and Navy vessels. To date, these safety strategies have been effective.

Public Health

Management of hazardous materials and hazardous wastes in conjunction with Navy training operations on the Open Ocean Area has been addressed earlier in Section 4.1.4. No substantial releases of these materials to the environment are anticipated.

Materials expended on the sea ranges during Navy training operations will include liquid and soluble hazardous constituents that will quickly disperse in the water column. These materials also will include solid hazardous constituents that will quickly settle to the ocean floor and soon become buried in sediment, coated by corrosion, or encrusted by benthic organisms. Due to the very small quantities of these materials relative to the extent of the sea ranges, the volume of the ocean, and the remoteness of the sea ranges relative to human populations, their concentrations in areas of potential human contact generally will be undetectable.

With regard to EMR hazards, SOPs are in place to protect Navy personnel and the public. These procedures include setting the heights and angles of EMR transmission to avoid direct exposure, posting warning signs, establishing safe operating levels, and activating warning lights when radar systems are operational. Sources of EMR include radar, navigational aids, and Electronic Warfare (EW). These systems are the same as, or similar to, civilian navigational aids and radars at local airports and television weather stations throughout the United States. EW systems emit EMR similar to that from cell phones, hand-held radios, commercial radio, and television stations. Measures also are in place to avoid excessive exposure from EMR emitted by military aircraft. To avoid excessive exposures from EMR, military aircraft are operated in accordance with standard procedures that establish minimum separations distances between EMR emitters and people, ordnance, and fuels.

4.1.5.1.2 HRC RDT&E Operations

RDT&E operations under the No-action Alternative would consist of the NUWC shipboard tests on the SESEF range and missile defense operations. Navy vessels engaged in operations on the SESEF range would pose no public health or safety risk during routine ship operations. Missile defense operations include aerial targets launched from PMRF, mobile sea-based platforms, or military cargo aircraft. During Navy Aegis missile defense RDT&E operations, a ballistic missile target vehicle is launched from PMRF and intercepted by a ship-launched missile. Missile launches by their very nature involve some degree of risk, and it is for this reason that DoD and PMRF have specific launch and range safety policies and procedures to assure that any potential risk to the public and government assets (launch support facilities) are minimized.

Many procedures are in place to mitigate the potential hazards of an accident during the flight of one of these missiles. The PMRF Flight Safety Office prepares Range Safety Operational Procedure (RSOP) for each mission that involves missiles, supersonic targets, or rockets. This includes debris of hit-to-kill intercept tests where an interceptor missile impacts a target missile. The Commanding Officer of PMRF approves each RSOP, which includes specific requirements and mission rules. The Flight Safety Office has extensive experience in analyzing the risks posed by such operations. In spite of the developmental nature of missile operations (which leads to a significant probability of mission failure), the United States has an unblemished record of public safety during missile and rocket launches. Appendix L describes the general approach to protect the public and involved personnel from launch accident hazards.

Ship and Aircraft Exclusion Areas ensure that vehicles are not in areas of unacceptable risk. These areas include the places where planned debris may impact (such as dropped stages of multi-stage vehicles or debris from hit-to-kill intercept engagements) and also the regions at risk if there is a failure (such as under the planned flight path). Aircraft regions are designed in a similar fashion. The specific definition of each of these regions is determined by a probabilistic risk analysis that incorporates modeling of the vehicle response to malfunctions, mission rules (such as Destruct Limits), and the vulnerability of vehicles to debris. NOTMARs and NOTAMs are issued for the entire region that may be at risk, encompassing both exclusion areas and warning areas (areas with very remote probability of hazard). Surveillance by aircraft and satellite is used to ensure that there are no ships or aircraft in cleared areas, and also that the collective risk meets acceptable risk criteria for the mission.

Prior to each mission, a comprehensive analysis of the proposed mission, including flight plans, planned impact areas, vehicle response to malfunctions, and effects of flight termination action is performed. A probabilistic analysis is performed with sufficient conservative assumptions incorporated to ensure that the risks from the mission are acceptable. The guidance of the Range Commanders' Council (RCC) for acceptable risk (in RCC-321) is followed. These acceptable risk criteria are designed to ensure that the risk to the public from range operations is lower than the average background risk for other third-party activities (for example, the risk of a person on the ground being injured from an airplane crash).

4.1.5.1.3 Major Exercises

Major Exercises consist of training operations and, in some cases, RDT&E operations, both addressed above. Potential impacts will be similar to those described earlier for training operations and RDT&E operations.

4.1.5.2 ALTERNATIVE 1 (HEALTH AND SAFETY—OPEN OCEAN)

4.1.5.2.1 Increased Tempo and Frequency of Training Operations

Offshore operations proposed under Alternative 1 would have all the components of the No-action Alternative, but training operations would increase and new weapons platforms and systems would be employed. The safety procedures implemented under this alternative are the same as those described under the No-action Alternative.

Public Safety

Several training operations would experience increases from current levels in support of the FRTP. Table 2.3.1-1 describes those increases. Only the number of training operations would increase; no new types of training would be introduced. Increases in the number of individual training operations would increase the potential for conflicts with non-participants. Given the Navy's comprehensive safety procedures and its safety record for these operations, however, the actual potential for public safety impacts from training operations would remain low.

Public Health

Management of hazardous materials and hazardous wastes in conjunction with Navy training operations on the Open Ocean Area is addressed in Section 4.1.4. No substantial releases of these materials to the environment are anticipated.

The quantities of materials expended on the sea ranges during Navy training operations would increase moderately under Alternative 1, as compared to the quantities expended under the No-action Alternative. Expended training materials would include liquid or soluble hazardous materials that would quickly disperse in the water column. They also would include solid hazardous constituents that would quickly settle to the ocean floor and soon become buried in sediment, coated by corrosion, or encrusted by benthic organisms. Due to the very small quantities of these materials relative to the extent of the sea ranges, the volume of the ocean, and the remoteness of the sea ranges relative to human populations, their concentrations in areas of potential human contact generally would be low to undetectable.

4.1.5.2.2 Enhanced RDT&E Operations

RDT&E operations under Alternative 1 would consist of the NUWC shipboard tests on the FORACS and SESEF ranges and missile defense operations. Navy vessels engaged in NUWC operations would pose no public health or safety risk during routine ship operations. Proposed launches associated with enhanced and future operations would have a similar impact on health and safety as those described for the No-action Alternative.

4.1.5.2.3 HRC Enhancements and Major Exercises

Major Exercises consist of training operations and, in some cases, RDT&E operations, both addressed earlier. Potential impacts will be similar to those described earlier for training operations and RDT&E operations.

4.1.5.3 ALTERNATIVE 2 (HEALTH AND SAFETY—OPEN OCEAN)

4.1.5.3.1 Increased Tempo and Frequency of Training Operations

Public Safety

Several training operations would experience increases from current levels in support of the FRTP. Table 2.2.1-1 describes those increases. Only the number of training operations would increase; no new types of training would be introduced. Increases of over 100 percent in the number of individual training operations would increase the potential for conflicts with non-participants. Given the Navy’s safety procedures and its safety record for these operations, however, the actual potential for public safety impacts from training operations would remain low.

Public Health

Management of hazardous materials and hazardous wastes in conjunction with Navy training operations on the Open Ocean Area is addressed in Section 4.1.4. No substantial releases of these materials to the environment are anticipated.

The quantities of materials expended on the sea ranges during Navy training operations would increase substantially under Alternative 2, as compared to the quantities expended under the No-action Alternative. Expended training materials would include liquid and soluble hazardous constituents that would quickly disperse in the water column. They also would include solid hazardous constituents that would quickly settle to the ocean floor and soon become buried in sediment, coated by corrosion, or encrusted by benthic organisms. Due to the very small quantities of these materials relative to the extent of the sea ranges, the volume of the ocean, and the remoteness of the sea ranges relative to human populations, their concentrations in areas of potential human contact generally would be low to undetectable.

4.1.5.3.2 Enhanced RDT&E Operations

RDT&E operations under Alternative 2 would consist of the NUWC shipboard tests on the FORACS and SESEF ranges and missile defense operations. Navy vessels engaged in NUWC operations would pose no public health or safety risk during routine ship operations. Proposed launches associated with enhanced and future operations would have a similar impact on health and safety as those described for the No-action Alternative.

4.1.5.3.3 Additional Major Exercises—Multiple Strike Group Training

Vessels, aircraft, and other military assets employed in the Strike Group exercises would increase the overall intensity and duration of Navy training operations on the sea ranges. The Strike Group training would be similar to other large-exercise training operations held on the range. As with those other operations, the Multiple Strike Group training operations are not anticipated to pose a substantial risk to public safety.

4.1.6 NOISE—OPEN OCEAN

4.1.6.1 NO-ACTION ALTERNATIVE, ALTERNATIVE 1, AND ALTERNATIVE 2 (NOISE—OPEN OCEAN)

Potential airborne noise as a result of Navy training operations was examined to determine what effect the operations produced would have in the overall ambient noise levels within the HRC that resulted in an effect on the traditionally analyzed sensitive human noise receptors (i.e., schools, hospitals, etc.).

The factors considered in determining the significance of noise effects on marine mammals, birds, and fish are discussed within other sections of this chapter. Potential noise effects on fish (to the extent that noise introduced into the sea can affect catch) and marine mammals are discussed in Section 4.1.2.

While HRC training operations do generate airborne noise, noise-generating events in the open ocean area do not result in perceptible changes to the overall noise environment. In addition, training operations do not have an effect on sensitive noise receptors because these operations are typically conducted away from populated areas and most sensitive noise receptors. For operations that involve the expenditure of munitions either from aircraft or surface vessels, the Navy uses advance notice and scheduling, and strict on-scene procedures to ensure the area is clear of civilian vessels or other non-participants. The public is notified of the location, date, and time of the hazardous operations via NOTMARs, thereby precluding any acoustical impacts to sensitive receptors. Proposed increases in operations under Alternative 1 and Alternative 2 would result in increases in noise events. The increases would contribute a negligible level of increased noise, however, because they would continue to occur within the open ocean where typically no sensitive noise receptors are present.

The HRC is approved for supersonic flight, however, no data are available that describe the exact location of supersonic operations. Supersonic activity in the HRC is generally restricted to altitudes greater than 30,000 ft above sea level or in areas at least 30 nm from shore. These restrictions prevent most sonic booms from reaching the ground. There would be no perceptible increase in long-term noise levels as a result of sonic booms, and populated areas are not likely to be affected since such flights would typically be conducted in areas greater than 30 nm offshore and above 30,000 ft. More detailed information on sonic booms is provided in Appendix H.

4.1.7 SOCIOECONOMICS—OPEN OCEAN AREA

4.1.7.1 NO-ACTION ALTERNATIVE, ALTERNATIVE 1, AND ALTERNATIVE 2 (SOCIOECONOMICS—OPEN OCEAN AREA)

This analysis examines the potential for operations that could affect (either adversely or beneficially) socioeconomic activity within the HRC and the surrounding region of interest. Typical socioeconomic analysis considerations for offshore areas include commercial sea transport, commercial and sport fishing, and other tourism-related activities (e.g., whale watching).

Commercial shipping, commercial fishing, sport fishing, and tourist-related activities occur regularly within the HRC open ocean area. Under the No-action Alternative, there will be no change in the nature, scope, or intensity of operations within the HRC. Long-range advance notice of scheduled operations' times and locations to be used within the HRC are made available to the public and commercial vessels via NOTMARS. These NOTMARs provide notice to commercial ship operators, commercial fisherman, recreational boaters, and other area users that the military will be operating in a specific area, allowing them to plan their activities accordingly. These temporary range clearance procedures for safety purposes have been employed regularly over time without significant socioeconomic impacts on commercial shipping, commercial fishing, or tourist-related activities.

Offshore training operations may have the potential for occasional, temporary disruptions of commercial shipping, commercial fishing, and tourism within the HRC; however, such operations would be infrequent and of very limited duration. Offshore training operations will not result in significant restrictions on commercial shipping, commercial fishing, or tourism-related activities due to the Navy's procedures for issuing NOTMARs and the ability of commercial vessels to plan accordingly when NOTMARs are issued.

Proposed increases in training operations under Alternative 1 and Alternative 2 would result in increases in training operations in the open ocean. However, the Navy would continue to issue NOTMARs for scheduled operation times and locations, and precautions would be taken to ensure that no interactions between military operations and civilian vessels occurred during training operations. No additional impacts to socioeconomics are anticipated.

4.1.8 WATER RESOURCES—OPEN OCEAN

4.1.8.1 NO-ACTION ALTERNATIVE (WATER RESOURCES—OPEN OCEAN)

4.1.8.1.1 HRC Training Operations

Under the No-action Alternative, Navy training operations in the Open Ocean Area (as listed in Table 4.1-1) would expend a wide variety of materials, a substantial portion of which would not be recovered. Types of unrecovered materials include the following:

- Incidental release of materials
- Debris and/or discharge

- Expendable devices
- Jet fuel, oils, hydraulic fluid, batteries, and explosive cartridges
- Torpedoes and missiles
- Chaff and flare

Potential impacts to water quality would primarily be associated with the incidental release of materials from surface ships, submarines, or other vessels. Hazardous constituents of concern possibly emitted from the surface ship or submarine (i.e., fuel, oil) are less dense than seawater and would remain near the surface and therefore would not affect the benthic community. Sheens produced from these operations are not expected to cause any significant long-term impact on water quality because a majority of the toxic components would evaporate within several hours to days and/or be degraded by biogenic organisms (e.g., bacteria, phytoplankton, zooplankton).

The resulting debris and/or discharges from operations may also affect the physical and chemical properties of benthic habitats and the quality of surrounding marine waters. Hazardous constituents can be released from sonobuoys, targets, torpedoes, missiles, and underwater explosions. Impacts from hazardous materials, primarily batteries, may affect water or sediment quality in the vicinity of the debris. The release of metal ions (e.g., lead, copper, and silver) during operation of the seawater batteries or as a result of corrosion of sonobuoy or target components represents a source of potential environmental degradation for marine invertebrates. In general, the toxicological impact of exposure to high concentrations of heavy metals can result in either immediate mortality of exposed organisms (acute effect) or accumulation of heavy metal residues by these same species. Benthic communities exposed to high concentrations of heavy metals (specifically copper and zinc) are characterized by reduced species richness (number of species), reduced abundance (number of organisms), and a shift in community composition from sensitive to more tolerant taxa.

Sonobuoys are expendable devices used for the detection of underwater acoustic sources and for conducting vertical water column temperature measurements. The primary source of contaminants in each sonobuoy is the seawater battery; these batteries have a maximum operational life of 8 hours, after which the chemical constituents in the battery are consumed. Long-term releases of lead and other metal from the remaining sonobuoy components will be substantially slower than the release during seawater battery operation. Lead has the potential to accumulate in bottom sediments, but the potential concentrations will be well below sediment quality criteria based on thresholds for negative biological effects. By far the greatest amount of material will likely to be deposited in a relatively inert form, as the lead ballast weights will become encrusted with lead oxide and other salts and be covered by the bottom sediments.

Sonobuoy emissions are not anticipated to accumulate or result in additive effects on water or sediment quality as will occur within an enclosed body of water since the constituents of sonobuoys will be widely dispersed in space and time throughout training areas. In addition, dispersion of released metals and other chemical constituents due to currents near the ocean floor will help minimize any long-term degradation of water and sediment quality. As a result, substantial long-term degradation of marine water or sediment quality will not likely occur as a result of sonobuoy operations.

Most air targets contain jet fuel, oils, hydraulic fluid, batteries, and explosive cartridges as part of their operating systems. Following a training operation, targets are generally flown (using remote control) to a pre-determined recovery point. Fuel is shut off by an electronic signal, the engine stops, and the target descends. A parachute is activated and the target ascends to ocean surface where it is retrieved by range personnel using helicopters or range support boats. However, some targets are physically hit by missiles, and these targets fall into the ocean, and can potentially result in temporary, localized adverse impacts on water quality. Most of the hazardous constituents of concern (i.e., fuel, oil) are less dense than seawater and will remain near the surface and therefore will not affect sediment quality. Ocean currents at the surface and within the water column will also rapidly dilute any metal ions or other chemical constituents released by the target. Sheens (e.g., oil or fuel) produced from these operations have a less than significant long-term effect on water quality because a majority of the toxic components (e.g., aromatics) would evaporate within several hours to days or be degraded by biogenic organisms. This process may occur at a faster rate depending on sea conditions (e.g., wind and waves).

Potential effects of torpedoes on water or sediment quality are associated with propulsion systems, chemical releases, or expended accessories. During normal exercise operations, none of the potentially hazardous or harmful materials are released into the marine environment because the torpedo is sealed and, at the end of a run, the torpedoes are recovered. It would be unlikely that OTTO Fuel II contained in a torpedo would be released into the marine environment. Under the worst-case scenario of a catastrophic failure, however, up to 59 pounds (lb) could be released from a MK-46 (U.S. Department of the Navy, 1996). It is anticipated that in the event of such a maximum potential spill, temporary impacts to water quality may occur, but no long-term significant impacts to water quality are anticipated because:

- The water volume and depth would dilute the spill
- Although OTTO (torpedo) Fuel II may be toxic to marine organisms (U.S. Department of the Navy, 1996), in particular, sessile benthic animals and vegetation, mobile organisms may move away from areas of high OTTO Fuel II concentrations
- Common marine bacteria degrade and ultimately break down OTTO Fuel (U.S. Department of the Navy, 1996).

Missiles contain hazardous materials as normal parts of their functional components. In general, the largest single hazardous material type is solid propellant, but there are numerous hazardous materials used in igniters, explosive bolts, batteries, and warheads. For missiles falling in the ocean, the principal source of potential impacts to water and sediment quality will be the unburned solid propellant residue and batteries. The remaining solid propellant fragments will sink to the ocean floor and undergo changes in the presence of seawater. Testing has demonstrated that water penetrates only 0.06 inch into the propellant during the first 24 hours of immersion, and that fragments will very slowly release ammonium and perchlorate ions (Aerospace Corporation, 1998). These ions will be expected to be rapidly diluted and disperse in the surrounding water such that local concentrations will be extremely low. However, assuming that all of the propellant on the ocean floor will be in the form of 4-inch cubes, only 0.42 percent of it will be wetted during the first 24 hours. If all the ammonium perchlorate leaches out of the wetted propellant, then approximately 0.01 lb will enter the surrounding seawater. The concentration will decrease over time as the leaching rate decreases and further dilution occurs. The aluminum will remain in the propellant binder and eventually be oxidized by seawater to aluminum oxide. The remaining binder material and aluminum oxide will not pose a threat to the marine environment. Therefore, effects from missile propellant may have temporary, minimal impacts on water quality.

Both chaff and flares are used during aircraft training operations. Chaff is an aluminum coated glass fiber used as a defensive mechanism to reflect radar. All of the components of the aluminum coating are present in seawater in trace amounts, except magnesium, which is present at 0.1 percent. The stearic acid coating is biodegradable and nontoxic. The potential for chaff to have a long-term adverse impact on water quality is very unlikely, and chemicals leached from the chaff will also be diluted by the surrounding seawater, thus reducing the potential for concentrations to build up to levels that can have effects on sediment quality and benthic habitats.

Flares are used over water during training. They are composed of a magnesium pellet that burns quickly at a very high temperature leaving ash and end caps and pistons. Laboratory leaching tests of flare pellets and residual ash using synthetic seawater found barium in the pellet tests, while boron and chromium were found in the ash tests. The pH of the test water was raised in both tests. Ash from flares will be dispersed over the water surface and then settle out. Chemical leaching will occur throughout the settling period through the water column, and any leaching after the particles reached the bottom will be dispersed by currents. Therefore, localized and temporary impacts to water quality may occur, but no long-term impact is anticipated.

4.1.8.1.2 HRC RDT&E Operations

RDT&E operations under the No-action Alternative are listed in Table 4.1-1. Unrecovered materials associated with RDT&E operations will be similar to those earlier above for training operations with the exception of Missile Operations and Missile Defense operations. Therefore, the discussion presented above would apply here. Potential water quality impacts associated with Missile Operations and Missile Defense operations include hydrocarbon chloride deposition and solid propellants released in the open ocean.

The effects of hydrogen chloride deposition were modeled from the ASRM. Under nominal launch conditions when the relative humidity is less than 100 percent, deposition of hydrogen chloride gas on the surface of the sea would not be significant. Analyses for the most conservative case, where rain would be present soon after test firing the ASRM, concluded that acid deposition to surface water will not result in any impacts to larger surface water bodies in the area. This analysis was based on the buffering capacity of fresh water which is considerably lower than the buffering capacity of sea water; therefore, it is expected that even for the most conservative case condition where all of the hydrogen chloride emission falls over the open ocean area, the pH level would not be depressed by more than 0.2 standard units for more than a few minutes. (U.S. Army Space and Strategic Defense Command)

Mathematical modeling results of ASRM tests indicated the maximum deposition of aluminum oxide would measure about 1.6 milligrams per meter (mg/m). Aluminum oxide is not considered toxic under natural conditions but may contribute potentially harmful species of soluble aluminum forms under acidic conditions. It is difficult to quantify the portion of aluminum oxide that reacts with hydrogen chloride to form additional toxic aluminum species. The most conservative approach assumes that all of the aluminum oxide deposited has reacted with hydrogen chloride. With this extremely conservative assumption, the deposition of about 1.6

mg/m2of aluminum oxide equals approximately 0.0054 milligrams per liter of aluminum at a water depth of 0.15 m (0.5 ft). This analysis is based on the assumption that it will not be raining at the time of the test event or within 2 hours after the event. Rain will increase the amount of deposition. (U.S. Army Space and Strategic Defense Command, 1994) Even in the most conservative scenario of an on-ship or early flight failure where all of the propellant is ignited and all of the hydrogen chloride and aluminum oxide are deposited, any toxic concentration of these products will be buffered and diluted by seawater to non-toxic levels within minutes. Consequently, any impacts from accidental release will be very transient.

Solid propellant is primarily composed of rubber (polybutadiene) mixed with ammonium perchlorate (AP). The AP contained within the matrix of rubber will dissolve slowly. While there is no definitive information on the solubility/toxicity of the propellant material in seawater, the toxicity is expected to be relatively low. As a most conservative case, toxic concentrations of AP would be expected only within a few yards of the source. (U.S. Department of the Navy, 1997) In the event of an ignition failure or other launch mishap, a fueled rocket motor or portions of the unburned fuel would likely fall into ocean waters. In that case, small fragments of fuel may float on the surface of the sea for a time, and some dissolution may occur. However, the fragments will become waterlogged and sink (U.S. Department of the Navy, 1997). In terms of the potential for cumulative impacts, the effect of any hydrogen chloride deposition in the open ocean area will be very transient due to the buffering capacity of seawater. Similarly, deposition of aluminum compounds will be very small and dispersal from surface mixing will be rapid. Therefore, no incremental, additive, cumulative impacts are anticipated.

NASA conducted a thorough evaluation of the effects of missile systems which are deposited in seawater. It concluded that the release of hazardous materials aboard missiles into seawater will not be significant. Materials will be rapidly diluted and, except for the immediate vicinity of the debris, will not be found at concentrations identified as producing any adverse effect. The Pacific Ocean depth in the vicinity of the launch area is thousands of feet deep, and consequently the water quality impact from the fuel is expected to be minimal. Any area affected by the slow dissolution of the propellant will be relatively small due to the size of the rocket motor or propellant pieces relative to the quantity of seawater (U.S. Department of the Navy, 1997).

4.1.8.1.3 Major Exercises

Major Exercises under the No-action Alternative, such as RIMPAC and USWEX, include ongoing training operations and in some cases RDT&E operations as listed in Table 4.1-1. Therefore, potential impacts from Major Exercises will be the same as those described earlier for training operations and RDT&E operations.

4.1.8.2 ALTERNATIVE 1 (WATER RESOURCES—OPEN OCEAN)

4.1.8.2.1 Increased Tempo and Frequency of Training Operations

Under Alternative 1, several training operations would increase from current levels. Only the number of training operations would increase; no new types of training would be introduced in the open ocean area. Increases in the number of individual training operations would proportionately increase the amounts of water pollutants released. However, the quantities of these materials would still be very small, relative to the extent of the sea ranges, and the large volume of ocean waters into which they would disperse. Therefore, the potential for water quality effects from these constituents would not be significant.

4.1.8.2.2 Enhanced and Future RDT&E Operations

Water quality effects associated with RDT&E operations under Alternative 1 would be the same as those described under the No-action Alternative. Future RDT&E operations (as listed in Table 4.1-1) would not introduce any new types of expended materials or debris into the open ocean area.

4.1.8.2.3 HRC Enhancement

No new types of expended material or debris would be introduced into the open ocean area. Therefore, proposed HRC enhancements would have no effect on open ocean water quality.

4.1.8.2.4 Major Exercises

Major Exercises under Alternative 1, such as RIMPAC and USWEX, include ongoing training operations and in some cases RDT&E operations as listed in Table 4.1-1. Although training operations associated with Major Exercises would increase under Alternative 1, potential impacts would still be the same as those described under the No-action Alternative.

4.1.8.3 ALTERNATIVE 2 (WATER RESOURCES—OPEN OCEAN)

4.1.8.3.1 Increased Tempo and Frequency of Training Operations

Under the Alternative 2, several training operations would increase from current levels and Alternative 1 levels. Only the number of training operations would increase; no new types of training would be introduced in the open ocean area. Increases in the number of individual training operations would proportionately increase the amounts of water pollutants released. However, the quantities of these materials would still be very small, relative to the extent of the sea ranges, and the large volume of ocean waters into which they would disperse. Therefore, the potential for water quality effects from these constituents would not be significant.

4.1.8.3.2 Enhanced and Future RDT&E Operations

Water quality effects associated with RDT&E operations under Alternative 2 would be the same as those described under the No-action Alternative. Future RDT&E operations (as listed in Table 4.1-1) would not introduce any new types of expended materials or debris into the open ocean area.

4.1.8.3.3 Additional Major Exercises – Multiple Strike Group Training

Vessels, aircraft, and other military assets employed during Multiple Strike Group training operations would increase the overall intensity and duration of Navy training operations on the sea ranges. The Strike Group training would be similar to other large-exercise training operations held on the range. Although the intensity of training operations associated with Multiple Strike Group Training would increase under Alternative 2, potential impacts would still be the same as those described under the No-action Alternative and no new types of expended material or debris would be introduced into the open ocean.

4.2 NORTHWESTERN HAWAIIAN ISLANDS

Table 4.2-1 lists ongoing operations for the No-action Alternative and proposed operations for Alternatives 1 and 2 near the Northwestern Hawaiian Islands. Alternative 2 is the preferred alternative.

Table 4.2-1. Operations Occurring Near the Northwestern Hawaiian Islands

Research, Development, Testing, and Evaluation (RDT&E) Operations
• Missile Defense

Missile defense operations for the No-action Alternative (see figure 2.2.2.4.1-4) and proposed operations for Alternatives 1 and 2 (see figure 2.2.3.4-1) have the potential to generate debris that falls within areas of the Northwestern Hawaiian Islands.

4.2.1 BIOLOGICAL RESOURCES

Some current flight trajectories could result in the Terminal High Altitude Area Defense (THAAD) missile flying over portions of the Hawaiian Islands National Wildlife Refuge. Of particular concern is overflight of Nihoa at the southeastern end of the Northwestern Hawaiian Islands, 240 nautical miles northwest of Oahu. The THAAD project office performed a debris analysis to identify weight and toxicity of the debris that could potentially impact Nihoa. Preliminary results indicated that debris greater than 0.5 foot-pounds is not expected to impact Nihoa. Such low-force debris is not expected to severely harm threatened, endangered, migratory, or other endemic species occurring on the island. The probability for debris to hit birds, seals, or other wildlife will be extremely low. Quantities of falling debris (e.g., solid rocket propellant) will be very low and widely scattered so as not to present a toxicity issue. Falling debris will also have cooled down sufficiently so as not to present a fire hazard for vegetation and habitat. If feasible, consideration will be given to alterations in the missile flight trajectory, to further minimize the potential for debris impacts on the island.

4.2.2 CULTURAL RESOURCES

Missile defense operations, including THAAD, have the potential to generate debris that falls within areas of the Northwestern Hawaiian Islands, particularly the vicinity of Nihoa. Some of these islands are known to have significant cultural resources sites, and the islands of Nihoa and Necker are listed in the National and Hawaii State Registers of Historic Places. Debris analyses of the types, quantities, and sizes associated with the Pacific Missile Range Facility (PMRF) missile operations indicate that the potential to impact land resources of any type is very low and extremely remote. In addition, trajectories can be altered under certain circumstances to further minimize the potential for impacts. As noted in Section 4.2.1, future missions will include consideration of missile flight trajectory alterations, if feasible, to minimize the potential for debris within the monument. As a result, impacts on cultural resources within the Northwest Hawaiian Islands are not expected.

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4.3 KAUAI

4.3.1 PACIFIC MISSILE RANGE FACILITY

4.3.1.1 PACIFIC MISSILE RANGE FACILITY/MAIN BASE

Table 4.3.1.1-1 lists ongoing operations for the No-action Alternative and proposed operations for Alternatives 1 and 2 at Pacific Missile Range Facility (PMRF)/Main Base. Alternative 2 is the preferred alternative.

Table 4.3.1.1-1. Operations Occurring at PMRF/Main Base

Training Operations	Research, Development, Testing, and Evaluation (RDT&E) Operations
• Expeditionary Assault (offshore)	• Testing and Evaluation Activities (offshore & land)
• Surface to Surface Gunnery Exercise (offshore & land)	• Electronic Combat/Electronic Warfare (offshore & land)
• Flare Exercise (offshore)	• Joint Task Force Wide Area Relay Network (land)
• Antisubmarine Warfare Tracking Exercise (offshore)	• High Frequency (offshore)
• Antisubmarine Warfare Torpedo Exercise (offshore)	• Missile Operations (land)
• Major Integrated Anti-Submarine Warfare (ASW) Training Exercise (offshore)	• Missile Defense (offshore & land)
• Electronic Combat Operations (offshore)	• Field Carrier Landing Practice (Alternative 1) (land)
• Mine Countermeasures Exercise (offshore)	• Additional Chemical Simulant (Alternative 1) (offshore & land)
• Mine Neutralization (offshore)	• Test Unmanned Surface Vehicles (Alternative 2) (offshore)
• Mine Laying (offshore)	• Test Unmanned Aerial Vehicles (Alternative 1) (offshore & land)
• Swimmer Insertion/Extraction (offshore)	• Test Hypersonic Vehicles (Alternative 1) (offshore & land)
• Special Warfare Operations (SPECWAROPS) (offshore & land)	• Portable Undersea Tracking Range (Alternative 1) (offshore)
• Air Operations (offshore & land)	• Large Area Tracking Range (LATR) Upgrade (Alternative 1) (land)
• Humanitarian Assistance/Non-Combatant Evacuation Operations (HAO/NEO) (land)	• Expanded Training Capability for Transient Air Wings (Alternative 1) (offshore & land)
• Command and Control (C2) (land)	• Enhanced Auto ID System and Force Protection Capability (Alternative 1) (land)
• Aircraft Support Operations (offshore & land)	• Construct Range Operations Control Building (Alternative 1) (land)
• Personnel Support Operations (land)	• Improve Fiber Optics Infrastructure (Alternative 1) (land)
	• Direct Energy (Alternative 2) (offshore & land)
	• Advanced Hypersonic Weapon (Alternative 2) (offshore & land)

4.3.1.1.1 Air Quality—PMRF/Main Base

4.3.1.1.1.1 No-action Alternative (Air Quality—PMRF/Main Base)

Under the No-action Alternative, there will be no change to current air quality impacts at PMRF/Main Base. The base is considered a major source of air pollutants, since it has the potential to emit more than 100 tons per year of one or more criteria pollutants. The State of Hawaii has issued a Title V Covered Source Permit for five diesel generators at PMRF/Main Base, which was renewed in 2003. Table 4.3.1.1.1.1-1 lists the predicted ambient air quality impacts determined in the Title V Permit for PMRF/Main Base. The Title V permit controls the emissions generated by restricting the hours for use for each generator. The existing power generators will continue to be operated in accordance with the Title V Permit.

Table 4.3.1.1.1.1-1. Ambient Air Quality Impact Limits Predicted for PMRF/Main Base

Pollutant	Averaging Time	Predicted Impact ($\mu g/m^3$)	Air Standard ($\mu g/m^3$)	Percent of Standard
Sulfur Dioxide	3-hour	561	1,300	43
	24-hour	141	365	39
	Annual (2)	13	80	16
Nitrogen Dioxide	Annual (2,3)	65	70	93
Carbon Monoxide	1-Hour	1,364	10,000	14
	8-hour	683	5,000	14
PM-10	24-hour	64	150	43
	Annual (2)	7	50	14
Lead (1)	Calendar Quarter	-	1.5	0
Hydrogen Sulfide (1)	1-hour	-	35	0

(1) Lead and hydrogen sulfide are not expected at PMRF
(2) The annual concentrations are based on fuel limitations of 208,000 gallons/year for the combined usage of the 320 kW generators and 217,800 gallons/year for the combined usage of the 600 kW generators
(3) Nitrogen Dioxide concentrations were calculated using the ozone limiting method with a background ozone concentration of 34.6 $\mu g/m^3$
PM-10 = Particulate matter with a mean aerodynamic diameter greater than or equal to 10 microns

HRC Training Operations

Under the No-action Alternative, existing HRC Training Operations at PMRF will continue to occur. Operations at PMRF/Main Base that can affect regional air quality would include GUNEX, Swimmer Insertion/Extraction, Expeditionary Assault, and MISSILEX. There would be no increase in existing emissions during the continuing operations listed above.

GUNEX, Swimmer Insertion/Extraction, and Expeditionary Assault operations will produce mobile emissions from helicopters, fixed-wing aircraft and airship operations, and operations of diesel engines of landing craft and tracked vehicles. These emissions are not restricted by the current Title V permit held by PMRF.

MISSILEX from PMRF/Main Base will continue to occur at current levels. Missile and rocket launches are characterized by intense combustive reactions over a short period, which result in exhaust streams of varying sizes, depending on the size of the launch vehicle. Table 4.3.1.1.1.1-2 lists major exhaust components from typical missiles launched from PMRF.

Table 4.3.1.1.1.1-2: Estimated Emissions from Typical Missile Launches at PMRF/Main Base (pounds)

Missile	Aluminum Oxide	Carbon Monoxide	Carbon Dioxide	Hydrogen	Water	Hydrochloric Acid	Nitrogen	Lead	Others
Castor IV	5,395	5,725	679	498	1,731	4,425	1,777	0	7
Strategic Target System (1)	11,256	8,369	862	635	1,918	3,885	3,710	0	53
STRYPI	2,870	3,018	362	227	688	1,631	997	0	0

(1) Exhaust products are total for all three stages

Pre-launch activities include the transportation of launch vehicles to PMRF/Main Base launch facilities and assembly of the launch vehicles. The mobile exhaust emissions due to transportation will be intermittent and not have a measurable air quality impact.

Analysis of typical launch vehicles at PMRF determined that exhaust emissions will not produce short-term exceedances within a previously determined ground hazard area of 10,000 ft (Table 4.3.1.1.1.1-2). In addition, this area is evacuated of all personnel before any launch.

Activities performed during post-launch will include the removal of all mobile equipment and assets brought to PMRF. The removal can result in small, local amounts of fugitive dust, which will have a minor impact on air quality. However, this impact will be minimized through the use of dust suppression methods.

Air emissions can pose a potential health threat. However, modeling determined that all exhaust concentrations from the termination of a missile shortly after liftoff will be below applicable health-based standards at the edge of the ground hazard area. Also, personnel remaining outdoors within the launch hazard area will wear appropriate safety equipment, such as respirator masks.

Each launch is a discrete event, and the total number of launches would not exceed what can currently be performed annually at PMRF. The logistics of the launch procedures will allow sufficient time between launches so that no exhaust from one launch will impact the ambient air quality during the next. The tempo of launch events will be managed by range operations to stay within the limits of current agreements.

HRC RDT&E Operations

Ongoing operations associated with research, development, test, and evaluation (RDT&E) Operations that can affect air quality at PMRF/Main Base include missile defense ballistic missile target flights and Terminal High Altitude Area Defense (THAAD) interceptor operations.

RDT&E operations include missile launches from both northern and southern PMRF/Main base launch sites. Impacts will be as described above for HRC Training Operations. The rate of launches will not increase at PMRF/Main base due to the No-action Alternative HRC RDT&E Operations.

Major Exercises

Major Exercises include ongoing training operations, and in some cases RDT&E operations. In addition to routine training exercises at PMRF/Main Base, Command and Control (C2), Aircraft Operations Support, Humanitarian Assistance/Non-Combatant Evacuation Operations (HAO/NEO), Missile Launches, Special Warfare Operations (SPECWAROPS), and Underwater Demolition Exercises are conducted during Major Exercises.

C2 is achieved through a network of communication devices strategically located at selected Department of Defense (DoD) installations around the islands with no impacts to the regional air quality.

Potential impacts on regional air quality from Aircraft Operations Support, HAO/NEO, Missile Launches, and SPECWAROPS will be similar to those described for the Training Operations and RDT&E Operations.

4.3.1.1.1.2 Alternative 1 (Air Quality—PMRF/Main Base)

Increased Tempo and Frequency of Training Operations and New Training Operation and Major Exercises

While training operations and Major Exercises would increase in number, emissions would be similar to existing levels. The types of exercises that would occur at PMRF/Main Base would be similar to those described in Section 4.3.1.1.1.1.

Enhanced and Future RDT&E Operations

Increased and Future operations include additional chemical simulants in target launches, interceptor targets launched from Wake Island, Kwajalein Atoll, or Vandenberg AFB into the Temporary Operating Area, High Speed Unmanned Aerial and Surface Vehicle testing, and Hypersonic Vehicle testing.

Launch preparation involved in chemical simulants for target launches would be similar to those described in Section 4.3.1.1.1.1. Flight testing of target launches with chemical simulants would result in aerial dispersal of tributyl phosphate (TBP) at altitude. As TBP descends from an aerial release, minimal evaporation would occur due to the low vapor pressure and volatility of TBP; therefore, harmful concentrations in the air would not occur as a result of evaporation of TBP (International Programme on Chemical Safety, 2001).

The intercept of targets launched into the PMRF Controlled Area would be from existing launch facilities and the intercept areas would be in the Open Ocean Area and Temporary Operating Area of the PMRF Range. The proposed launch vehicles from PMRF/Main Base would produce similar emissions to those described in Section 4.3.1.1.1.1.

HRC Enhancements

Proposed HRC Complex Enhancements at PMRF/Main Base include construction of range operations control building, range safety for high energy lasers, and improved fiber optic infrastructure.

The specific types of equipment that would be used during construction of the range operations control building, and improved fiber optic infrastructure are not known at this time. Excavation and grading would normally involve the use of bulldozers, scrapers, backhoes, and trucks. The construction of buildings would likely involve the use of pile drivers, concrete mixers, pumps, saws, hammers, cranes, and forklifts. Proposed construction at PMRF/Main Base might cause temporary generation of fugitive dust and diesel exhaust emissions. Additionally, volatile organic compounds (VOCs) might be released from paints, solvents, or cleansers. Specific amounts of each pollutant generated depend upon the number of vehicles involved, the area disturbed, and the length of time the construction would take place. These emissions are not anticipated to cause exceedances of the National Ambient Air Quality Standards (NAAQS) or Hawaii Ambient Air Quality Standards. Additionally, implementation of standard dust suppression methods (frequent watering) and a vehicle maintenance program (proper tuning and preventive maintenance of vehicles) would minimize fugitive dust emissions and vehicle exhaust emissions, respectively, and would help to maintain the area's current air quality. Due to the exclusion of the public from the immediate vicinity of construction, the public would not be exposed to emissions.

4.3.1.1.1.3 Alternative 2 (Air Quality—PMRF/Main Base)

Increased Tempo and Frequency of Training Operations and Additional Major Exercises—Multiple Strike Group Training

While training operations would increase in number, emissions would be similar to existing levels. The types of major exercises that would occur at PMRF/Main Base would be similar to those described in Section 4.3.1.1.1.1.

Future RDT&E Operations

The proposed high energy laser would require a 25,000-square foot (ft^2) building at PMRF/Main Base. Construction impacts would be similar to those described earlier; however, environmental documentation would be required to analyze the specific location and operational requirements. Up to four air targets and up to four surface targets would be used for testing and operation of the high energy laser would require 30 megawatts of power. Emissions from generators needed to produce this level of power would require the current Title V permit for PMRF/Main Base to be modified or renewed.

The testing of the Advanced Hypersonic Weapon would include two launches of a Strategic Target System booster from Kauai Test Facility (KTF) and two launches of the Orion 50S XLG first stage and Orion 50S XL second stage weapon from the same site. The Strategic Target System booster has been previously launched at KTF and it is anticipated that the testing of the Hypersonic Weapon with the Orion configuration at the same site would have a similar air quality impact as described for the No-action Alternative. Each launch is a discrete event, and the total number of launches would not exceed what could currently be performed annually at PMRF. The logistics of the launch procedures would allow sufficient time between launches so that no exhaust from one launch would impact the ambient air quality during the next. The tempo of launch events would continue to be managed by range operations to stay within the limits of current agreements.

4.3.1.1.2 Airspace—PMRF/Main Base

The potential impacts to airspace in the PMRF/Main Base Area are discussed in terms of conflicts with the use of controlled and uncontrolled airspace, special use airspace, en route airways and jet routes, and airports and airfields.

4.3.1.1.2.1 No-action Alternative (Airspace—PMRF/Main Base)

HRC Training Operations

The ongoing training operations that can affect airspace include mine laying, surface-to-surface gunnery exercise (S-S GUNEX), and air-to-surface gunnery exercise (A-S GUNEX) occurring above territorial waters.

Controlled and Uncontrolled Airspace

The Navy can accomplish the No-action Alternative without modifications or need for additional airspace to accommodate continuing mission operations.

Special Use Airspace

Ongoing, operations identified above will continue to use the existing PMRF/Main Base special use airspace including Restricted Areas, Warning Areas and Air Traffic Control Assigned Airspace (ATCAA) shown on Figure 3.3.1.1.2-1. Although the nature and intensity of utilization varies over time and by individual special use airspace area, the continuing training operations represent precisely the kinds of operations for which the special use airspace was created. Restricted Areas were designated to contain hazards to non-participating aircraft, and the Warning Areas are designed and set aside by the Federal Aviation Administration (FAA) to accommodate activities that present a hazard to other aircraft. As such, the continuing training operations do not represent an adverse impact to special use airspace and do not conflict with any airspace use plans, policies, and controls.

En Route Airways and Jet Routes

Two low altitude airways pass through the region of influence: V15 (through W-188), and V-16 (through W-186). Use of these low altitude airways comes under the control of the Honolulu Air Route Traffic Control Center (ARTCC). In addition, the Navy surveys the airspace involved in each training operation either by radar or patrol aircraft. Safety regulations dictate that hazardous operations will be suspended when it is known that any non-participating aircraft has entered any part of a training activity danger zone until the non-participating entrant has left the area or a thorough check of the suspected area has been performed. Aircraft using the V16 airway through the northern part of W-186 and over Niihau will not likely be re-routed by air traffic control if they are flying over 9,000 feet (ft) mean sea level, since W-186 extends up to but does not include 9,000 ft. Consequently, there are no airspace conflicts.

In terms of potential airspace use impacts to en route airways and jet routes, the continuing training operations will be in compliance with DoD Directive 4540.1, as directed by the Office of the Chief of Naval Operations Instruction (OPNAVINST) 3770.4A. In addition, before conducting an operation that is hazardous to non-participating aircraft, Notices to Airmen (NOTAMs) will be sent in accordance with the conditions of the directive specified in OPNAVINST 3721.20A.

As noted above, continuing training operations will use the existing special use airspace and will not require either: 1) a change to an existing or planned instrument flight rules (IFR) minimum flight altitude, a published or special instrument procedure, or an IFR departure procedure; or (2) a visual flight rules (VFR) operation to change from a regular flight course or altitude.

Airports and Airfields

Ongoing operations will continue to use the existing special use airspace and will not restrict access to or affect the use of the existing airfields and airports at PMRF. Operations at the PMRF airfield will continue unhindered.

Similarly, the existing airfield or airport arrival and departure traffic flows will not be affected by the No-action Alternative. Access to the PMRF airfield, Kekaha airstrip, and the heliports at Kokee and Makaha Ridge will not be curtailed. With all arriving and departing aircraft, and all participating military aircraft, under the control of the PMRF Radar Control Facility, there will be no airfield or airport conflicts in the area under the No-action Alternative.

HRC RDT&E Operations

The ongoing RDT&E operations that could affect airspace include missile defense ballistic missile target flights and THAAD interceptor operations. RDT&E operations are conducted in PMRF Restricted Airspace and Warning Areas as shown on Figure 3.3.1.1.2-1. Missile launches from PMRF and Kauai Test Facility (KTF) will move into Open Ocean Areas soon after launch.

Controlled and Uncontrolled Airspace

No new airspace proposal or any modification to the existing controlled airspace was identified to accommodate continuing RDT&E operations. Interceptor missile launches from PMRF and target missiles launched from KTF will be well above flight level (FL) 600 (60,000 ft) and still be within the R-3101 Restricted Airspace, which covers the surface to unlimited altitude, within 1 minute of the rocket motor firing. As such, all other local flight activities will occur at sufficient distance and altitude that the target missile and interceptor missiles will have minimal effect. Activation of the proposed stationary altitude reservation (ALTRV) procedures, where the FAA provides separation between non-participating aircraft and the missile flight test activities in the Temporary Operating Area, are discussed under the Open Ocean Section 4.1.1.

Special Use Airspace

Ongoing, RDT&E operations identified earlier will be conducted within the existing special use airspace in Restricted Area R-3101 and extend into the adjacent W-188 Warning Area controlled by PMRF, and will not represent a direct special use airspace impact. The missile launches represent precisely the kinds of activities that special use airspace was created for: namely, to accommodate national security and necessary military activities, and to confine or segregate activities considered to be hazardous to non-participating aircraft.

Due to the coordination and planning procedures that are in place, the RDT&E operations do not represent an adverse impact to special use airspace and do not conflict with any airspace use plans, policies, and controls.

En Route Airways and Jet Routes

Two IFR en route low altitude airways are used by commercial aircraft that pass through the PMRF Warning Areas. The two low altitude airways are V15 (through W-188), and V-16 (through W-186). Use of these low altitude airways comes under the control of the Honolulu ARTCC. In addition, during an RDT&E operation, provision is made for surveillance of the affected airspace either by radar or patrol aircraft. Target and defensive missile launches will be conducted in compliance with DoD Directive 4540.1, as enclosed by OPNAVINST 3770.4A (U.S. Department of the Navy, 1994). DoD Directive 4540.1 specifies procedures for conducting missile and projectile firing, namely "firing areas shall be selected so that trajectories are clear of established oceanic air routes or areas of known surface or air activity" (Department of Defense Directive 4540.1, § E5, 1981).

Before conducting a missile launch and/or intercept test, NOTAMs will be sent in accordance with the conditions of the directive specified in OPNAVINST 3721.20. In addition, to satisfy airspace safety requirements, the responsible commander will obtain approval from the Administrator, FAA, through the appropriate Navy airspace representative. Provision is made for surveillance of the affected airspace either by radar or patrol aircraft. In addition, safety regulations dictate that hazardous operations will be suspended when it is known that any non-participating aircraft have entered any part of the danger zone until the non-participating entrant has left the area or a thorough check of the suspected area has been performed.

The airways and jet routes in the region of influence are protected because of the required coordination with the FAA. There is a scheduling agency identified for each piece of special use airspace that would be utilized. The procedures for scheduling each piece of airspace are performed in accordance with letters of agreement with the controlling FAA facility, and the Honolulu and Oakland ARTCCs. Schedules are provided to the FAA facility as agreed between the agencies involved. Aircraft transiting the Open Ocean Area region of influence on one of the low-altitude airways and/or high-altitude jet routes, that will be affected by flight test activities within the PMRF/Main Base region of influence, will be notified of any necessary rerouting before departing their originating airport and will therefore be able to take on additional fuel before takeoff. Real-time airspace management involves the release of airspace to the FAA when the airspace is not in use or when extraordinary events occur that require drastic action, such as weather requiring additional airspace.

The FAA ARTCCs are responsible for air traffic flow control or management to transition air traffic. The ARTCCs provide separation services to aircraft operating on IFR flight plans and principally during the en route phases of the flight. They also provide traffic and weather advisories to airborne aircraft. By appropriately containing military activities within the Restricted Airspace and Warning Areas non-participating traffic is advised or separated accordingly.

As noted above, continuing RDT&E operations will use the existing special use airspace and will not require either: (1) a change to an existing or planned IFR minimum flight altitude, a published or special instrument procedure, or an IFR departure procedure; or (2) a VFR operation to change from a regular flight course or altitude.

Airports and Airfields

Impacts would be similar to those discussed for the HRC Training Operations and there will be no airfield or airport conflicts in the region of influence for the No-action Alternative.

Major Exercises

Major Exercises such as Rim of the Pacific (RIMPAC) and Undersea Warfare Exercise (USWEX), include ongoing training operations and, in some cases RDT&E operations. Therefore, potential impacts from a Major Exercise on the PMRF airspace will be similar to those described earlier for the Training Operations and RDT&E Operations. RIMPAC planning conferences, which include coordination with the FAA, are conducted beginning in March of the year prior to each RIMPAC. Each of the USWEX training operations, up to four per year, will include coordination with the FAA well in advance of the 3- or 4-day exercise.

4.3.1.1.2.2 Alternative 1 (Airspace—PMRF/Main Base)

Increased Tempo and Frequency of Training Operations and New Training Operations

Alternative 1 would include increases in the number of training exercises including mine laying, S-S GUNEX, and A-S GUNEX occurring above territorial waters. Training operations would occur in the same locations as for the No-action Alternative.

The potential impacts on controlled and uncontrolled airspace, special use airspace, en route airways and jet routes, and airports and airfields would be similar to that described above for the No-action Alternative. The total number of training operations that affect airspace would increase by approximately 14 percent above the No-action Alternative. No new airspace proposal or any modification to the existing controlled airspace would be required. The training operations would continue to use the existing special use airspace including the PMRF Restricted Airspace, Warning Areas and ATCAA shown on Figure 3.3.1.1.2-1. By appropriately containing military activities within the Restricted Airspace and Warning Areas or coordinating the use of the ATCAA area, non-participating traffic is advised or separated accordingly.

Enhanced and Future RDT&E Operations

The proposed operations include Standard Missile 6 launches from a sea-based platform, and high speed and unmanned aerial vehicle testing. The number of operations is unknown and would most likely replace some of the RDT&E operations identified in the RDT&E operations Section above.

HRC Enhancements

Range safety for high-energy lasers at PMRF could affect airspace. Depending on the intensity of the lasers, nomenclature would need to be added to aeronautical charts, and certain test events could require NOTAMs and Notices to Mariners (NOTMARs).

The potential impacts on controlled and uncontrolled airspace, special use airspace, en route airways and jet routes, and airports and airfields would be similar to that described above for missile launches. The establishment of laser range operational procedures, including horizontal and vertical buffers, would minimize potential impacts to aircraft. All operations would be in accordance with American National Standards Institute Z136.1, *Safe Use of Lasers*, which has been adopted by DoD as the governing standard for laser safety. Additional information on range safety for high-energy lasers is in Section 4.1.5, Health and Safety–Open Ocean.

Major Exercises

Major Exercises, such as RIMPAC and USWEX, include ongoing training operations and, in some cases, RDT&E operations. Therefore, potential impacts from a Major Exercise would be similar to those described above for the Training Operations and RDT&E Operations.

An additional proposed training activity associated with Major Exercises is Field Carrier Landing Practice (FCLP). This activity involves pilots from an aircraft carrier air wing practicing landings at a land runway. As discussed in Chapter 2.0, the runway at PMRF could be used for FCLP. For each pilot, the FCLP would include 8 to 10 touch-and-go landings at the PMRF runway during both daytime and at night. The carrier wing aircraft would be operating within the PMRF Class D and Class E airspace and the adjacent area within Warning Areas W-186 and W-188. FCLP operations would be below the V-15 and V-16 airways.

RIMPAC planning conferences, which include coordination with the FAA, are conducted beginning in March of the year prior to each RIMPAC. Each of the USWEX training operations, up to six per year, would include coordination with the FAA well in advance of the 3- or 4-day exercise. FAA coordination would include discussions regarding the anticipated number of aircraft, including FCLP operations.

4.3.1.1.2.3 Alternative 2 (Airspace—PMRF/Main Base)

Increased Tempo and Frequency of Training Operations

Alternative 2 would include increases in the number of training exercises including mine laying, S-S GUNEX, A-S GUNEX, and Air-to-Surface Missile Exercise (A-S MISSILEX). Training operations would occur in the same locations as for the No-action Alternative.

The potential impacts on controlled and uncontrolled airspace, special use airspace, en route airways and jet routes, and airports and airfields would be similar to that described in Section 4.3.1.1.2.1 for the No-action Alternative. The total number of training operations that affect airspace would increase by approximately 11 percent above the No-action Alternative. No new airspace proposal or any modification to the existing controlled airspace would be required. The training operations would continue to use the existing PMRF special use airspace shown on Figure 3.3.1.1.2-1. By appropriately containing military activities within the Restricted Airspace, Warning Areas or coordinating the use of the ATCAA areas, non-participating traffic is advised or separated accordingly, thus avoiding potential adverse impacts to the low altitude airways and high altitude jet routes in the region of influence.

Alternative 2 would include increases in the number of RDT&E operations including missile defense ballistic missile target flights, THAAD interceptor operations, A-S MISSILEX, Air-to-Air MISSILEX (A-A MISSILEX), and surface-to-air missile exercise (S-A MISSILEX). RDT&E operations would occur in the same locations as for the No-action Alternative.

The potential impacts on controlled and uncontrolled airspace, special use airspace, en route airways and jet routes, and airports and airfields would be similar to that described in Section

4.1.1.1 for the No-action Alternative. The total number of RDT&E operations that may affect airspace would increase by approximately 17 percent above the No-action Alternative. No new airspace proposal or any modification to the existing controlled airspace would be required. The RDT&E operations would continue to use the existing special use airspace including the PMRF Restricted Airspace, Warning Areas and ATCAA shown on Figure 3.3.1.1.2-1. By appropriately containing military activities within these areas, non-participating traffic is advised or separated accordingly.

Enhanced and Future RDT&E Operations

Planned RDT&E Operations include a Maritime Directed Energy Test Center at PMRF and the Advanced Hypersonic Weapon test program at KTF.

The Directed Energy Test Center, which might include a High Energy Laser Program, would have minimal impacts on airspace due to the required electromagnetic radiation/electromagnetic interference (EMR/EMI) coordination process. As discussed in Section 4.1.1.2, high-energy lasers at PMRF could affect airspace. Depending on the intensity of the lasers, nomenclature would need to be added to aeronautical charts, and certain test events could require NOTAMs and NOTMARs. The potential impacts on controlled and uncontrolled airspace, special use airspace, en route airways and jet routes, and airports and airfields would be similar to that described previously for missile launches. The establishment of laser range operational procedures, including horizontal and vertical buffers, would minimize potential impacts to aircraft. All operations would be in accordance with American National Standards Institute Z136.1, *Safe Use of Lasers*, which has been adopted by DoD as the governing standard for laser safety. Additional information on range safety for high-energy lasers is in Section 4.1.5, Health and Safety-Open Ocean.

The Advanced Hypersonic Weapon tests would be similar to a ballistic missile test, and the potential impacts on controlled and uncontrolled airspace, special use airspace, en route airways and jet routes, and airports and airfields would be similar to that described for missile launches.

Additional Major Exercises—Multiple Strike Group Training

A Multiple Strike Group exercise consists of operations that involve Navy assets engaging in a schedule of events battle scenario, with U.S. forces (blue forces) pitted against a hypothetical opposition force (red force). Participants use and build upon previously gained training skill sets to maintain and improve the proficiency needed for a mission-capable, deployment-ready unit. The exercise would occur over a 5- to 10-day period. The Multiple Strike Group training would involve many of the training operations identified and evaluated under the No-action Alternative and Alternative 1 including mine laying exercises, S-S GUNEX, A-S GUNEX, A-S MISSILEX, and FCLP.

Much of the Multiple Strike Group training would occur in the open ocean area. However, as part of this training, FCLP could occur at PMRF. Potential impacts would be similar to those described in Section 4.3.1.1.2.1.

RIMPAC planning conferences, which include coordination with the FAA, are conducted beginning in March of the year prior to each RIMPAC. Each of the USWEX training operations, up to six per year, would include coordination with the FAA well in advance of the 3- or 4-day exercise. FAA coordination would include discussions regarding the anticipated number of aircraft including FCLP operations.

4.3.1.1.3 Biological Resources (Terrestrial and Offshore)—PMRF/Main Base

Potential impacts of construction, building modification, and missile launches on terrestrial and marine biological resources within the PMRF region of influence have been addressed in detail in the Strategic Target System Environmental Impact Statement (EIS), the Restrictive Easement EIS, the PMRF Enhanced Capability EIS, the THAAD Pacific Flight Tests Environmental Assessment (EA), and several other program-specific EAs. Based on these prior analyses, and the effects of current and past missile launch activities, the potential impacts of operations related to continuing RDT&E on biological resources are expected to be minimal.

The analytical approach for biological resources involved evaluating the degree to which the proposed launch activities can impact vegetation, wildlife, threatened or endangered species, and sensitive habitat within the affected area. Offshore refers to ocean areas at depths of 100 fathoms or less. Criteria for assessing potential impacts on biological resources are based on the following: the number or amount of the resource that will be impacted relative to its occurrence at the project site, the sensitivity of the resource to proposed operations, and the duration of the impact. Impacts are considered substantial if they have the potential to result in reduction of the population size of Federally listed threatened or endangered species, degradation of biologically important unique habitats, substantial long-term loss of vegetation, or reduction in capacity of a habitat to support wildlife.

4.3.1.1.3.1 No-action Alternative (Biological Resources (Terrestrial and Offshore)—PMRF/Main Base)

HRC Training Operations, HRC Support Operations, and Major Exercises

Vegetation

Although ohai and lau'ehu have been observed north of PMRF/Main Base, there are no known listed plant species on PMRF. Amphibious landings have taken place at PMRF for many years. Damage to vegetation from movement of personnel, vehicles, and equipment across the beach and into upland areas during Expeditionary Assault exercises and SPECWAROPS is not likely if the movement is restricted to existing routes. Damage to sensitive vegetation from other exercises such as Swimmer Insertion/Extraction, HAO/NEO, and Humanitarian /Disaster Relief (HA/DR) is also unlikely since troops are directed to avoid such areas. HAO/NEO and HA/DR exercises use existing open areas and facilities, though some temporary structures including tents may be used in preselected locations. All participants follow current guidelines to avoid undue impacts to vegetation.

Compliance with relevant Navy policies and procedures during training operations limits the potential for introduction of invasive weed plant species. Military Customs Inspectors are responsible for implementing Federal customs statutes and agricultural regulations for transfers of military goods and personnel from overseas into U.S. jurisdiction. Military inspectors do not inspect goods and personnel transferred to Hawaii from the U.S. mainland, because inspections apply only to shipments entering Hawaii from foreign sources or those bound to the mainland from Hawaii. Military inspectors are trained to look for prohibited animals, soil, seeds, and other pests. Inbound flights carrying cargo from the mainland and landing at PMRF are advised to inspect and secure their cargo prior to shipment to ensure it is free of invasives. To prevent transport of invasive seeds from PMRF to Kokee, ground crews are tasked to blow/wash down vehicles and equipment prior to movement. (Burger, 2007c; Nature Conservancy and Natural Resources Defense Council, 1992)

Missile launches are performed at KTF facilities in the northern (KTF Launch Complex) and southern portions (Kokole Point Launch Complex) of PMRF. Analysis provided in the Strategic Target System EIS (U.S. Army Strategic Defense Command, 1992) concluded that although vegetation near the Strategic Target System launch pad can suffer some temporary distress from the heat generated at launch and from hydrogen chloride or aluminum oxide emissions, there is no evidence of any long-term adverse effect on vegetation from two decades of launches at PMRF. Similarly, it is expected that no vegetation impacts will occur at other launch sites on PMRF.

Wildlife

Effects of the exercises described below on open ocean marine species are discussed in the Open Ocean Section (4.1.2). At PMRF, portions of the Bombing Exercise (BOMBEX), Mine Exercise (MINEX), gunnery/special weapons tests, and SINKEX can also occur within offshore waters. Effects on marine species are similar to those discussed in Section 4.1.2.

The weapons used in most BOMBEX and GUNEX pose little risk to whales, monk seals, or sea turtles unless they were to be near the surface at the point of impact. Both 0.50-caliber machine guns and the close-in weapons systems exclusively fire non-explosive ammunition. The same applies to larger weapons firing inert ordnance for training exercises. These rounds pose a risk only at the point of impact. To avoid harming animals, target areas are determined to be clear of marine mammals and sea turtles prior to commencement of exercises.

Potential impacts of past amphibious landings have been monitored. The area of Majors Bay used for landing operations is located on part of the shoreline typically not used by sea turtles or monk seals. Within 1 hour prior to initiation of Expeditionary Assault landing operations, landing routes and beach areas are surveyed for the presence of sensitive wildlife. If any marine mammals or sea turtles are found to be present on the beach, the exercise is delayed until the animals leave the area.

In accordance with the mitigation measures adopted for PMRF's Enhanced Capability EIS (Pacific Missile Range Facility, Barking Sands, 1998), night lighting is shielded to the extent practical to minimize its potential effect on night-flying birds (Newell's shearwater and petrels) and Hawaiian hoary bats.

The fired missiles and targets during MISSILEXs are not recovered, with the exception of BQMs, which have parachutes. Launches of target missiles and drones from PMRF occur from existing ground-based target launch sites at PMRF launch complex and KTF. Their potential effects are discussed below.

Noise

Noise and movement of personnel, vehicles, helicopters, and landing craft during training operations and exercises may temporarily displace fish, birds, and other sensitive species. However, training operations are short in duration and occur within regularly used range areas. Major Exercises incorporate avoidance procedures to avoid wildlife that are foraging, resting, or hauled out, such as green sea turtles or Hawaiian monk seals.

Figures 4.3.1.1.9.1-1 through 4.3.1.1.9.1-3 (in Section 4.3.1.1.9.1) show typical noise levels from missile launches at the northern and southern launch facilities at PMRF/Main Base. The brief noise peaks produced by missiles, such as THAAD, are comparable to levels produced by thunder at close range (120 decibel [dB] to 140 dB peak). Disturbance to wildlife from launches would be brief and is not likely to have long-term impacts. Following a launch, wildlife in the vicinity typically resume feeding and other normal behavior patterns. Waterfowl driven from preferred feeding areas by aircraft or explosions usually return soon after the disturbance stops, as long as the disturbance is not severe or repeated within a short time frame.

Emissions

Results of monitoring conducted following a Strategic Target System launch from KTF at PMRF indicated little effect on wildlife due to the low-level, short-term hydrogen chloride emissions. The program included marine surveys of representative birds and mammals for both pre-launch and post-launch conditions. Birds flying through an exhaust plume may be exposed to concentrations of hydrogen chloride that could irritate eye and respiratory membranes (Federal Aviation Administration, 1996). However, most birds would not come into contact with the exhaust plume, because of their flight away from the initial launch noise. Because aluminum oxide and hydrogen chloride do not bioaccumulate, no indirect effects to the food chain are anticipated. (U.S. Department of the 1998;; Missile Defense Agency, 2003)

Within offshore waters, the potential ingestion of contaminants by fish and other marine species would be remote because of atmospheric dispersion of the emission cloud, the diluting effects of the ocean water, and the relatively small area that would be affected. Further discussions on the effects of MISSILEX on fish and Essential Fish Habitat (EFH) are presented in the Open Ocean Section (4.1.2) and in Appendix G.

Debris

According to analysis contained in the PMRF Enhanced Capability EIS, debris from shore-based missile launch programs is not expected to produce any measurable impacts on offshore benthic (sea floor) resources.

During nominal launch activities, spent missile boosters and other missile debris have the potential to impact EFH in coastal waters. By the time the spent rocket motors impact in the ocean, generally all of the propellants in them will have been consumed. Any residual aluminum oxide, burnt hydrocarbons, or propellant materials are not expected to present toxicity concerns. Such missile components would immediately sink to the ocean bottom out of reach of most marine life. The National Aeronautics and Space Administration conducted a thorough evaluation of the effects of launch vehicles that are deposited in seawater. It concluded that the release of hazardous materials carried onboard rocket systems will not be significant. Materials will be rapidly diluted in the seawater and, except for the immediate vicinity of the debris, will not be found at concentrations identified as producing adverse effects (Pacific Missile Range

Facility, Barking Sands, 1998). Further discussions on deeper water/open ocean impacts from missile debris are provided in Section 4.1.2.

The probability for a launch mishap is very low. However, an early flight termination or mishap will cause missile debris to impact along the flight corridor, potentially in offshore waters. In most cases, the errant missile will be moving at such a high velocity that resulting missile debris will strike the water further downrange. If humpback whales, monk seals, or sea turtles were observed in the offshore launch safety zone, the launch will be delayed (U.S. Army Strategic Defense Command, 1992).

During launch mishaps involving solid propellant missiles, pieces of solid propellant can be widely dispersed over the water, but then sink to the ocean bottom out of reach of most marine life. In shallower waters, the propellants will be subject to constant wave action and currents. The water circulation will help to prevent localized build-up of any contaminants.

Unburned solid fuel is hard and rubber-like, and any ammonium perchlorate will slowly dissolve out of the rubber-like binder, producing ammonia and chlorine that will disperse into the surrounding seawater. The solid fuel's aluminum oxide is insoluble. Additionally, as the fuel slowly dissolves, its outer layers become spongy, further retarding dissolution. Thus, no toxic levels of ammonia, chlorine, or aluminum will be expected.

A study conducted for the U.S. Air Force (Lang, et al., 2000) measured the amount of perchlorate lost from solid propellant samples immersed in fresh and salt water. From the measurement of the concentration of the perchlorate ion in solution, the mass fraction loss of the propellant sample due to perchlorate leaching was calculated. The resulting data showed that it will take approximately 270 days for 90 percent of the perchlorate to leach out of the solid propellant in seawater at a temperature of 84˚F. Because of the slow rate of dissolution and constant mixing of surrounding water, resulting perchlorate concentrations are not expected to impact EFH, sea turtles, or other marine life.

In the unlikely event of a launch mishap involving a liquid-propellant missile, if the fuel and/or oxidizer do not explode or burn, they will likely be deposited on the ground or water surface. For THAAD missiles, a maximum of 0.5 gallon of hypergolic bi-propellants will be released from the Divert and Attitude Control System. For a Lance missile, up to several hundred pounds of inhibited red fuming nitric acid and hydrazine can be released. The Liquid Fuel Target System has the potential to release up to several hundred gallons of coal tar distillate and inhibited red fuming nitric acid.

When released, the inhibited red fuming nitric acid will volatize into the atmosphere. Residual nitric acid will cause a localized short-term pH change in the water; however, the acid will mix with the water and eventually be neutralized and diluted. The hypergolic oxidizer will also form nitric and nitrous acid on contact with water, and would be quickly diluted and buffered by seawater. With regard to hydrazine fuels, these highly reactive species quickly oxidize, forming amines and amino acids, which are beneficial nutrients to simple marine organisms. Prior to oxidation, there is some potential for exposure of marine life to toxic levels, but for a very limited area and time (National Aeronautic and Space Administration, 2002). Coal tar distillate fuel would not mix with the water, but would form a slick on the surface. Because of (1) the diluting and neutralizing effects of seawater, (2) the relatively small area that will be affected, and (3) the existing spill prevention, containment, and control measures in place at PMRF, minimal impacts to marine species are expected.

Electromagnetic Radiation

In terms of the potential for EMR impacts to wildlife, the operation of the THAAD radar during missile flight tests is not expected to radiate lower than 5 degrees, which precludes EMR impacts to terrestrial species on the beach, or marine species in or on the water. The potential for main-beam (airborne) exposure thermal effects to birds exists. Unfortunately, while much information exists on the effects of microwaves on laboratory animals (mostly rats, mice, and similar species), relatively few studies have been conducted on birds. Likewise, while there is specific information on calculating whole-body-averaged specific absorption rates at different frequencies for various polarizations for many mammalian species over a wide range, there is little or no specific information for birds. Mitigating these concerns is the fact that radar beams are relatively narrow and operate non-continuously; that is, radars generate EMR in a rapid pulse as opposed to other EMR sources that radiate continuously (e.g., microwave antennas). To remain in the beam for any period requires that birds fly directly along the beam axis or hover within the beam for a significant time. There is presently insufficient information to make a quantitative estimate of the joint probability of such an occurrence (beam stationary/bird flying directly on-axis or hovering for several minutes), but it is estimated to not be substantial. Thus, the probability for the THAAD radar to harm birds or other flying wildlife with any frequency is judged to be low. (U.S. Department of the Navy, 1998)

Environmentally Sensitive Habitat

Operations currently avoid the coastal dune systems. Current operations do not occur in any of the wetland areas on base, including those associated with the Nohili Ditch and the Kawaiele Ditch.

HRC Training Operations and Major Exercises at PMRF do not occur in established critical habitat areas for lau'ehu that are located off base (Figure 3.3.1.1.3-2). Unexpected flight terminations or other launch mishaps have the potential to impact an area (Unit H3), which has been designated as unoccupied critical habitat by fire, debris, and the resultant cleanup. However, the likelihood of a mishap occurring is small, and appropriate measures will be in place to minimize adverse effects.

The Hawaiian Islands Humpback Whale National Marine Sanctuary Final EIS and Management Plan (U.S. Department of Commerce, National Oceanic and Atmospheric Administration and State of Hawaii, Office of Planning, 1997) recognizes that PMRF plays an important role in national defense training. The EIS cites missile launches as one of DoD's ongoing operations that occur within the sanctuary boundaries.

HRC RDT&E Operations

PMRF's additional mission is supporting RDT&E projects. The at sea operations are analyzed in the Open Ocean Section (4.1.2). Land sensor and missile defense effects would be the same or similar to those discussed above. Other operations on PMRF include one-of-a-kind or short duration RDT&E operations conducted for both government and commercial customers. Examples include humpback whale detection, Maritime Synthetic Range, and numerous System Integration Checkout operations. Generally these types of operations have no or minimal effect on biological resources.

4.3.1.1.3.2 Alternative 1 (Biological Resources (Terrestrial and Offshore)—PMRF/Main Base)

Increased Tempo and Frequency of Training Operations and New Training Operation

Alternative 1 would include up to six USWEX per year (an increase of two exercises), the RIMPAC biennial exercise, and two Strike Groups conducting training exercises simultaneously in the HRC, as well as other continuing training exercises (See Table 2.2.2.1-1). This would amount to an average increase of approximately 9 percent for offshore and onshore operations. While training operations would increase in number, the likelihood of a similar increase in impacts to biological resources is small, as described below.

Vegetation

Operations would take place in current operating areas, with no expansion. Compliance with relevant Navy policies and procedures during these increased training operations should minimize the effects on vegetation, as well as limit the potential for introduction of invasive plant species. No threatened or endangered plants have been observed on PMRF.

Wildlife

Impacts to wildlife would be similar to those described previously for the No-action Alternative. It is unlikely that a listed species or other wildlife on PMRF would be injured or killed as a result of increased training operations. The additional training operations would comply with relevant Navy policies and procedures, which would minimize the potential for effects on wildlife.

Environmentally Sensitive Habitat

The continued use of regular training areas and transit routes would avoid the wetland acreage and other environmentally sensitive habitat on PMRF, thus no impacts are anticipated.

Enhanced and Future RDT&E Operations

Payloads on some target vehicle launches from PMRF would incorporate additional chemical simulants, which include larger quantities of TBP and various glycols. Up to approximately 120 gallons of simulant could be used in target vehicles. The simulant would be transported from the Continental United States to PMRF with the target vehicle and loaded into the target payload as part of the vehicle processing activities.

The use and effects of simulants have been analyzed in other PMRF-related documents. THAAD element test activities associated with the Missile Defense Agency lethality program might include development and testing of Nuclear, Biological, or Chemical material simulants within a laboratory or other indoor and outdoor test facilities. These activities were analyzed in the *Programmatic Environmental Assessment, Theater Missile Defense Lethality Program* (U.S. Army Space and Strategic Defense Command, 1993c). The only proposed chemical simulant that might be included as a target payload would be small quantities of TBP, which is a non-flammable, non-explosive, colorless, odorless liquid typically used as a solvent in commercial industry. The release of simulant would occur at a high altitude over the open ocean during a nominal flight test. The potential ingestion of toxins, such as the small amount of propellant or simulant remaining in the spent boosters or on pieces of missile debris, by marine mammals or fish species would be remote because of (1) atmospheric dispersion, (2) the diluting and neutralizing effects of seawater, and (3) the relatively small area that could potentially be affected.

Launches from Wake Island, the Reagan Test Site at U.S. Army Kwajalein Atoll (USAKA), and Vandenberg AFB toward the vicinity of PMRF are proposed. Launches from those sites would be from existing launch facilities and the intercept areas would be in the Open Ocean Area and Temporary Operating Area of the PMRF Range. Targets would also be launched from sea-based and air-based platforms. The effects of these missile tests would be similar to those described above for the No-action Alternative and in Section 4.1.2.

As part of Alternative 1, PMRF would develop the capability to launch the Extended Range Active Missile, tentatively designated Standard Missile-6 (SM-6), from a sea-based platform. Impacts should be similar to those for other missile launches previously discussed.

HRC Enhancements

Where possible, existing towers would be used for the placement of new equipment to enhance the PMRF electronic warfare (EW) training capability. The construction of any new towers on Kauai or on other islands (e.g., Molokai, Lanai, Maui, and Hawaii), would occur at locations selected by personnel familiar with local environmental constraints, including the presence of threatened or endangered species. Additional environmental documentation could be required once specific sites are identified.

PMRF would provide dedicated equipment and other support to Strike Groups as they transit to/from San Diego, California. No construction would be required and no impacts to biological resources are anticipated.

Enhanced Automatic Identification System and Force Protection Capability

As part of the enhanced Automatic Identification System (AIS) and Force Protection Capability, antennas would be added to Building 282 on PMRF Main Base, resulting in temporary elevated noise levels. No vegetation clearing or ground disturbance would be required for this effort. Because construction-related noise would be localized, intermittent, and occur over a relatively short-term, the potential for impacts on biological resources would be minimal.

Pacific Missile Range Facility Enhancements

<u>Construct Range Operations Control Building</u>

PMRF would construct a new, almost 90,000-square ft building to consolidate range operations currently conducted in 13 buildings. Its proposed location is shown on Figure 2.2.3.5.4-6.

<u>Vegetation</u>. The proposed building site is within the previously disturbed administrative area. No unique habitat or indigenous or native vegetation would be disturbed. No threatened or endangered vegetation has been identified as occurring on PMRF.

<u>Wildlife</u>. At 50 ft from construction equipment, noise levels typically range from 70 to 98 dBA. The combination of increased noise levels and human activity would likely displace some small mammals and birds (e.g., common field and urban birds, Laysan albatross, and small rodents) that forage, feed, or nest within and adjacent to the construction site. Impacts to listed birds that could be in or transiting the construction area would be limited to startle or flying away reactions. Bird migration patterns would not be altered.

Any outdoor lighting associated with construction activities and permanent structures would be properly shielded, following U.S. Fish and Wildlife Service (USFWS) guidelines to minimize reflection and impact to light-sensitive wildlife, such as the Newell's shearwater and petrels.

Environmentally Sensitive Habitat. Construction would not likely directly affect any wetlands on base including those associated with the Nohili Ditch and the Kawaiele Ditch.

4.3.1.1.3.3 Alternative 2 (Biological Resources (Terrestrial and Offshore)—PMRF/Main Base)

Increased Tempo and Frequency of Training Operations

Under Alternative 2, the tempo of training exercises would be increased and the frequency of exercises could also increase. Wildlife exhibits a wide variety of responses to noise. Some species are more sensitive to noise disturbances than others. Literature on the effects on wildlife from noise suggests that common responses to noise events include a startle or fright response, and ultimately, habituation (getting accustomed to the noise). It has been reported that the intensity and duration of the startle responses decrease with the number and frequency of exposures. (U.S. Department of the Navy, 2006)

Enhanced and Future RDT&E Operations

The high-energy laser would require a 25,000-ft^2, permanent operations building on PMRF. If Naval Sea Systems Command (NAVSEA) decides to build and operate this Maritime Directed Energy Test Center, separate environmental documentation would be required to analyze the specific location, and test and operational requirements; including the requirement of 30 megawatts of power. Impacts would be similar to those from other construction activities described above.

PMRF would also add the capability to test non-eye-safe lasers. These types of lasers are associated with the Hellfire system and the GQM-163 Coyote. If Airborne Laser system testing were conducted at PMRF, separate environmental documentation would be required to analyze the specific test requirements.

Advanced Hypersonic Weapon

Launches of Orion first and second stage configurations as part of the Advanced Hypersonic Weapon testing would be similar to launches of the Strategic Target System previously analyzed in the Strategic Target System EIS and the PMRF Enhanced Capability EIS. No new facilities would be required. The launch azimuth and flight termination system would be the same as that of the existing Strategic Target System. Existing radars and the ground hazard area would also be the same. As a result, impacts to biological resources would be minimal.

Additional Major Exercises—Multiple Strike Group Training

Up to three Strike Groups would be added to the Major Exercises occurring in the HRC. These ships would not be home ported in Hawaii, but would be in the area for up to 30 days per exercise. The exercises proposed would be similar to those occurring during current Major Exercises, with impacts to biological resources being similar to those described above. The Multiple Strike Group training operations should not impact the continued existence of threatened and endangered species populations at PMRF.

4.3.1.1.4 Cultural Resources—PMRF/Main Base

4.3.1.1.4.1 No-action Alternative (Cultural Resources—PMRF/Main Base)

HRC Training Operations

Training operations with the potential to affect terrestrial cultural resources at PMRF Main Base include Swimmer Insertion/Extraction and Expeditionary Assault, and HAO/NEO. All three of these exercises exhibit similar operations that involve personnel and equipment (e.g., Amphibious Assault Vehicle (AAVs), Sea, Air, and Land Delivery Vehicles (SDVs), supply trucks) crossing beach areas or following existing roads from the shoreline and dispersing into designated areas for from 1 to 18 days of training.

At PMRF, the insertion point for operations is at Majors Bay and within a landing zone that has been specifically designated for these types of exercises. The Majors Bay landing site is heavily disturbed from long-term use by both the military and the public, and contains no recorded cultural resources in either the landing or staging areas. This location has a low potential for the unanticipated discovery of cultural materials or human remains. There is one significant recorded cultural site in the over-night area inland of the beach (Site 05-1834) (Commander, Navy Region Hawai‘i, 2005); however, the site is fully marked in the field and easily recognized as a “keep-out” area (U.S. Department of the Navy, Commander, Third Fleet, 2002). With adherence to prohibitions against entry into this area, no impacts to cultural resources will occur from these operations at Majors Bay.

Underwater Swimmer Insertion/Extraction training involves the use of submersible watercraft (SDV or ASDS) to deliver special operations forces for clandestine operations training. Mine countermeasures (MCM) involve the placement, detection, and retrieval of inert underwater mines (shapes) to support mine clearance training. Placement involves deploying the shapes from either a small, shallow-draft boat or by use of a large shore crane; shapes are moored (e.g., tethered to concrete blocks), buoyant, or rest on the sandy or rubble-covered ocean bottom. Expeditionary Assault is an amphibious exercise that encompasses seaborne forces assaulting across a beach. Troops disperse from the landing crafts and proceed through offshore water and across the beach to designated areas.

According to the National Oceanic and Atmospheric Administration’s shipwreck maps, there are two known wrecks and two Native Hawaiian fishponds in the vicinity of PMRF. Both of the wrecks and one fishpond are near the northern extreme of the facility’s shoreline; the second fishpond is in central PMRF (Site 05-0721–Kawaiele Ditch) and is significant as a traditional cultural property associated with the Menehune (International Archaeological Resources Institute, Inc., 2003).

MCM, Expeditionary Assault, and HAO/NEO operations will take place within PMRF’s dedicated beach landing area, which is along the south-central shoreline of the installation clearly away from the sensitive areas described above. No effects will occur to the known wrecks and fishponds, and no adverse effects on unidentified underwater cultural resources are expected.

If unanticipated cultural resources are encountered (particularly human remains) for any activity, operation plans direct that all operations will cease in the immediate vicinity of the find and procedures outlined in the PMRF Integrated Cultural Resources Management Plan (ICRMP), Standard Operating Procedure II.3.3, followed (Commander, Navy Region Hawai‘i, 2005).

HRC RDT&E Operations

Missile operations at PMRF encompass a wide array of missile types and are conducted from existing launch facilities. Potential impacts on cultural resources from launches include:

- New construction, ground-clearing, and off-road traffic activities
- Sound pressure damage to buildings and structures from launch operations
- Inadvertent ignition of vegetation and subsequent fire suppression activities
- Increased human presence in archaeologically sensitive areas as a result of training or maintenance operations
- Alteration, modification, renovation, or demolition of existing potentially significant facilities
- Underwater activities

Mitigation measures to reduce and/or eliminate any potential adverse effects on known or unidentified historic properties have been developed and are presented in the PMRF ICRMP (Commander, Navy Region Hawai‘i, 2005). These include:

- Avoiding operations and construction in areas where cultural resources are known to exist
- Monitoring all ground-disturbing activities and construction in medium and high sensitivity archaeological areas
- Briefing personnel working in culturally sensitive areas, including providing information on Federal laws protecting cultural resources
- Spraying water on vegetation within the immediate area of the launch vehicle prior to launch. In the event that vegetation ignites as a result of launches, fire suppression personnel are instructed to use an open spray nozzle whenever possible to minimize erosion damage (such as to sand dunes) and prevent destruction of cultural resources.
- If extensive burning of dune vegetation occurs, conducting post-burn archaeological surveys in consultation with the Hawaii State Historic Preservation Office (SHPO) and Navy archaeologist
- Implementing data recovery/research and documentation program if cultural resources are discovered as a result of normal training, operation, and base operations activities.

As part of the PMRF Enhanced Capabilities EIS process, a Memorandum of Agreement for the protection of cultural resources was signed in 1999 (Appendix I), which includes a monitoring plan for ground-disturbing activities and a burial treatment plan. These plans have been integrated into the Standard Operating Procedures of the PMRF ICRMP as well (Commander, Navy Region Hawai‘i, 2005).

Because extensive measures are in place for the protection of cultural resources during missile operations at PMRF, no adverse effects are expected. With missile operations and all other military activities at PMRF, the Navy will continue to provide Native Hawaiians with access to traditional religious and cultural properties, in accordance with the American Indian Religious Freedom Act and Executive Order 13007, on a case-by-case basis.

Major Exercises

Elements of Major Exercises with the potential to affect terrestrial cultural resources are included in the above discussions.

4.3.1.1.4.2 Alternative 1 (Cultural Resources—PMRF/Main Base)

Increased Tempo and Frequency of Training Operations and New Training Operation

Increases in the numbers of exercises required under Alternative 1 would have no effect on terrestrial cultural resources at PMRF. Baseline operations (i.e., the No-action Alternative) analyzed above will have no adverse effect on known cultural resources at PMRF, and established guidance (e.g., the PMRF ICRMP and a Memorandum of Agreement) is in place for protection. Increased tempo and frequency of training operations under Alternative 1 would not be anticipated to produce adverse effects. (Commander, Navy Region Hawaii, 2005)

HRC Enhancements

Enhanced Automatic Identification System and Force Protection

The AIS provides a ship-to-ship and ship-to-shore communications capability. To enhance the existing system, new antennas would be added to Building 282 at PMRF Main Base. Historic buildings surveys have been completed of PMRF/Main Base, and Building 282 has not been recommended as eligible for inclusion in the National Register. As a result, installation of a new antenna on this building would have no effect on cultural resources (Commander, Navy Region Hawai‘i, 2005)(see Appendix I).

Pacific Missile Range Facility Enhancements

Operations at PMRF main base with the potential to affect terrestrial cultural resources include construction of a new diesel generator, construction of a new Range Operations Control Building and completion of a new fiber optic cable line between Main Base and Makaha Ridge and/or PMRF and Kokee (see Figure 2.1-1).

<u>Range Operations Control Building</u>

There are no cultural resources sites identified within the direct region of influence for construction of the Range Operations Control Building. The areas have been surveyed for archaeological resources; however, subsurface features may still be present (Commander, Navy Region Hawai‘i, 2005; West and Desilets 2005). Construction of these facilities will require coordination with the PMRF Environmental Engineer and will follow the guidance provided in the PMRF ICRMP, most specifically Standard Operating Procedure II.3.1 (Commander, Navy Region Hawai‘i, 2005). Mitigation measures would include, but not be limited to, archaeological monitoring during construction.

<u>Fiber Optic Cable</u>

Improving the fiber optic infrastructure between PMRF, Makaha Ridge, and Kokee would involve the installation of approximately 23 miles of fiber optic cable. Between PMRF and Makaha Ridge, the cable would be hung on existing Kauai Island Utility Cooperative (KIUC) poles. Between Makaha Ridge and Kokee a new underground duct system would be required. The system would use three high-density polyethylene, 2-inch ducts with micro-ducts to minimize communication hand-holes and would be built to Protective Distribution System standards with an Intrusion Detection System.

Hanging the new fiber optic cable on existing KIUC utility poles between PMRF and Makaha Ridge would have no effect on cultural resources. However, any connections required between the existing cable terminal and the poles (i.e., trenching, installation of new ducts, or erection of new poles across PMRF to get to the KIUC intersection) could affect subsurface cultural materials. Once the exact paths of the cable connection and underground duct (between Makaha Ridge and Kokee) are determined, coordination with the PMRF Environmental Engineer would be required, following guidance provided in the PMRF ICRMP (Commander, Navy Region Hawai'i, 2005). Mitigation measures would include, but may not be limited to, archaeological monitoring during construction.

Major Exercises

Impacts associated with Major Exercises at PMRF/Main Base would be similar to those discussed in Section 4.3.1.1.4.1.

4.3.1.1.4.3 Alternative 2 (Cultural Resources—PMRF/Main Base)

Increased Tempo and Frequency of Training Operations

Increases in the numbers of exercises required under Alternative 2 would have no effect on terrestrial cultural resources at PMRF. Baseline operations (i.e., the No-action Alternative) analyzed earlier would have no adverse effect on known cultural resources at PMRF, and established guidance (e.g., the PMRF ICRMP and a Memorandum of Agreement) is in place for protection. Increased tempo and frequency of training operations above Alternative 1 would not be anticipated to produce adverse effects.

Future RDT&E Operations

Directed Energy

The Directed Energy program would require the construction of new facilities at PMRF/Main Base, including a new administration building and a new operations building (see Figure 2.2.4.4-1). The buildings are currently sited in locations where there are no known archaeological sites; however, the locations have not been finalized. There is always the potential for subsurface archaeological remains to occur. Once the exact facility locations have been determined, construction would require coordination with the PMRF Environmental Engineer, following guidance provided in the PMRF ICRMP (Commander, Navy Region Hawai'i, 2005).

Advanced Hypersonic Weapon

The Advanced Hypersonic Weapon involves multiple launches of a long range missile. Launches would be from the KTF area of PMRF. No construction is required for this program and, as described above, measures are in place for the protection of terrestrial cultural resources within the ground hazard area. As a result, adverse effects are not expected.

Additional Major Exercises—Multiple Strike Group Training

Operations associated with the Multiple Strike Group primarily involve sea and air operations; therefore, adverse effects on terrestrial cultural resources at PMRF/Main Base are not expected.

4.3.1.1.5 Geology and Soils—PMRF/Main Base

4.3.1.1.5.1 No-action Alternative (Geology and Soils—PMRF/Main Base)

Ongoing training operations at PMRF/Main Base, expeditionary assault, ground maneuvers and HAO/NEO exercises would have minimal direct impact on the beach and inland areas, and soils would not be permanently affected.

4.3.1.1.5.2 Alternatives 1 and 2 (Geology and Soils—PMRF/Main Base)

Construction activities that could affect geology and soils include installation of Automatic Identification System and Force Protection equipment, construction of a new Range Operations Control Building and construction of the proposed high-energy laser facility. New construction would follow standard methods to control erosion during construction. No adverse impacts to soils are likely to occur as a result of new construction because the proposed sites are located in modern alluvial and dune sands unsuitable for agricultural development. Soil disturbance would be limited to the immediate vicinity of the construction area and would be of short duration. Soils at the proposed sites may be subject to minor erosion from the wind during the construction period. Base personnel would exercise best management practices to reduce soil erosion.

4.3.1.1.6 Hazardous Materials and Waste—PMRF/Main Base

4.3.1.1.6.1 No-action Alternative (Hazardous Materials and Waste—PMRF/Main Base)

HRC Training Operations and Support Operations

Under the No-action Alternative existing operations at PMRF/Main Base will continue and there will be no increase in hazardous materials used and hazardous waste produced. PMRF/Main Base has plans in place to manage hazardous materials and waste.

Under the No-action Alternative, existing HRC Training Operations at PMRF will continue to occur. Operations at PMRF/Main Base that can affect hazardous material and waste include GUNEX, Swimmer Insertion/Extraction, Expeditionary Assault, and Missile Exercises. Section 3.3.1.1.6 details existing levels of hazardous materials and hazardous wastes at PMRF/Main Base. The No-action Alternative will continue to generate similar levels. PMRF operations follow applicable State and Federal requirements for the management of hazardous materials and waste generated. All hazardous materials and hazardous waste will continue to be shipped in accordance with Department of Transportation (DOT) regulations.

Hazardous materials and wastes associated with GUNEX, Swimmer Insertion/Extraction and Expeditionary Assault will primarily include fuels needed for vehicles used in the operations. These vehicles will be fueled prior to the start of the training operations. Any spills that occur will be handled in accordance with existing standard operating procedures (SOPs) at PMRF. In addition, training materials will be expended offshore at PMRF/Main Base during training exercises. Items that will be expended in the water offshore and those not recognized as training debris typically will not be recovered.

Missile Exercises at PMRF/Main Base

Both solid and liquid propellant missiles launch activities will continue to occur at PMRF/Main Base. Pre-launch activities associated with these launches include transportation and handling of launch vehicles. All elements of the launch vehicle will be transported, handled and stored at PMRF in accordance with applicable Federal and State regulations and standard range SOPs to limit any adverse impact.

Potential soil contamination could occur from rocket emissions forming hazardous residues in concentrations which would dictate a hazard to human health, or, in the event of an early flight termination, burning fuel may reach the ground. During nominal launches of a solid propellant missile, the primary emission products would include hydrogen chloride, aluminum oxide, carbon dioxide, carbon monoxide, nitrogen, and water.

No adverse changes to soil chemistry are predicted to occur as a result of hydrogen chloride or aluminum oxide deposition from solid fueled target and interceptor launches. No solid propellant missile launches would occur during rain, and the launch system would not use a water deluge system for cooling and noise suppression (a deluge system could increase the potential for ground deposition. Potential deposition of aluminum oxide per launch is expected to be small relative to the levels of aluminum present in the soil. Previous studies performed by the Department of Energy to evaluate the impact of potentially launching Strategic Target Systems at KTF measured high background levels of aluminum in the soils of the Mana Plain. Soil deposition of measurable levels of aluminum oxide from a moving exhaust cloud is predicted to be negligible (U.S. Army Strategic Defense Command, 1992). Additionally, because the launch location is on the western side of the island, the launch trajectory is away from the island, and there are strong persistent wind conditions, it is expected that very little of these emissions would be deposited at PMRF.

In the unlikely event of an on-pad fire or early flight failure over land of a solid propellant missile, most or all of the fuel would likely burn up before being extinguished. Any remaining fuel would be collected and disposed of as hazardous waste. Potential soil contamination which could result from such an incident is expected to be localized. An on-pad spill or catastrophic missile failure of a liquid-fueled missile over land could result in the release of unsymmetrical dimethyl hydrazine fuel and/or inhibited red fuming nitric acid oxidizer. Unsymmetrical dimethyl hydrazine is heavier than air, and if not oxidized when airborne will react and/or possibly ignite with the porous earth or will form dimethylamine and oxides of nitrogen. All of these substances are soluble in water. On further oxidation of the dimethylamine, the amino substances serve as nutrients to plant life. Airborne nitrogen dioxide would return to earth as nitric acid rains in precipitation events and would react with the calcium carbonate soil to form the nitrates which are used in fertilizer for plant life (U.S. Army Space and Strategic Defense Command, 1995).

Likewise, inhibited red fuming nitric acid that reached the ground would react with calcium carbonate soils to form calcium nitrates (U.S. Army Space and Strategic Defense Command, 1995). Calcium nitrate, a strong oxidizer, is a dangerous fire risk in contact with organic materials, and may explode if shocked or heated (U.S. Army Space and Strategic Defense Command, 1995). Therefore, depending on the amount of the propellant and/or oxidizer released, soils contaminated with these liquid propellants may require removal to prevent subsequent fires or explosions. Calcium nitrate is also water soluble, so it is anticipated that any residual material or unreacted fuel would be washed into the groundwater or directly out to sea.

Potentially hazardous materials (external to those preloaded into the launch vehicles) to be used will be fuel required for electrical power generators, coating, sealants and solvents needed for launch and launch preparation. The types of hazardous materials used and hazardous waste generated will be managed in accordance with existing PMRF procedures, which conform to Federal and State of Hawaii requirements.

In addition, the PMRF Fire Department and Spill Response Team are trained in the appropriate procedures to handle the materials associated with launches if a mishap occurs. All personnel involved in these operations will wear protective clothing and receive specialized training in spill containment and cleanup. During launches there is the potential for a mishap to occur resulting in potentially hazardous missile debris and propellants falling within the ground hazard area. The hazardous materials that result from a flight termination will be cleaned up and any contaminated areas remediated. All hazardous waste generated from such a mishap will be disposed of in accordance with appropriate State and Federal requirements. Specific restoration actions, if necessary, will be determined on a case-by-case basis in coordination with the procedures of the Facility Services Division of Hazardous Materials.

HRC RDT&E Operations

Ongoing operations associated with RDT&E Operations that can affect hazardous materials and waste levels at PMRF/Main Base include missile defense ballistic missile target flights and THAAD interceptor operations.

RDT&E Operations includes conducting missile launches from both northern and southern PMRF/Main base launch sites. Impacts will be as described above for HRC Training Operations. The types of hazardous materials used and hazardous waste generated will be similar to current materials and will not result in any existing procedural changes to the hazardous materials and hazardous waste management plans currently in place. The rate of launches will not increase at PMRF/Main base due to the No-action Alternative.

Major Exercises

Major Exercises include ongoing training operations, and in some cases RDT&E operations. C2 is achieved through a network of communication devices strategically located at selected DoD installations around the islands with no hazardous material or hazardous waste impacts foreseen.

Potential impacts to hazardous materials and wastes at PMRF/Main Base from a Major Exercise will be similar to those described for the Training Operations and RDT&E Operations. The types of hazardous materials used and hazardous waste generated will be similar to current materials and will not result in any existing procedural changes to the hazardous materials and hazardous waste management plans currently in place.

4.3.1.1.6.2 Alternative 1 (Hazardous Materials and Waste—PMRF/Main Base)

Increased Tempo and Frequency of Training Operations and New Training Operations and Major Exercises

The types of exercises that would occur at PMRF/Main Base would be similar to those described in Section 4.3.1.1.6.1. While training operations would increase in number, hazardous materials used and hazardous waste generated would be similar to existing usage and generation, and would not result in any changes to management plans currently in place.

Enhanced and Future RDT&E Operations

Increased and future RDT&E operations include Interceptor targets launched from Wake Island, Kwajalein Atoll, or Vandenberg AFB into the Temporary Operating Area, Additional Chemical Simulants, High Speed unmanned aerial and surface vehicle testing, and Hypersonic Vehicle testing.

Proposed launches associated with increase and future RDT&E operations would have a similar impact to hazardous material used and wastes generated as those described for the No-action Alternative. The proposed solid and liquid propellants would be similar to past launches from PMRF and would follow the same hazardous materials and hazardous waste handling procedures developed under existing plans. The types of hazardous materials used and hazardous waste generated would be similar to current materials and would not result in any changes to the hazardous materials and hazardous waste management plans currently in place.

Section 4.3.1.1.7.2, Health and Safety, addresses the amounts of liquid fuels required and the appropriate health and safety measures. All liquid propellant fuel spills would be remediated and hazardous waste generated would be disposed of in accordance with appropriate requirements.

During launches of either solid or liquid propellant missiles there is the potential for a mishap to occur resulting in potentially hazardous missile debris and propellants falling within the ground hazard area. As addressed for previous launch programs on PMRF, the hazardous materials that result from a flight termination would be cleaned-up and any contaminated areas remediated. All hazardous waste generated in such a mishap would be disposed of in accordance with appropriate State and Federal requirements

Target launches from PMRF would incorporate additional chemical simulants to include larger quantities of tributyl phosphate (TBP) and various glycols. Approximately 120 gallons (gal) of simulant would be used in target vehicles launched from PMRF. The simulant would be transported from the Continental United States to PMRF with the target vehicle and would be loaded into the target vehicle payload as part of the payload processing activities.

TBP is a non-flammable, non-explosive, colorless, odorless liquid typically used as a solvent in commercial industry. The release of simulant would occur at a high altitude over the open ocean during a nominal flight test. TBP is not considered a hazardous substance or constituent by the Comprehensive Environmental Response, Compensation, and Liability act (CERCLA), Resource Conservation and Recovery Act (RCRA), and DOT. There are no reportable quantities or cleanup standards established for TBP. However, caution would be used when handling TBP, as recommended on Material Safety Data Sheets and in keeping with PMRF SOPs. Launch preparation activities, including loading and handling of the TBP payload, would have a minimal impact to hazardous materials and waste. Emergency response planning would be incorporated into operations requirement in order to minimize any impact due to an unplanned release of TBP. Loading TBP would be similar to other project actions at PMRF and would not result in an increased hazard.

HRC Enhancements

Proposed HRC Complex Enhancements at PMRF/Main Base include construction of range operations control building, range safety for high energy lasers, and improve fiber optic infrastructure.

Construction of new facilities at PMRF/Main Base, including a range operation control building and improved fiber optic infrastructure, would be conducted in accordance with the U.S. Army Corps of Engineers (USACE) Safety and Health Requirements Manual. Before any facility modifications, the areas to be modified would be surveyed for asbestos and lead-based paint. These materials would be removed in accordance with Federal and State requirements prior to building modifications. Construction activities associated with HRC enhancements would be centralized to the greatest extent possible at the selected project site and on specific construction laydown areas. Hazardous materials and waste management would be performed in accordance with ongoing PMRF procedures, as well as applicable Federal, State and local requirements. All construction activities would follow the PMRF spill control plan.

Proposed construction activities are anticipated to use small quantities of hazardous materials, which would result in the generation of some hazardous and nonhazardous wastes. The hazardous materials that are anticipated to be used are common to construction activities and could include diesel fuel, anti-freeze, hydraulic fluid, lubricating oils, welding gases, and small amounts of paints, thinners, and adhesives. Hazardous materials management techniques would be used during the construction period to minimize (1) the amount of hazardous materials stored, (2) the threat of their accidental and unplanned release into the environment, and (3) the quantity of hazardous waste generated.

PMRF would develop and implement the necessary SOPs and range safety requirements necessary to provide safe operations associated with future high energy laser tests.

4.3.1.1.6.3 Alternative 2 (Hazardous Materials and Waste—PMRF/Main Base)

Increased Tempo and Frequency of Training Operations

Impacts to hazardous materials and waste at PMRF/Main Base from increased training operations would be similar to existing levels of hazardous materials used and waste generated. The total number of training operations that affect hazardous material use and hazardous waste generation would increase by an average of approximately 31 percent above the No-action Alternative. While the number of exercises would increase, the level of hazardous materials used and waste generated would continue to be managed by PMRF under appropriate State and Federal requirements.

Future RDT&E Operations

The proposed high energy laser would require a 25,000-ft^2 building at PMRF/Main Base. Construction impacts would be similar to those described earlier. However, separate environmental documentation would be required to analyze specific location and operational requirements, including requirements associated with hazardous material use and hazardous waste generation.

The testing of the Advanced Hypersonic Weapon would include two launches of a Strategic Target System booster from KTF and two launches of the Orion 50S XLG first stage and Orion 50S XL second stage weapon from the same site. The Strategic Target System booster has been previously launched at KTF, and hazardous materials and wastes would be the same for these launches. The testing of the Hypersonic Weapon with the Orion configuration would be anticipated to use similar hazardous materials and produce similar hazardous waste. While the number of launches would increase, hazardous material usage and waste generation would continue to be managed by PMRF under appropriate State and Federal requirements.

Additional Major Exercises—Multiple Strike Group Training

Up to three Strike Groups would be added to the Major Exercises occurring in the HRC. These ships would not be home ported in Hawaii, but would be in the HRC area for up to 30 days per exercise. Operations associated with this training that could occur at PMRF/Main Base would be similar to those described in Section 4.3.1.1.6.1 and would require similar levels of hazardous materials and produce similar levels of hazardous waste. While the number of operations would increase at PMRF/Main Base during Strike Group Training, the levels of hazardous materials and waste would continue to be managed by PMRF under appropriate State and Federal requirements.

4.3.1.1.7 Health and Safety—PMRF/Main Base

4.3.1.1.7.1 No-action Alternative (Health and Safety—PMRF/Main Base)

Under the No-action Alternative existing operations at PMRF/Main Base will continue. PMRF takes every reasonable precaution during planning and execution of operations, training exercises, and test and development operations to prevent injury to human life or property.

HRC Training Operations and Support Operations

Under the No-action Alternative existing HRC Training Operations at PMRF will continue to occur. The ongoing operations associated with the No-action Alternative HRC Training Operations that can affect health and safety at PMRF/Main Base includes GUNEX, Swimmer Insertion/Extraction, Expeditionary Assault, and Missile Exercises.

SOPs will be used during GUNEX, Swimmer Insertion/Extraction, and Expeditionary Assault exercises. These procedures include the use of clearance zones, restricting landings to specific areas of the beach, publication of training overlays that identify the landing routes and any restricted areas, and designating a lookout to watch for other vessels. Every reasonable precaution is taken to prevent injury to human life or property.

Missile Exercises at PMRF/Main Base

Missile and aerial target launch activities can occur from the PMRF Launch Complex on the northern part of the base and from two Department of Energy KTF launch areas on the northern and southern ends of the base. The missile and aerial targets are launched from fixed or portable launchers using either solid or liquid propellants. Health and safety concerns stem from pre-launch, launch, and post-launch activities.

Missile launches by their very nature involve some degree of risk, and it is for this reason that DoD and PMRF have specific launch and range safety policies and procedures to assure that any potential risk to the public and government assets (launch support facilities) are minimized. Potential issues related to health and safety include mishaps during the transportation of missile components, toxic and explosive risks during missile integration and assembly, mishaps during payload/warhead mating, mishaps during handling, and launch associated debris and emissions.

Hazards During Pre-flight Operations

Missiles and support equipment may arrive at Pearl Harbor before final shipment to PMRF. Equipment will be available at Pearl Harbor for the loading and unloading of missiles. Storage areas will be available for the temporary storage of any hazardous materials. Missiles and support equipment are routinely transported directly to PMRF by aircraft. Missiles and support equipment may also be transported by ship to Nawiliwili Harbor, then by DoD/DOT-approved over-the-road carrier truck to PMRF. Applicable State and Federal regulations and range safety plans and procedures are followed in transporting and handling potentially explosive ordnance and hazardous materials. Missile components, including any propellant, are transported in DOT and military designed and approved shipping containers.

The protection afforded by shipping containers is sufficient to protect solid rocket motors from the shock required to cause an explosion. In the unlikely event of a transportation accident, the solid propellants would likely burn rather than explode. The solid propellants would release combustion products, specifically hydrogen chloride, which would irritate the eyes and skin of persons nearby. Such an accident would not likely occur given the in-place safety procedures used by PMRF during transportation and handling of missile components. Explosive Safety Quantity-Distances (ESQDs) are established along transportation corridors.

On arrival at PMRF, support equipment is placed in secure storage until assembly and launch preparation. ESQDs are established around ordnance storage and Missile Assembly Buildings. Access to storage and support facilities is limited to trained and authorized PMRF/mission critical personnel.

Hazards During Vehicle Launch

Many procedures are in place to mitigate the potential hazards of an accident during the flight of one of these missiles. The PMRF Flight Safety Office prepares Range Safety Operational Procedure (RSOP) for each mission that involves missiles, supersonic targets, or rockets. This includes debris of hit-to-kill intercept tests where an interceptor missile impacts a target missile. The Commanding Officer of PMRF approves each RSOP, which includes specific requirements and mission rules. The Flight Safety Office has extensive experience in analyzing the risks posed by such operations. In spite of the developmental nature of missile operations (which leads to a significant probability of mission failure), the United States has an unblemished record of public safety during missile and rocket launches. Appendix L describes the general approach to protect the public and involved personnel from launch accident hazards. A brief overview of missile flight procedures is presented here, with specific examples for some of the proposed programs. The procedures in place are designed such that there is a very low probability of any adverse health or safety consequences of missile or rocket activities.

To protect people from injury from either nominal launches or accidents, two primary mitigation measures are in place: flight termination and clearance of specified regions. Clearance areas include the ground hazard area for land areas, Ship Exclusion Zones for ocean areas, and

Restricted Airspace and Altitude Reservations for airspace. In addition, launch times and trajectories are cleared with United States Space Command to prevent impacts upon satellites (both manned and unmanned); this process is called Collision Avoidance. For some missions, no flight termination system is needed. This occurs when the vehicle properties are such that all potential debris from accidents is contained within the hazard area.

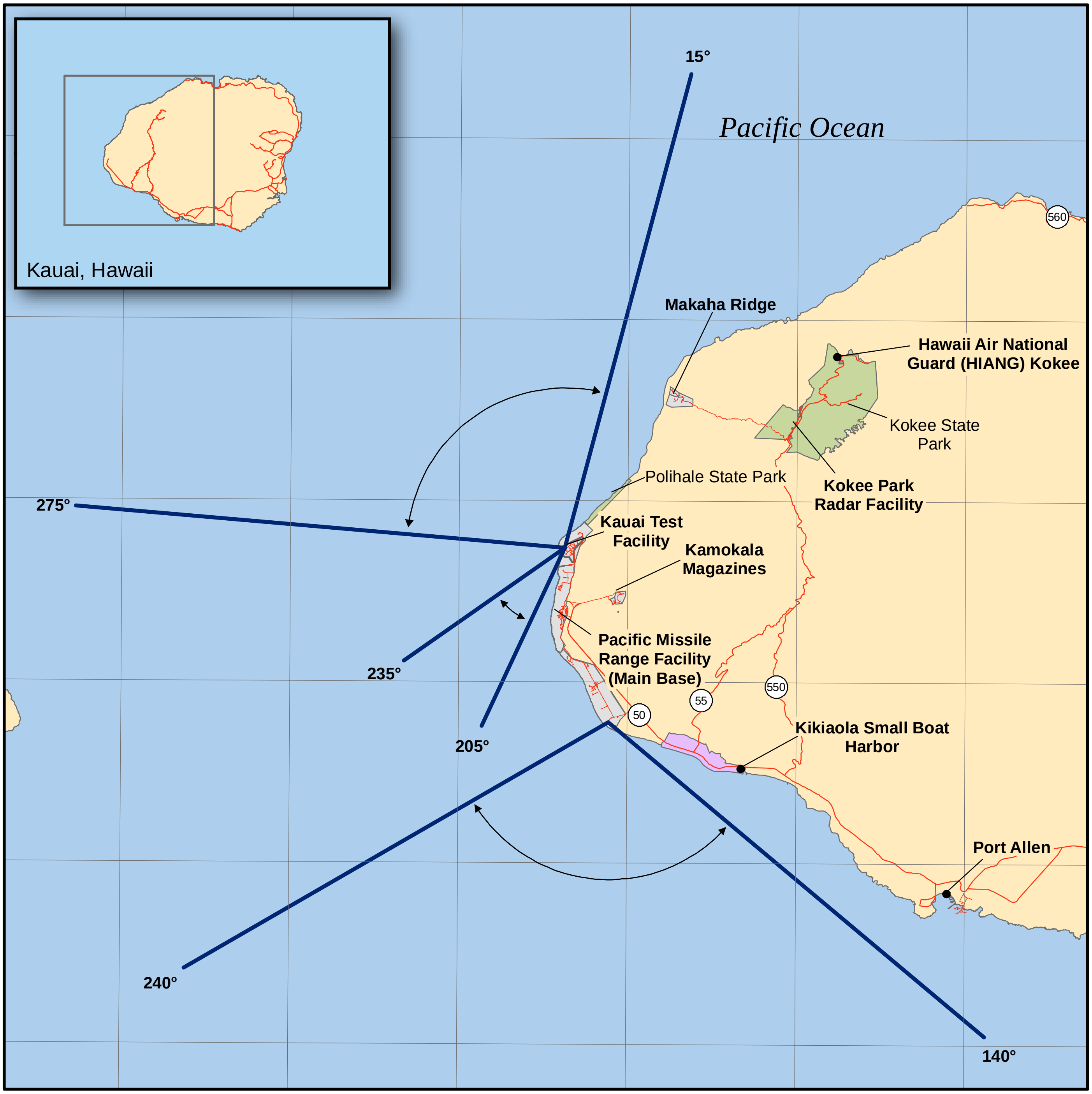
Flight termination is performed by the Missile Flight Safety Officer if a missile malfunctions and leaves a predefined region or violates other predefined mission rules. The acceptable flight region is bounded by Destruct Limits, which are defined to make impact on populated areas highly unlikely. The Missile Flight Safety Officer terminates flight if the Instantaneous Impact Point of a vehicle crosses a Destruct Limit. The range safety program includes redundant command destruct systems that permit in-flight tracking of the test missile. The Missile Flight Safety Officer monitors in real-time missile performance and evaluates flight termination criteria. The flight termination system provides a mechanism to protect the public with very high reliability, even in the unlikely case of a missile malfunction.

The sizes and locations of clearance regions, as well as the duration of closure, are determined for each particular launch through analysis and simulation.

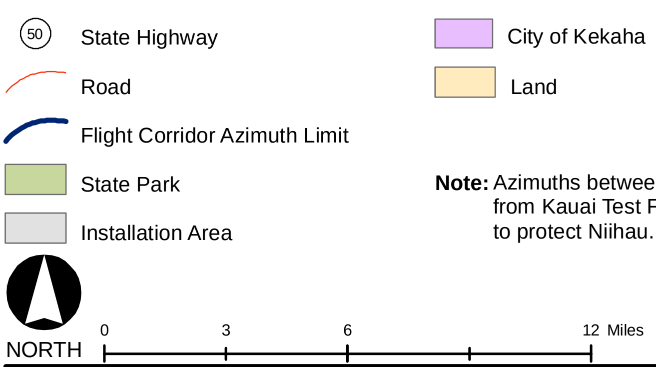
The ground hazard area includes the area that may be at risk from a vehicle failure very early in flight. It is a region in the vicinity of the launch location, typically extending 1,000 to 20,000 ft from the launch point, depending on the vehicle and mission. Clearance of this region ensures that the public is excluded from any area that would be at risk from an errant missile in the time after launch, but before Missile Flight Safety Officer could react to the malfunction (i.e., several seconds). For launches from the northern portion of PMRF Main Base (such as some Missile Defense, THAAD, Flexible Target Family), PMRF may activate the easement on State of Hawaii lands, and close roads on the Mana Plain (see Section 4.3.1.1.8).

The Ship and Aircraft Exclusion Areas ensure that vehicles are not in areas of unacceptable risk. These areas include the places where planned debris may impact (such as dropped stages of multi-stage vehicles or debris from hit-to-kill intercept engagements) and also the regions at risk if there is a failure (such as under the planned flight path). Aircraft regions are designed in a similar fashion. The specific definition of each of these regions is determined by a probabilistic risk analysis that incorporates modeling of the vehicle response to malfunctions, mission rules (such as Destruct Limits), and the vulnerability of vehicles to debris. NOTMARs and NOTAMs are issued for the entire region that may be at risk, encompassing both exclusion areas and warning areas (areas with very remote probability of hazard). Surveillance by aircraft and satellite is used to ensure that there are no ships or aircraft in cleared areas, and also that the collective risk meets acceptable risk criteria for the mission.

Examples of the Destruct Limits, NOTMARs, NOTAMs, ground hazard areas, and Ship Exclusion Areas are shown in Figure 4.3.1.1.7-1. A given mission would have different regions, but in all cases the same process to ensure mission personnel and public safety would be followed.



EXPLANATION



Note: Azimuths between 235° and 275° from Kauai Test Facility are avoided to protect Niihau.

Pacific Missile Range Facility Flight Corridor Azimuth Limits

Kauai, Hawaii

Figure 4.3.1.1.7-1

Prior to each mission, the PMRF Flight Safety Office performs a comprehensive analysis of the proposed mission, including flight plans, planned impact areas, vehicle response to malfunctions, and effects of flight termination action. A probabilistic analysis is performed with sufficient conservative assumptions incorporated to ensure that the risks from the mission are acceptable. PMRF follows the guidance of the Range Commanders' Council (RCC) for acceptable risk (in RCC-321). These acceptable risk criteria are designed to ensure that the risk to the public from range operations is lower than the average background risk for other third-party activities (for example, the risk of a person on the ground being injured from an airplane crash).

Post-launch Hazards

Debris from a launch may impact the ground or open ocean (either from stage jettison or from a flight termination action). Debris can consist of metals, solid propellant, and batteries. Potentially hazardous debris will be recovered from the ground or ocean (if it floats or impacts in shallow water) and disposed of in accordance with applicable State, Federal, and range hazardous waste requirements and operating procedures.

Sensor instrumentation operations will also occur during launches from PMRF/Main base. EMR health and safety issues described below address hazards of EMR to people, fuel, and ordnance (HERP, HERF, and HERO, respectively).

HERP hazards are the result of tissue heating by radio frequency energy. Hazard levels are a result of radio frequency energy averaged over any 6-minute period. The hazard of EMR to fuel is the ignition of fuel vapors by arcing or ignition of fuel in contact with the radiofrequency (RF) heated metal in intense radio frequency fields. The hazard of EMR on ordnance is the potential to cause the ordnance to explode in intense RF fields.

Prior to installing any new radar or modifications to existing radar, the PMRF conducts an EMR hazard review that considers hazards of EMR on personnel, fuel, and ordnance. The review provides recommendations for sector blanking (areas off-limits to EMR) and safety systems.

Regular radiation hazard surveys occur of the radar and other EMR generating equipment used on PMRF. None of the EMR generated affects the public using the beaches on PMRF or the areas adjacent to the facility. EMR hazards to personnel on PMRF are minimized by conducting hazard surveys of existing systems to ensure appropriate safety precautions are implemented. In addition, each radar unit contains warning lights that operate to inform personnel when the system is emitting EMR. Overall, with the implementation of the existing safety procedures, EMR represents a minimal health and safety risk to personnel working on PMRF or the public.

HRC RDT&E Operations

PMRF's additional mission is supporting RDT&E projects The at sea operations are analyzed in the Open Ocean Section (4.1.5). Land sensor and missile defense were discussed previously. Every reasonable precaution will be taken during planning and execution of operations, training operations, and RDT&E operations to prevent injury to human life or property.

Major Exercises

In addition to routine training exercises at PMRF, C2, Aircraft Operations Support, HAO/NEO, Missile Launches, Special Warfare Operations, Underwater Demolition Exercises are conducted during Major Exercises. C2 is achieved through a network of communication devices strategically located at selected DoD installations around the islands with no impacts to Health and Safety. Potential impacts to health and safety at PMRF/Main Base from a Major Exercise will be similar to those described for the Training Operations and RDT&E Operations.

4.3.1.1.7.2 Alternative 1 (Health and Safety—PMRF/Main Base)

Increased Tempo and Frequency of Training Operations and New Training Operations and Major Exercises

While training operations would increase in number, current SOPs would continue to be used during exercises. These procedures include the use of use of clearance zones, restricting landings to specific areas of the beach, publication of training overlays that identify the landing routes and any restricted areas, and designating a lookout to watch for other vessels. Every reasonable precaution would be taken to prevent injury to human life or property. The types of exercises that would occur at PMRF/Main Base would be similar to those described in Section 4.3.1.1.7.1.

Enhanced and Future RDT&E Operations

Increased and future operations include incorporation of additional non-lethal chemical simulants in target launches, interceptor targets launched from Wake Island, Kwajalein Atoll, or Vandenberg AFB into the Temporary Operating Area, High Speed unmanned aerial and surface vehicle testing, and Hypersonic Vehicle testing.

Proposed launches associated with increased and future operations would have a similar impact on health and safety as those described for the No-action Alternative. The proposed solid and liquid propellants would be similar to past launches from PMRF/Main Base and would follow the same health and safety procedures developed under existing plans described in Section 3.3.1.1.7.

Target launches would incorporate additional chemical simulants to include larger quantities of tributyl phosphate (TBP)and various glycols. The launch preparation activities would include loading and handling of the simulant payload. All simulant related operations would be performed in accordance with OSHA standards and SOPs developed, reviewed, and approved by PMRF. Adherence to these procedures would minimize the potential for health and safety impacts to both workers and the public. High levels TBP has been shown to have an irritant effect on the skin, eyes, and mucous membranes in humans; however, personnel directly involved in the loading of the simulant would wear appropriate personal protection equipment. In addition, aerial dispersion of TBP during proposed target launches would not be at levels to cause a health and safety concern to the public. Previous analysis of using TBP as a chemical stimulant determined that the amount of TBP that could be ingested by humans would be magnitudes below the amount needed to reach the probable oral lethal dose (U.S. Army Space and Missile Defense Command, 2004). In addition, any dispersion of the proposed chemical stimulant would occur over the open ocean; therefore, deposition of TBP would not pose an ingestion hazard to the public.

HRC Enhancements

Proposed HRC Enhancements at PMRF/Main Base include construction of range operations control building, range safety for high energy lasers, and improve fiber optic infrastructure.

New facilities would be constructed in accordance with the Corps of Engineers Safety and Health Requirements Manual. New facilities are routinely constructed for both military and civilian operations and present only potential occupational-related effects on safety and health for workers involved in the performance of the construction activity. The siting of launch facilities, ordnance facilities, and instrumentation would be in accordance with DoD standards.

PMRF would develop and implement the necessary SOPs and range safety requirements necessary to provide safe operations associated with future high energy laser tests.

4.3.1.1.7.3 Alternative 2 (Health and Safety—PMRF/Main Base)

Increased Tempo and Frequency of Training Operations and Additional Major Exercises—Multiple Strike Group Training

While training operations would increase in number, current SOPs would continue to be used during exercises. These procedures include the use of use of clearance zones, restricting landings to specific areas of the beach, publication of training overlays that identify the landing routes and any restricted areas, and designating a lookout to watch for other vessels. Every reasonable precaution would be taken to prevent injury to human life or property.

Future RDT&E Operations

The proposed high energy laser would require a 25,000-ft^2 building at PMRF/Main Base. Construction impacts would be similar to those described earlier; however, separate environmental documentation would be required to analyze the specific location and operational requirements. Range safety is responsible for assuring the safe usage of laser systems on the PMRF range. Range safety would require the proposed high-energy laser program to provide specific information about the proposed usage so that a safety analysis of all types of hazards could be completed and appropriate remedial procedures would be taken before initiation of potentially hazardous laser operations.

The high-energy laser program office would be responsible for providing all necessary documentation to PMRF prior to issuance of the Range Safety Approval (RSA) or RSOP. These include:

- Letter of Approval or a Letter of No Concern from the FAA for the use of the laser within Honolulu FAA airspace,
- Letter of Approval or a Letter of No Concern for the use of their laser if it will or has the potential of lasing above the horizon from USSPACECOM as well as clearance from USSPACECOM for each intended laser firing,
- Letter of Approval from the Laser Safety Review Board (LSRB) at Dahlgren for the use for their laser on Navy Ranges (this letter entails a survey and certification of the laser by the LSRB), and
- Range Safety Laser Data Package.

The Range Safety Laser Data Package is intended to provide the Range Safety Office with sufficient information to perform an evaluation of the safety of the laser and the proposed lasing activity and to approve the laser and its operation, and any risk mitigations required.

The Range Safety Office would analyze the submittal to assure that it is in compliance with PMRF safety criteria, which is based on Range Commanders Council document RCC-316, OPNAVINST 5100.27A and 2004 Laser Safety Survey Report for the Pacific Missile Range Facility Open Ocean Range. PMRF would be responsible for publishing an RSA or an RSOP for the laser operation specifying hazard areas and safety guidelines for the operation of the laser. The RSA/RSOP process would include an onsite safety inspection of the system by a PMRF Laser Safety Specialist to ensure that it complies with the Navy guidelines for lasers. As appropriate, the Range Safety Office would review the proposed laser systems for other non-optical hazard mechanisms, such as toxic releases.

Safety assurance would include defining exclusion areas, ensuring that the NOTAM and NOTMAR requests are submitted to the responsible agencies (FAA and Coast Guard respectively), ensuring that the laser operation falls within the approved operational areas, surveillance/clearance of the operational area and scheduling of the appropriate airspace and surface space. A Medical Surveillance Program would be required for any PMRF personnel or contractors whose duties lie within the hazard area of a laser program that is a permanent tenant or one whose tenancy is for an extended duration, and may require additional time to implement beyond the time normally required to generate an RSA or RSOP.

For general training scenarios of the proposed high-energy laser, the Range Safety Office would build on the *2004 Laser Safety Survey Report* performed by the Corona Division of the Naval Surface Warfare Center (Solis, 2004). This document defines the boundaries of the two laser target areas at PMRF: The outer W-186 Area and the outer W-188 Area are multipurpose bombing and laser target ranges used for aerial lasing. Only airborne laser designators may be used on the laser target areas. Procedures and restrictions for use of these areas are defined in this survey.

The testing of the Advanced Hypersonic Weapon would include two launches of a Strategic Target System booster from KTF and two launches of the Orion 50S XLG first stage and Orion 50S XL second stage weapon from the same site. The Strategic Target System booster has been previously launched at KTF. It's anticipated that the testing of the Hypersonic Weapon with the Orion configuration at the same site would have a similar potential health and safety impact as described for the No-action Alternative. The proposed solid and liquid propellants would be similar to past launches and would follow the same health and safety procedures developed under existing plans.

4.3.1.1.8 Land Use—PMRF/Main Base

Land-based use (offshore and onshore) was evaluated by analyzing the operations associated with each alternative presented in Chapter 2.0 of this EIS/Overseas EIS (OEIS). If any activity indicates a potential environmental consequence it has been discussed in the appropriate section below. Land use associated with KTF has been evaluated within PMRF/Main Base.

4.3.1.1.8.1 No-action Alternative (Land Use—PMRF/Main Base)

Under the No-action Alternative, three operations were reviewed for current land use associated with PMRF/Main Base: HRC Training Operations, RDT&E, and Major Exercises.

HRC Training Operations

PMRF will continue to conduct ongoing training operations, under the No-action Alternative. Land-based operations include Expeditionary Assault, Swimmer Insertion/Extraction, Aircraft Support Operations, Air Operations, and HAO/NEO. The current baseline occurrence for each of these operations is listed on Table 2.2.2.1-1, a full description is found in Appendix D, and a description of current weapon systems is found in Appendix E.

On-base Land Use

PMRF/Main Base will continue to conduct the ongoing training operations listed above within the designed conservation district/military lands at current capacity. All established safety measures will continue to be followed (ESQD Arcs, Ground Hazard Areas, Accident Potential Zones and Rocket Launchers). The continuation of operations at PMRF/Main Base under the No-action Alternative will be consistent to the maximum extent practicable with the Hawaii Coastal Zone Management Program.

On-base Recreation

Recreational services available to military and civilian personnel at PMRF/Main Base will remain at current status during non-hazardous operations. The installation's approximately 1,000-ft by 8-mile beach in the southern zone of PMRF will remain accessible to Kauai residents possessing an approved beach access pass. The beaches on PMRF only represent a small portion of the available beaches on western Kauai and do not provide any unique recreational coastal opportunities that cannot be provided elsewhere on the island. The requirement for safety zones around PMRF has served to protect and preserve scenic areas.

Off-based Land Use

PMRF operates adjacent to County and State designated agricultural areas (Figure 3.3.1.1.8-2). There are no inhabited buildings within these areas. The current State and County designations limit any development of a conflicting use between these governmental agencies and the Navy. The Navy currently leases 270 acres within the Agricultural Preservation Initiative (API) area which contain the pumping system for the Mana Plain. The ongoing training operations under the No-action Alternative are not conducted within these areas. Missile ground hazard areas that extend off-base into these agricultural areas, which are only used during launch events, will continue to adhere to established safety measures (Section 3.3.1.1.7-Health and Safety).

Approximately 70 acres of the southern extent of Polihale State Park are within the restricted easement boundary for PMRF/Main Base. This area contains missile ground hazard areas, which are only used during launch events. The ongoing training operations at PMRF are not conducted within the Park area. However, effects of these operations extend off-base into the 70 acres of the Park that are within the restricted easement boundary. In order to secure these areas during training operations, a 2,110-acre restrictive easement has been established with the State of Hawaii. The purpose of the easement is to protect all persons, private property, and vehicles during Vandal launches and Strategic Target System (STS) launches. Additionally, safety is ensured by restricting access to the land within a designated ground hazard areas, (6,000 ft and 10,000 ft for Vandal and STS respectively) prior to, during, and shortly after a launch (U.S. Department of the Navy, 2005, 1998). Figure 3.3.1.1.7-1 shows PMRF safety zones discussed in this paragraph.

HRC RDT&E Operations

Current ongoing HRC RDT&E Operations at PMRF/Main Base are listed in Table 2.2.2.4-1 and are detailed in Section 2.2.2.4 of this EIS/OEIS. These operations include Missile Defense, Gunnery/Special Weapons Test, and Evaluation, Electronic Combat/Electronic Warfare, High Frequency, Science & Technology/Others and Terminal High Altitude Area Defense. Based on previous EAs these training operations have little or no impact to land-based use (including recreation). Under the No-action Alternative there is no change in the current baseline level of occurrence for these operations.

Major Exercises

Major Exercises can have multiple training operations or sub-operations, each with its own mission, objective, and time period. Types of Major Exercises that are associated with PMRF are listed on Table 2.2.2.5-1, and Figure 2.2.2.5-1 shows the areas used by these exercises. Major Exercises associated with PMRF/Main Base are Humanitarian Assistance Operations/Non-combat Evacuation Operation, Special Warfare Operations, Demolition Exercises, and Expeditionary Assault. In addition, four USWEX operations and one biennial RIMPAC exercise are considered part of Major Exercises. Under the No-action Alternative, the number of training operations associated with a Major Exercises will continue at the current baseline level.

4.3.1.1.8.2 Alternative 1 (Land Use—PMRF/Main Base)

Increased Tempo and Frequency of Training Operations

Under Alternative 1, PMRF would continue those ongoing operations described under the No-action Alternative with a potential increase in the number of these operations performed per year.

HRC Training Operations associated with land-based use for PMRF/Main Base Area under Alternative 1 are Expeditionary Assault, Swimmer Insertion/Extraction, Aircraft Support Operations, Air Operations, and HAO/NEO (Table 2.2.3.1-1). The continuation of activities at PMRF/Main Base under Alternative 1 would be the same as those listed under the No-action Alternative above. Land-based use at PMRF/Main Base would not change for HRC training activities.

Enhanced and Future RDT&E Operations

Based on a review of increased and future RDT&E operations (Section 2.2.3.4), Test Hypersonic Vehicles may be associated with land-based use at PMRF/Main Base. The proposed hypersonic vehicles could be flight tested at PMRF from within and beyond the Temporary Operation Area (Figure 2.2.3.4-1). Additionally, rocket launching a hypersonic test vehicle could occur from the Vandal launch site at PMRF and follow a similar flight trajectory as other missiles launched from PMRF. To mitigate any inconvenience to the public from these increased and future RDT&E operations, the Navy would continue to monitor and evaluate current existing warning areas and buffers associated with launches from PMRF including the requirement for safety zones and missile ground hazard areas (which are only used during launch events that extend off-base into agricultural and recreational areas). Under Alternative 1, land-based use at PMRF/Main Base would not change due to increased and future RDT&E operations.

Major Exercises

Under Alternative 1, the Navy proposes to continue RIMPAC and USWEX exercises as described in the No-action Alternative. Additionally, under Alternative 1, USWEX frequency would increase by 50 percent (from 4 to 6 times per year). Appendix D shows the matrix of operations generally used during a USWEX exercise by location and shows the matrix of operations planned during future RIMPAC exercises by location. The operations associated with the exercises would be chosen from the list of training operations in Appendix D. These exercises are conducted primarily in open-ocean or near shore and require minimum assistance from a land-based resource during operation. Under Alternative 1, land-based base use at PMRF/Main Base would not change due to operations associated with Major Exercises.

4.3.1.1.8.3 Alternative 2 (Land Use—PMRF/Main Base)

Alternative 2 includes all the operations of Alternative 1 plus an increase in training RDT&E operations, as well as new RDT&E operations, and additional Major Exercises. Tables 2.2.4.1-1 and 2.2.4.3-1 show the number of operations proposed for Alternative 2, compared to the baseline and the number of operations proposed for Alternative 1. A description of training operations found in Appendix D, with current weapon systems discussed in Appendix E.

Increased Tempo and Frequency of Training Operations

The Navy proposes to increase the tempo of training exercises in the HRC. Also, exercises usually lasting 5 days would be completed in 3 days.

HRC Training Operations identified to be associated with land-based use for PMRF/Main Base under Alternative 2 are Expeditionary Assault, Swimmer Insertion/Extraction, Aircraft Support Operations, Air Operations, and HAO/NEO (Table 2.2.4.1-1). There would be an increase in the number of operations for Expeditionary Assault, Swimmer Insertion/Extraction, and Aircraft Support activities under Alternative 2.

Expeditionary Assault activities would increase by 9 percent (from 11-12 operations), Swimmer Insertion/Extraction operations would increase by approximately 10 percent (from 52 to 57 operations) and the Aircraft Support Activities would increase 100 percent (from 1 to 2 operations). The cumulative increase in the three operations is approximately 11 percent (from 64-71 operations). Therefore, the Navy will continue to maintain the requirement for safety zones around PMRF, which are only used during launch events that extend off-base into agricultural and recreational areas. Under Alternative 2, land-based use at PMRF/Main Base would not change due to increases in HRC training operations.

Additional Major Exercises—Multiple Strike Group Training

Under Alternative 2, up to three Strike Groups would be allowed to conduct training exercises simultaneously in the HRC (Figure 1.1-1). The Strike Groups would not be home ported in Hawaii, but would be in Hawaii for up to 30 days per exercise. The nature and location of the potential Major Exercises performed by a Strike Groups are primary associated with open-ocean areas or areas other than PMRF/Main Base Area. Under Alternative 2 land-based use on PMRF/Main Base would not change due to Major Exercises.

4.3.1.1.9 Noise—PMRF/Main Base

Noise impacts on human receptors are evaluated based on whether or not a noise event will exceed DoD or Occupational Safety and Health Administration (OSHA) guidelines. Sensitive receptors at PMRF/Main Base consist of on-base housing, which is located approximately 5 mi south of the northern KTF and PMRF launch areas and 1 mi from the southern launch site. The nearest off-base residential area is Kekaha, which is approximately 8 mi south of the northern launch areas and 3 mi from the southern launch site. Noise effects on wildlife are discussed in Section 4.3.1.1.3, Biological Resources (Terrestrial and Offshore).

4.3.1.1.9.1 No-action Alternative (Noise—PMRF/Main Base)

HRC Training Operations and Support Operations

Under the No-action Alternative, existing operations at PMRF/Main Base will continue and there will be no increase to existing noise levels. PMRF maintains a hearing protection program that includes monitoring the hearing of personnel exposed to high noise levels and identifying and posting notification of noise hazard areas. Personnel who work in noise-hazard areas are required to use appropriate hearing protection to bring noise levels within established safety levels.

Under the No-action Alternative, existing Hawaii Range Complex (HRC) Training Operations and Major Exercises at PMRF will continue to occur. Operations at PMRF/Main Base that can affect the noise environment include GUNEX, Swimmer Insertion/Extraction, Expeditionary Assault, and Missile Exercises. There will be no increase in existing noise levels during the continuing exercises listed above. The noise levels will be a combination of ambient noise and noise produced during the No-action Alternative. Ambient noise sources may include wind, surf, highway traffic, aircraft operations, and other local noise-generating land uses.

Mine laying occurs as either an airborne or underwater activity. Underwater mine laying produces no airborne noise. Mine laying training comprises two major types of operations: MINEXs and Mine Readiness Certification Inspections. MINEXs generally involve a single aircraft sortie (FA-18 or P-3), while Mine Readiness Certification Inspections are aircrew pre-deployment evaluations of entire units (i.e., supply, personnel, loading, aircrew weapon delivery, and recovery). Both operations are conducted in the PMRF range. In the single aircraft MINEX, the aircraft may make multiple passes in the same flight pattern, dropping one or more shapes each time. MINEX operations typically last approximately 1 hour.

The Mine Readiness Certification Inspections operation is similar to the MINEX except that multiple aircraft are used. Several aircraft usually take off from an aircraft carrier (or a shore station in the case of a P-3 wing), obtain clearance from Range Control, and verify visually that the range is clear of small boats. After flying over the Initial Point, they drop their shape in a predetermined pattern and return to the carrier (or shore base). Typical range time for this mission is approximately 1 hour. As with the MINEX operations, localized noise areas surrounding the operations site are expected. Due to the flight paths of the aircraft over water, the inert character of the mine shapes, and the remoteness of the sites with respect to sensitive receptors, potential impacts are minimal.

During GUNEX, small arms fires (using blank ammunition during the beach assault) will produce minor, short-term increases in ambient noise levels, and cannot be avoided. Short-term noise impacts associated with the simultaneous firing of six howitzers could also occur during GUNEX. Exposure to impulsive or impact noise will not exceed 140 unweighted peak decibels (dBP) at any time. The radius of exposure to 140 dBP during the simultaneous firing of six howitzers was calculated at 4,331 ft from the center of the gun emplacement. At PMRF/Main Base, military housing is 1,000 to 3,000 ft from the landing beach. Previous GUNEX operations have occurred at least 3,000 ft from housing.

During Swimmer Insertion/Extraction and Expeditionary Assault exercises, the noise sources can include helicopters, fixed-wing aircraft and airship operations, and operations of diesel engines of landing craft and tracked vehicles. Airfield operations are analyzed in the current Air Installation Compatible Use Zone (AICUZ) study. The majority of high noise levels associated with aircraft operations are contained within the PMRF/Main Base boundary. Some Day-Night Average Sound Level (L_{dn}) contours do extend to the adjacent sugar cane fields, which are considered a compatible land use in accordance with Navy AICUZ recommendations. PMRF/Main Base aircraft operations do not affect off-base residential areas or other sensitive receptors. On-base facilities have appropriate noise abatement to limit impacts from airfield operations.

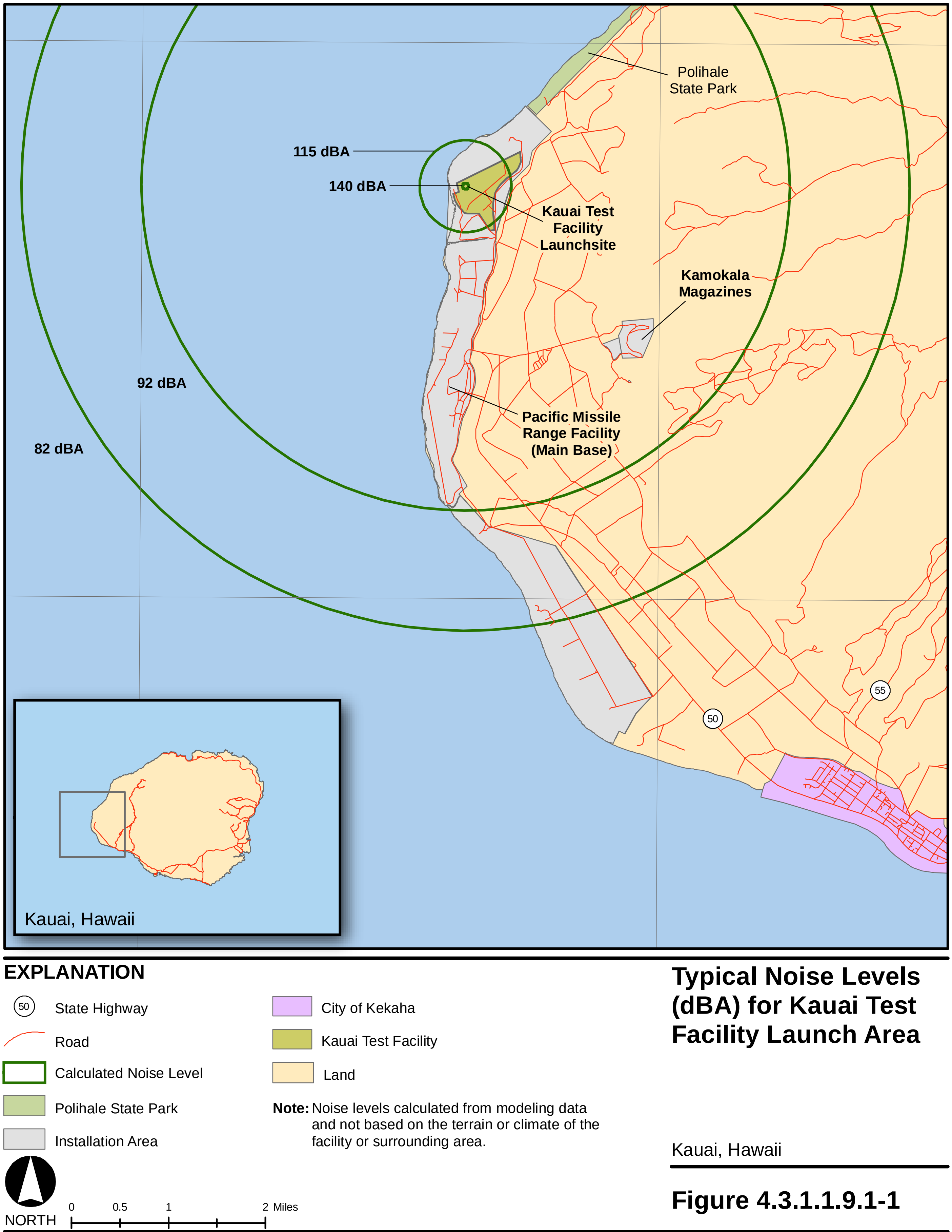
In addition, swimmer insertion and extraction operations that occur beneath the water have no airborne noise sources. Other insertion techniques involve helicopter insertion. The expected noise level for this operation is 90 dBA at 50 ft. These operations take place near the coast on military training areas away from population centers.

Missile Exercises at PMRF/Main Base

Noises produced during pre-launch activities include noise from mechanical equipment, as well as an increase in traffic noise levels due to the increase in support personnel. This increase is considered temporary, and does not permanently impact the surrounding area.

Noise produced during launches stem from the interaction of the exhaust jet with the atmosphere and the combustion of the fuel. The sound pressure from a missile is related to the engine's thrust level and other design features. Figures 4.3.1.1.9.1-1 through 4.3.1.1.9.1-3 show typical noise levels from launches at PMRF and KTF launch facilities. Limits have been set by DoD and OSHA to prevent damage to human hearing. Generally, noise levels above 140 dBA will not be exceeded at any time. A time-weighted limit for 15 minutes (or less) exposure is 115 dBA. In onbase areas where these noise levels will be exceeded, personnel are required to wear hearing protection. None of the noise levels outside the ground hazard areas, where non-essential personnel and the public are excluded, would exceed either DoD or OSHA safety requirements.

In addition to the noise of the rocket engine, sonic booms are possible. A sonic boom is a sound that resembles rolling thunder, and is produced by a shock wave that forms at the nose of a vehicle that is traveling faster than the speed of sound. Sonic booms from PMRF/Main Base launches do not occur over land. Offshore vessels impacted by sonic booms will be expected to experience sound resembling mild thunder. Sonic booms generated during launch activities will occur over the Pacific Ocean, and will not affect the public on Kauai or Niihau because the proposed missile trajectory will not include overflight of populated areas.



Typical Noise Levels (dBA) for Kauai Test Facility Launch Area

Kauai, Hawaii

Figure 4.3.1.1.9.1-1

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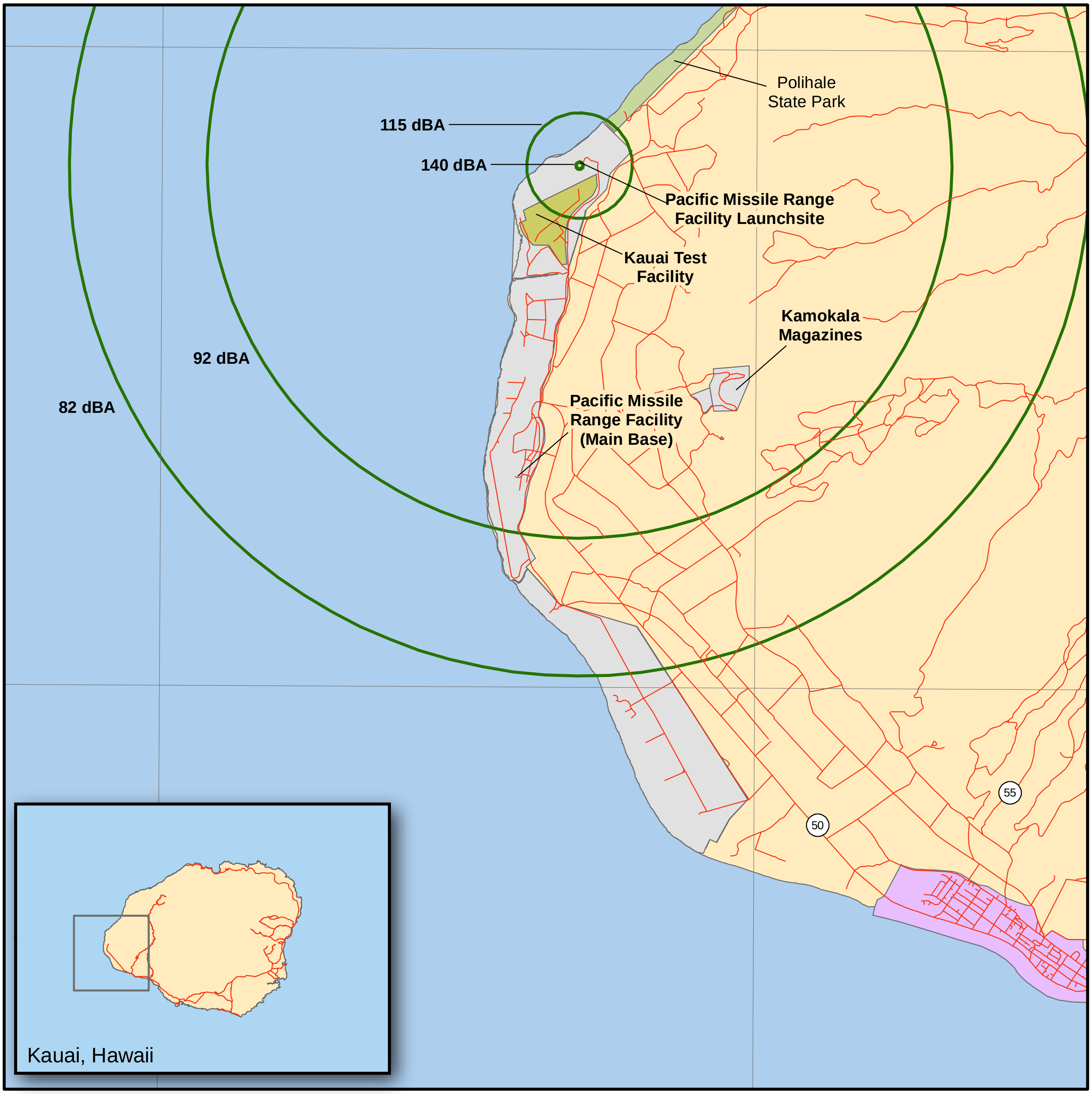


EXPLANATION

- 50 State Highway
- Road
- Calculated Noise Level
- Polihale State Park
- Installation Area
- City of Kekaha
- Kauai Test Facility
- Land

Note: Noise levels calculated from modeling data and not based on the terrain or climate of the facility or surrounding area.

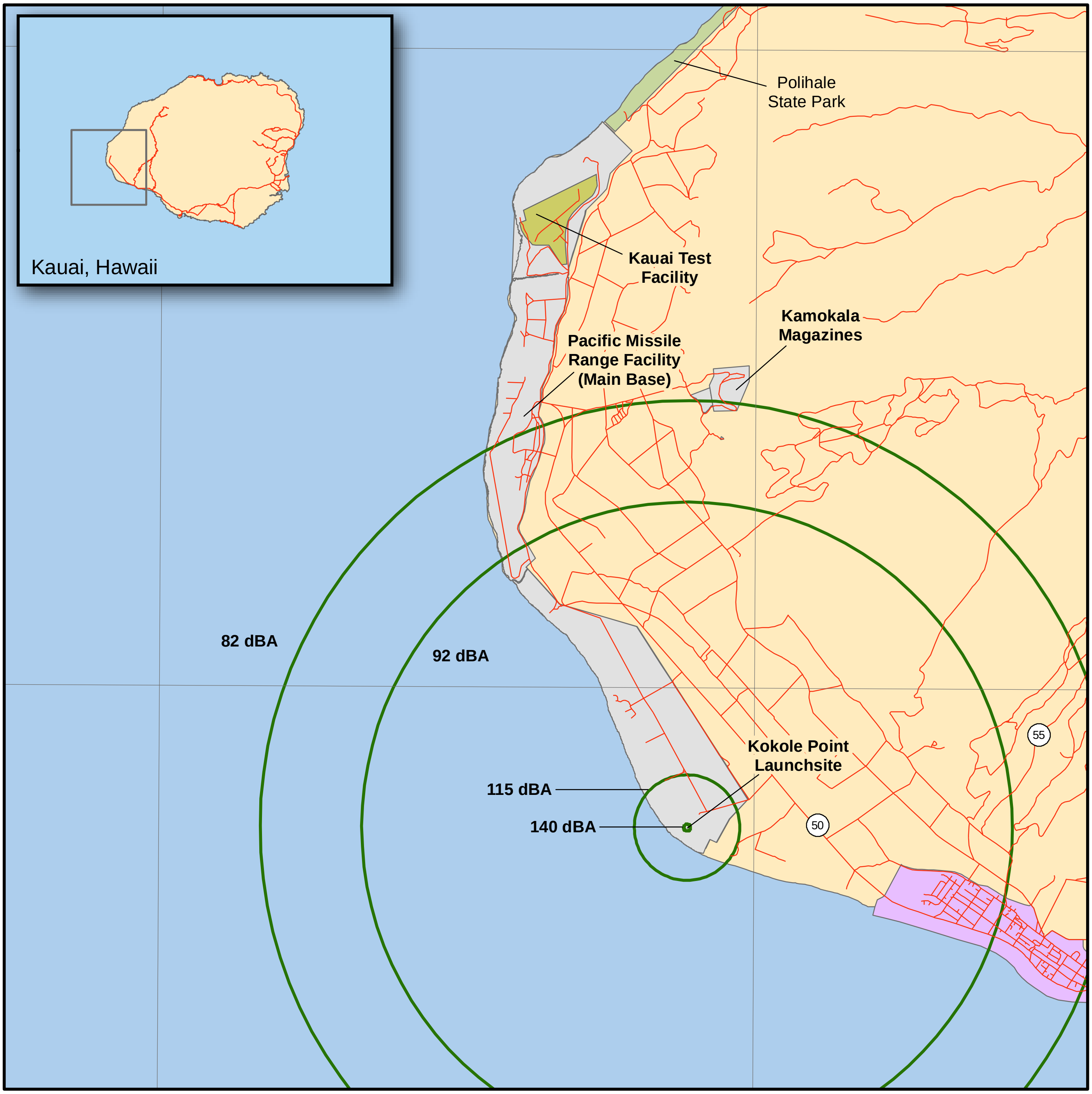
NORTH

0 0.5 1 2 Miles

Typical Noise Levels (dBA) for Pacific Missile Range Facility Launch Area

Kauai, Hawaii

Figure 4.3.1.1.9.1-2



EXPLANATION

- 50 State Highway
- Road
- Calculated Noise Level
- Polihale State Park
- Installation Area
- City of Kekaha
- Kauai Test Facility
- Land

Note: Noise levels calculated from modeling data and not based on the terrain or climate of the facility or surrounding area.

NORTH

0 0.5 1 2 Miles

Typical Noise Levels (dBA) for Kokole Point Launch Area

Kauai, Hawaii

Figure 4.3.1.1.9.1-3

Noise levels from a flight termination or explosion of the missile system will be greater than that of a normal launch; however, the potential for such a mishap is low, as detailed in Section 4.3.1.1.7. All public, civilian, and nonessential personnel are required to be outside of ground hazard areas (see Figure 3.3.1.1.7-1) where expected noise levels will be below the 115 dBA limit for short-term exposure. Noise generated during the removal of all mobile equipment and assets during post-launch activities have minimal impacts to the noise environment on or off of PMRF/Main Base.

To limit noise impacts to nonessential personnel and the public, beach access to the areas of each of the exercises will be restricted for the duration of the exercise. PMRF implements safety procedures for personnel in the PMRF-controlled areas, which can include evacuation of non-operational personnel for the duration of the exercise. PMRF also coordinates appropriate safety measures with adjacent private land users. The noise exposure areas of concern are not anticipated to impact people because of these safety measures.

HRC RDT&E Operations

Ongoing operations associated with RDT&E Operations that can affect noise levels at PMRF/Main Base include missile defense ballistic missile target flights and THAAD interceptor launch operations. HRC RDT&E Operations includes conducting missile launches from PMRF and KTF launch sites. Potential impacts will be as described earlier for HRC Training Operations. The rate of launches will not increase at PMRF/Main base due to the No-action Alternative.

Additional sources of noise at PMRF/Main Base include heavy machinery and generators. Each of these noise sources can generate localized high noise levels. The heavy equipment is a mobile source of noise and typically causes short-term elevated noise levels. Generators are generally stationary. The emergency generators on PMRF/Main Base typically run only 3 to 4 hours per month to maintain readiness. Noise associated with these operations does not affect off-base areas. On-base personnel are required to wear hearing protection when in noise hazard areas.

Major Exercises

Major Exercises include ongoing training operations, and in some cases RDT&E operations. In addition to routine training exercises at PMRF/Main Base, C2, aircraft operations support, HAO/NEO, missile launches, SPECWAROPS, and underwater demolition exercises are conducted during Major Exercises.

C2 is achieved through a network of communication devices strategically located at selected DoD installations around the islands with no impacts to the noise environment. Potential impacts on the noise environment from Aircraft Operations Support, HAO/NEO, Missile Launches, and SPECWAROPS will be similar to those described for the Training Operations and RDT&E Operations.

Underwater Demolition Exercises will generate noise from the detonation of relatively small charges (less than 20 pounds [lb]) of explosive. The noise will be mitigated by placing the charges on the ocean bottom. Clearance zones will also be used to limit noise levels. To limit noise impacts, beach access to the areas of the exercises will be restricted for the duration of the exercise. PMRF implements safety procedures for personnel in the PMRF-controlled areas, which can include evacuation of non-operational personnel for the duration of the exercise. PMRF also coordinates appropriate safety measures with adjacent private land users to limit noise impacts.

4.3.1.1.9.2 Alternative 1 (Noise—PMRF/Main Base)

Increased Tempo and Frequency of Training Operations and New Training Operation and Major Exercises

While training operations and major exercises would increase in number, noise levels would be similar to existing noise levels. The types of exercises that would occur at PMRF/Main Base would be similar to those described in Section 4.3.1.1.9.1 and would not occur simultaneously.

Field Carrier Landing Practice

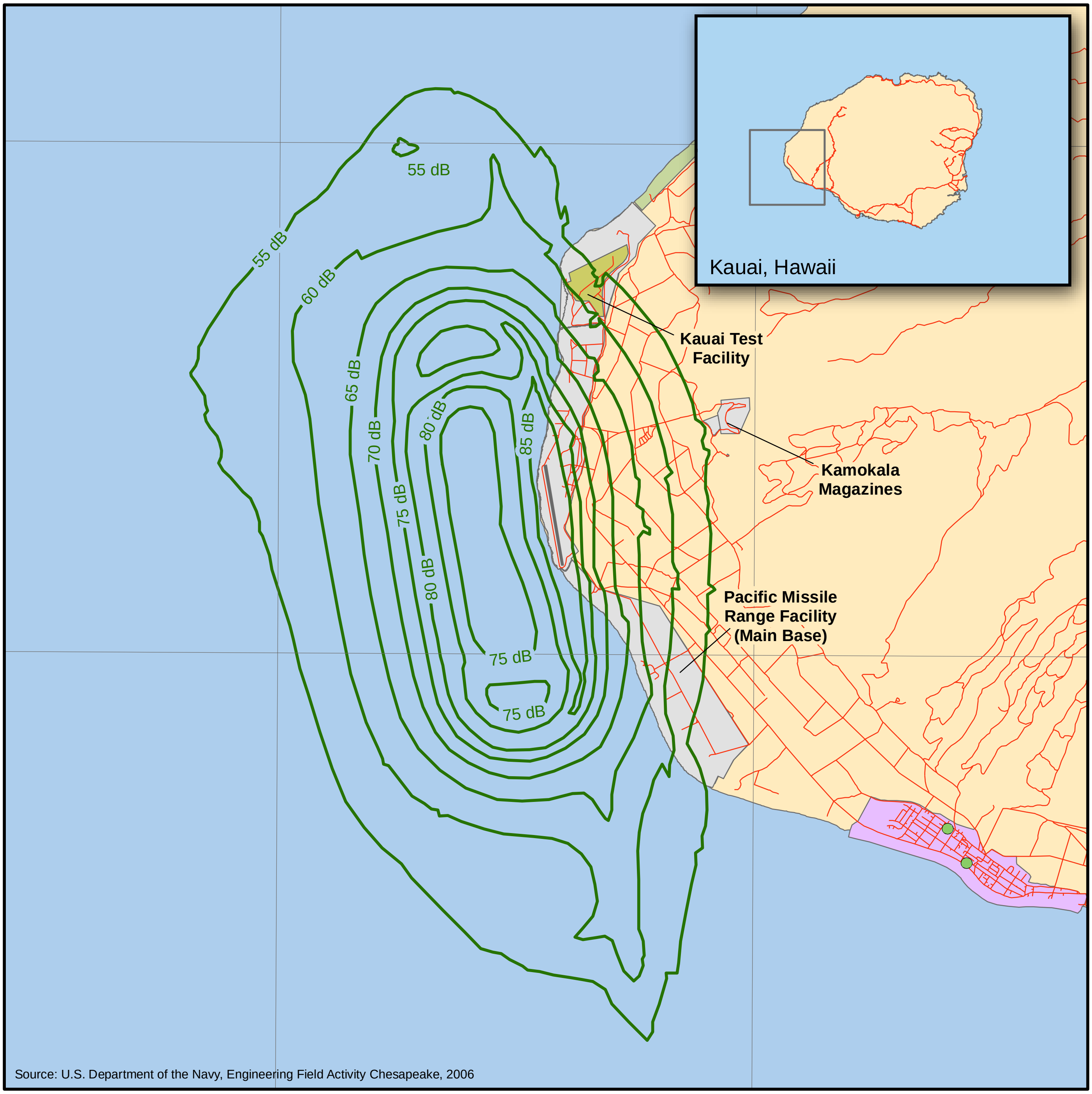
The Navy proposes to conduct an FCLP for half an air wing's pilots once a year in Hawaii. An FCLP is a series of touch-and-go landings that would be conducted during day or night periods, each consisting of six to eight touch-and-go landings per pilot. PMRF/Main Base is one of the sites proposed for this activity in Hawaii.

The *2006 Noise and Accident Potential Zone Study for PMRF Barking Sands* (U.S. Department of the Navy, Engineering Field Activity Chesapeake, 2006) considered the possibility of 25,486 flight operations in 2009, of which the proposed use of F/A-18 aircraft for FCLPs accounted for 34 percent of those operations. This proposed level of operation in the Noise and Accident Potential Study is an increase of approximately 90 percent over current flight operations at PMRF/Main Base. Figure 4.3.1.1.9.2-1 depicts the modeled noise levels for the 2009 condition. The figure shows that the 65-75 dB noise contours would extend off the PMRF/Main Base boundary to the north, south, and east. It is anticipated that 727 acres off-base would be affected by the noise levels. In addition, there would be 168 acres off-base within the 75 dB contour. While the proposed FCLPs in the study would account for only 34 percent of the 2009 modeled operations, the Noise and Accident Potential Zone Study determined that the FCLPs would account for the majority of the modeled noise levels. (U.S. Department of the Navy, Engineering Field Activity Chesapeake, 2006)

Under Alternative 1, 12 FCLP periods are proposed. It is anticipated that the noise levels for the proposed operations would not exceed the levels described in the *2006 Noise and Accident Potential Zone Study for PMRF Barking Sands* (U.S. Department of the Navy, 2006). 12 FCLP periods would account for approximately one percent of the modeled flight operations.

Enhanced and Future RDT&E Operations

Increased and future RDT&E operations would include Interceptor targets launched from Wake Island, Kwajalein Atoll, or Vandenberg Air force Base (AFB) into the Temporary Operating Area, High Speed Unmanned Aerial and Surface Vehicle testing, and Hypersonic Weapon testing.



EXPLANATION

- School
- Noise Contour
- Road
- City of Kekaha
- Runway
- Kauai Test Facility
- Installation Area
- Polihale State Park
- Land

Note: dB = Decibels

NORTH

0 0.5 1 2 Miles

Pacific Missile Range Facility Noise Contours for 2009 Prospective Flight Operations

Kauai, Hawaii

Figure 4.3.1.1.9.2-1

Interceptors would be launched from existing launch facilities at PMRF and KTF and the intercept areas would be in the Open Ocean Area and Temporary Operating Area of the HRC. It is anticipated that the proposed launch vehicles would produce similar noise levels to previously analyzed launch vehicles at PMRF. Figures 4.3.1.1.9.1-1 through 4.3.1.1.9.1-3 show noise levels produced during launches the PMRF and KTF launch facilities. Launch events would be audible for only short periods of time.

All public, civilian, and nonessential personnel would be required to be outside the ground hazard area where the expected noise levels would be below the 115 dBA limit for short-term exposure. The launches would be infrequent and of short duration and similar to previous launches.

HRC Enhancements

Proposed HRC Complex Enhancements at PMRF/Main Base would include a newly constructed range operations control building, enhanced range safety for high energy lasers, and an improved fiber optic infrastructure.

Construction noise levels associated with Alternative 1 activities would result in intermittent, short-term noise effects that would be temporary, lasting for the duration of the noise generating construction activities. Noise-generating construction activities would include excavation and grading, utility construction and paving, and frame building.

The specific types of equipment that would be used during construction of the range operations control building and improved fiber optic infrastructure are not known at this time. Excavation and grading would normally involve the use of bulldozers, scrapers, backhoes, and trucks. The construction of buildings would likely involve the use of pile drivers, concrete mixers, pumps, saws, hammers, cranes, and forklifts. Typical sound levels from construction equipment are listed in Table 4.3.1.1.9.2-1.

Table 4.3.1.1.9.2-1. Typical Construction Noise Levels

Source	Noise level (peak)	Distance from Source			
		50 feet	100 feet	200 feet	400 feet
Heavy Trucks	95	84-89	73-83	72-77	66-71
Dump Trucks	108	88	82	76	70
Concrete Mixer	105	85	79	73	67
Jackhammer	108	88	82	76	70
Scraper	93	80-89	74-82	68-77	60-71
Dozer	107	87-102	81-96	75-90	69-84
Generator	96	76	70	64	58
Crane	104	75-88	69-82	63-76	55-70
Loader	104	73-86	67-80	61-74	55-68
Grader	108	88-91	82-85	76-79	70-73
Dragline	105	85	79	73	67
Pile Driver	105	95	89	83	77
Fork Lift	100	95	89	83	77

Source: Golden et al., 1980

Due to the exclusion of the public from the immediate vicinity of construction, the public would not be exposed to hazardous noise levels. To minimize noise level impacts, personnel or contractors involved in the proposed construction activities would be required to wear hearing protection in areas where noise levels would exceed limits set by OSHA.

The operation of the range operations control building would not result in an increase in noise levels. The proposed facility would replace existing buildings on PMRF/Main Base used for similar operations.

4.3.1.1.9.3 Alternative 2 (Noise—PMRF/Main Base)

Increased Tempo and Frequency of Training Operations and Additional Major Exercises—Multiple Strike Group Training

Operations associated with the additional Major Exercises and training operations that could occur at PMRF/Main Base would be similar to those described in Section 4.3.1.1.9.1 and would produce similar noise levels.

Future RDT&E Operations

The proposed high energy laser would require a 25,000-ft^2 building at PMRF/Main Base. Construction impacts would be similar to those described in Section 4.3.1.1.9.2; however, separate environmental documentation would be required to analyze the specific location and operational requirements, including requiring 30 megawatts of power for operation.

The testing of the Advanced Hypersonic Weapon would include two launches of a Strategic Target System booster from KTF, and two launches of the Orion 50S XLG first stage and Orion 50S XL second stage weapon from the same site. The Strategic Target System booster has been previously launched at KTF, and noise levels would be the same as previous launches The testing of the Hypersonic Weapon with the Orion configuration would produce similar noise levels to launches at KTF (see Figure 4.3.1.1.9.1-1).

4.3.1.1.10 Socioeconomics—PMRF/Main Base

Socioeconomic characteristics are evaluated by analyzing action alternatives presented in Chapter 2.0 of this EIS/OEIS. If any activity associated with an alternative indicates a potential environmental consequence, it is discussed in the appropriate section below.

4.3.1.1.10.1 No-action Alternative (Socioeconomics—PMRF/Main Base)

Under the No-action Alternative, three operations associated with PMRF/Main Base were reviewed: HRC Training Operations, RDT&E Operations and Major Exercises. Current HRC training operations associated with PMRF/Main Base are listed in Table 2.2.2.1-1, a full description is found in Appendix D. A description of current weapon systems is found in Appendix E. Baseline RDT&E operations associated with PMRF/Main Base are listed in Table 2.2.2.4-1. Under the No-action Alternative, the socioeconomic impact(s) from PMRF/Main Base on Kauai will remain at current status which was analyzed in the 1998 PMRF Enhanced Capability Final EIS.

4.3.1.1.10.2 Alternative 1 (Socioeconomics—PMRF/Main Base)

Under Alternative 1, PMRF would continue on-going operations described under the No-action Alternative; however the number of operations performed per year might increase. Additionally, Alternative 1 includes Future RDT&E Operation, and HRC Enhancements.

Increased Tempo and Frequency of Training Operations

Under Alternative 1, Table 2.2.3.1-1 indicates a cumulative increase in HRC Training operations of approximately 5.3 percent (from 5,411 to 5,698 mission area events) and Table 2.2.3.3-1 indicates a cumulative increase in RDT&E Operations of approximately 9 percent (from 183 to 200 mission area events). These actions would bring only transient personnel to Kauai. The transient personnel would visit the island, staying anywhere from 2 weeks up to several months depending on the activity/event. For analysis purposes, Kauai's tourism industry attracted on average 18,869 tourists per day in 2004, and in 2005 there was a total of 1,090,302 visitors to the island of Kauai. The Missile Defense Agency could send 400 personnel to PMRF for a short time. By comparison, the 400 personnel would account for 2 percent of the average daily tourists on Kauai. Although the personnel are transient, there is a possibility of an impact on the economy of Kauai through tourism-related-services and the use of local hotel and lodging facilities.

Enhanced and Future RDT&E Operations

Under Alternative 1 the evaluation of the potential impacts from Future RDT&E Operations on the socioeconomic characteristics of Kauai was performed through a review of the detailed description of each planned operations listed in Section 2.2.2.1 and 2.2.2.4 of this EIS/OEIS. The operations do not indicate the need for new construction, permanent increase in the number of personnel required at PMRF/Main Base, or a need for additional housing on-base or off base. There is no indication that Kauai would be negatively impacted by increased and future operations at PMRF/Main Base Area and slight positive impacts would occur.

Cumulatively, the construction of the operations building, warehouse, site tower, antenna supports, the conversion of building 105, installation of utilities, parking lot, and fiber optic cable and the demolition of buildings would temporarily enhance the employment characteristics and income generated within the construction community on the Island of Kauai.

Major Exercises

Under Alternative 1, the Navy proposes to continue RIMPAC and USWEX exercises as described in the No-action Alternative. Under Alternative 1, USWEX frequency would increase from four to six times per year, which is a 50 percent increase. Appendix D shows the matrix of operations generally used during a USWEX exercise by location. The operations associated with the exercises would be chosen from the list of training operations in Appendix D. Appendix D shows the matrix of operations planned during future RIMPAC exercises by location. These exercises are conducted predominantly in the open ocean and near shore, and require minimum assistance from a land-based source. These operations would bring only transient personnel to Kauai who would visit the Island staying anywhere from two weeks up to several months depending on the activity/event they are working on. Although the personnel are transient, there is a possibility of an impact on the economy of Kauai through shopping, tourism-related-activities, and the use local hotel and lodging facilities.

4.3.1.1.10.3 Alternative 2 (Socioeconomics—PMRF/Main Base)

Increased Tempo and Frequency of Training Operations

Under Alternative 2, the Navy proposes to compress the tempo of training operations in the HRC. Table 2.2.4.1-1 indicates that training operations would cumulatively increase by approximately 11 percent (from 5,411 to 6,012 operations) and Table 2.2.4.3-1 indicates that RDT&E operations would cumulatively increase by approximately 18 percent (from 139 to 1647 operations). Personnel involved, as illustrated under the No-action Alternative and Alternative 1, would stay anywhere from two weeks up to several months depending on the operation they are working on. There is a possibility of an impact on the economy of Kauai through shopping, tourism-related-activities, and the use local hotel and lodging facilities.

Future RDT&E Operations

Under Alternative 2, PMRF proposed to develop the capability to support Direct Energy and Advanced Hypersonic Weapon. In support of the Direct Energy Test Center a permanent operations building would be constructed on PMRF and up to 100 personnel would support this program. If developed, this RDT&E activity would have an impact on the construction community of Kauai and the 100 personnel might affect the local real estate (renter-occupied homes or single-family owned homes) market.

Additional Major Exercises – Multiple Strike Group Training

Up to three Strike Groups would be allowed to conduct training exercises simultaneously in the HRC. The Strike Groups would not be home ported in Hawaii, but would be in the area of Hawaii for up to 30 days per exercises. Usually no more than one of the carriers would visit and allow shore leave while in the Hawaiian area. No increase in the income generated by Sailors and Marines from Strike Groups on Kauai would be expected from tourism-related services over that considered in the No-action Alternative.

4.3.1.1.11 Transportation—PMRF/Main Base

Transportation impacts are evaluated by analyzing operations associated with each alternative presented in Chapter 2.0 of this EIS/OEIS. If any proposed activity indicates a potential environmental impact, it has been discussed in the appropriate section below. Transportation for KTF has been evaluated within PMRF/Main Base.

4.3.1.1.11.1 No-action Alternative (Transportation—PMRF/Main Base)

HRC Training Operations and Support Operations

The No-action Alternative continues PMRF's primary mission, which includes training exercises, base operations and maintenance (including ongoing operation, maintenance, and upgrade of PMRF's transportation), and RDT&E which includes missile launches. These operations will not produce identified impacts to transportation systems. Additionally, transportation of ordnance will continue to be conducted in accordance with DOT, DoD, and Navy safety procedures. Liquid propellants will continue to be transported in accordance with parameters defined in the 1998 PMRF Enhanced Capability EIS.

4.3.1.1.11.2 Alternative 1 (Transportation—PMRF/Main Base)

Increased Tempo and Frequency of Training Operations and New Training Operation

Under Alternative 1, cumulative RDT&E operations associated with PMRF/Main Base Area would increase by approximately 7.2 percent (from 139 to 149 operations). According to the 2000 U.S. Census there are 58,000 people on Kauai with about 45,000 people old enough to drive. Additionally, the Kauai County Department of Motor Vehicles reports that there are now about 70,000 registered cars on Kauai, with about 8,000 rental cars in that number. The latest traffic count information (2001) for a traffic counter near the PMRF main gate indicates the average daily traffic on Route 50 was 1,845 vehicles. For analysis purpose, the 7.2 percent increase in operations could add 133 vehicles to the daily traffic on Route 50, which would make the total, average daily traffic 1,984 vehicles per day. The additional 133 vehicles (7.2 percent) would increase the total number of vehicles registered to drive on Kauai by approximately 0.20 percent.

HRC Enhancements

Section 2.2.2.3.5 presents specific enhancements and recommendations to optimize range capabilities, required to adequately support training for all missions and roles assigned to the HRC. A review of the enhancements indicates that the proposed construction of a new Range Operations Control Building on PMRF Main Base and the installation of Fiber Optic Cable along existing public roads might cause some temporary increases in ground transportation along existing public and KIUC access roads.

Major Exercises

Under Alternative 1, USWEX frequency would increase from four to six times per year (a 50 percent increase). Appendix D shows the matrix of operations generally used during a USWEX exercise by location. The operations associated with the exercises would be chosen from the list of training operations in Appendix D. These exercises are conducted predominantly in open-ocean or near shore, and require minimum assistance from land-base operations. The above section, "Increased Tempo and Frequency of Training Operations" gives a breakdown of the traffic pattern associated with PMRF/Main Base Area. If any intermittent increase in roadway usage were detected, then it would be associated with the exercises being conducted in support of the USWEX. Additionally, these operations are discrete and intermittent.

4.3.1.1.11.3 Alternative 2 (Transportation—PMRF/Main Base)

Increased Tempo and Frequency of Training Operations

Under Alternative 2, Table 2.2.4.1-1 indicates that the overall increase in the HRC Training operations associated with PMRF/Main Base would be approximately 13 percent (from 5,411 to 6,0121 operations). For HRC RDT&E, Table 2.2.4.3-1 indicates that the overall increase associated with PMRF/Main Base would be approximately 18 percent (from 139 to 164 operations). Any increase in road usage would be associated with the time period in which the operations are being conducted.

Future RDT&E Operations

Under Alternative 2, PMRF proposed to develop the capability to support Direct Energy and Advanced Hypersonic Weapon. In support of the Direct Energy Test Center a permanent operations building would be constructed on PMRF, and up to 100 personnel would support this program. For analysis purposes, 100 personnel could add 100 vehicles to the daily traffic flow of Kauai. In 2001 the average daily traffic flow on Route 50, near the main gate of PMRF/Main Base, was 1,845 vehicles. An addition of 100 vehicles would account for a 5.4 percent increase in the average daily traffic flow near the main gate of PMRF/Main Base and increase the total number of vehicles registered to drive on Kauai by approximately 0.1 percent.

Additional Major Exercises—Multiple Strike Group Training

Up to three Strike Groups would be allowed to conduct training exercises simultaneously in the HRC. The Strike Groups would not be home ported in Hawaii, but would be in Hawaii for up to 30 days per exercises. The nature and location of the potential Major Exercises performed by Strike Groups are predominately associated with open ocean areas or areas other than PMRF/Main Base. However, the soldiers, sailors and marines might visit Kauai. Any increase in roadway usage from major exercises would be associated with personnel visits to the island during the 30-day exercise period.

4.3.1.1.12 Utilities—PMRF/Main Base

Impacts on Utilities were evaluated by analyzing operations associated with each alternative presented in Chapter 2.0 of this EIS/OEIS. Utilities associated with KTF Utilities have been evaluated within PMRF/Main Base.

4.3.1.1.12.1 No-action Alternative (Utilities—PMRF/Main Base)

The No-action Alternative will not require a change to ongoing utilities demands to continue current baseline operations for HRC Training Operations (Table 2.2.2.1-1), RDT&E operations (Table 2.2.2.4-1), or Major Exercises (Table 2.2.2.5-1) at PMRF/Main Base. Water will continue to be supplied by the Mana Well and the Kauai County Water Department. Electrical power will continue to be purchased from the KIUC, and wastewater and solid waste will continue to be processed by current procedures (see Section 3.3.1.1.12).

4.3.1.1.12.2 Alternative 1 (Utilities—PMRF/Main Base)

Increased Tempo and Frequency of Training Operations and New Training Operation

Enhanced RDT&E Operations

Under Alternative 1, RDT& E operations associated with PMRF/Main Base Area would increase by approximately 7.2 percent (from 139-149 operations). The exact number of personnel associated with this increase is currently unknown. Additional demand for electricity, solid waste disposal, wastewater treatment, and portable and nonpotable water, however, would occur during the actual training periods, which are discrete and intermittent.

HRC Enhancements

The following enhancements were analyzed for their potential effect on the utilities demand on PMRF/Main Base Area.

Construct Range Operations Control Building

PMRF would construct a new 90,000 square foot building to consolidate range operations which currently occur in 13 buildings (Figure 2.2.3.5.4-6). The 13 buildings have a combined space of 55,000 ft^2 and will be demolished. The construction of a new building will add approximately 35,000 ft^2 of additional space that will require utilities from KIUC (electrical, water, wastewater, solid waste disposal). The KIUC service to PMRF/Main Base comprises 12.47 kV of electricity (overhead), originating from the KIUC Mana Substation. The Main Base power plant (Building 112) has been upgraded and improved for increased reliability and to accommodate long-term (FY05-FY09) future loading of 3,618.4 kVA. The proposed building is located in the central zone of PMRF and a potential power plant upgrade is also proposed for this zone. Additionally, a 4,200 ft^2 dehumidified warehouse to replace Building 106, which is 4,000 ft^2, would require utilities, as would the new site tower for the Q-1 radar and the electrical and electronic system laboratory (converted 105 annex).

Improved Fiber Optic Infrastructure

To improve communications and data transmission, PMRF would install fiber optic cable between the Main Base and the sites at Kokee, shown in Figure 2.1-1. This project involves the installation of approximately 23 mi of fiber optic cable, which would be hung on existing KIUC poles between PMRF/Main Base and Kokee. All equipment and installation activities would be expected to occur along existing public and KIUC access roads. Prior to implementation, PMRF would coordinate with KIUC and the local Department of Transportation.

Major Exercises

Under Alternative 1, USWEX frequency would increase from four to six times per year (a 50 percent increase). Appendix D shows the matrix of operations during a USWEX exercise by location. The training operation operations associated with the exercises are in Appendix D. Appendix D shows the matrix of operations planned during future RIMPAC exercises by location. These exercises are conducted predominantly in open-ocean or offshore and require minimum assistance from land-based operations. Any minimal increase in utilities demand on PMRF/Main Base would occur when major exercises are undertaken.

4.3.1.1.12.3 Alternative 2 (Utilities—PMRF/Main Base)

Increased Tempo and Frequency of Training Operations

The cumulative increase in HRC Training operations associated with PMRF/Main Base would be approximately 11 percent (5,411 to 6,012 operations) and for HRC RDT&E the cumulative increase would be approximately 18 percent (139 events to 164 operations). Any minimal increase in utilities demand on PMRF/Main Base would occur when training exercises are undertaken.

Future RDT&E Operations

Under Alternative 2, PMRF proposed to develop the capability to support Direct Energy and Advanced Hypersonic Weapon. In support of the Direct Energy Test Center, a permanent operations building would be constructed on PMRF. Portions of the center would be located in all three zones of PMRF (Figure 2.2.4.4-1). If developed, up to 100 personnel would support this program. The laser would require 30 megawatts of power. A potential power plant upgrade is proposed for the central zone. Separate environmental documentation would be required to analyze the specific location and requirements for this center.

Additional Major Exercises—Multiple Strike Group Training

Up to three Strike Groups would be allowed to conduct training exercises simultaneously in the HRC. The Strike Groups would not be home ported in Hawaii, but would be in Hawaii for up to

30 days per exercise. Normally no more than one Strike Group would visit Kauai. The location of potential major exercises performed by Strike Groups are predominately associated with open ocean areas or areas other than PMRF/Main Base. Any minimal increase in utility demand on PMRF/Main Base from major exercises would be associated with the conduct of major exercises during the 30 day exercise period.

4.3.1.1.13 Water Resources—PMRF/Main Base

4.3.1.1.13.1 No-action Alternative (Water Resources—PMRF/Main Base)

Under the No Action Alternative, operations that can affect water resources include expeditionary assault and ground maneuvers, areas that are used for handling materials in support of training, and HAO/NEO exercises.

HRC Training Operations and Support Operations

Expeditionary assault and ground maneuvers, areas that are used for handling materials in support of training operations, and HAO/NEO exercises have minimal direct impact on the beach and inland areas, and surface drainage is not permanently affected because there are no unique hydrological features that exist in the area. In addition, training operations are generally restricted to existing roads and/or previously disturbed areas.

HRC RDT&E Operations

Analysis of launch-related impacts is covered in the Strategic Target System EIS (U.S. Army Strategic Defense Command, 1992). The EIS evaluated the potential impacts of launch emissions, spills of toxic materials, and early flight termination. The analysis concluded that hydrogen chloride emissions would not significantly affect the chemical composition of surface or groundwater; that there would be no significant increase in aluminum oxide in surface waters due to launches; that sampling of surface waters in the vicinity of the launch site showed that hydrogen chloride, potentially deposited during past launches, has not affected surface water quality on PMRF or adjacent areas; and that contamination from spills of toxic materials would be highly unlikely. Subsequent sampling and analysis, prior to and following a 26 February 1993 Strategic Target System target launch, showed little or no evidence that the launch produced any adverse impact on water, soil, or vegetation (U.S. Army Space and Strategic Defense Command, 1993). As described in Chapter 3.0, sampling for perchlorate was conducted at PMRF in October and November 2006 and the results indicated perchlorate levels were within guidelines. Therefore, HRC RDT&E operations are not expected to affect water resources.

Major Exercises

Major Exercises under the No-action Alternative, such as RIMPAC and USWEX, include combinations of ongoing training operations. Therefore, potential impacts from Major Exercises would be the same to those described above for HRC training operations.

4.3.1.1.13.2 Alternative 1 (Water Resources—PMRF/Main Base)

Increased Tempo and Frequency of Training Operations and New Training Operation

Under Alternative 1, training associated with expeditionary assault and ground maneuvers, areas that are used for handling materials in support of training operations, and HAO/NEO exercises would increase. Proposed increases in operations would have minimal direct impact on the beach and inland areas, and surface drainage would not be permanently affected because there are no unique hydrological features that exist in the area. In addition, training operations are generally restricted to existing roads and/or previously disturbed areas.

Enhanced and Future RDT&E Operations

Under Alternative 1, RDT&E operations that could affect water resources include high speed unmanned aerial and surface vehicle testing and hypersonic vehicle testing. These launches would produce some additional exhaust emissions; however, the level of impacts to water resources would not be expected to increase above those identified for the No-action Alternative because there are no unique hydrological features that exist in the area.

HRC Enhancements

Under Alternative 1, operations that could affect water resources include installation of Automatic Identification System and Force Protection equipment, and construction of a new Range Operations Control Building. The dry climate, level topography, and high permeability of the soils eliminate the potential for impacts to water resources from construction operations.

In addition, all construction activities would follow Spill Prevention, Control, and Countermeasures Plans and transportation safety measures; therefore, potential effects on surface and groundwater resulting from accidental spills of hazardous materials would be minimized.

Major Exercises

Major Exercises include combinations of ongoing training operations. Under Alternative 1, the intensity and number of these exercises would be increased; however, since no new areas are proposed for training, impacts would be the same to those described under the No Action Alternative.

4.3.1.1.13.3 Alternative 2 (Water Resources—PMRF/Main Base)

Increased Tempo and Frequency of Training Operations

Under Alternative 2, training associated with expeditionary assault and ground maneuvers, areas that are used for handling materials in support of training operations, and HAO/NEO exercises would increase. Proposed increases in operations would have minimal direct impact on the beach and inland areas, and surface drainage would not be permanently affected because there are no unique hydrological features that exist in the area. In addition, training operations are generally restricted to existing roads and/or previously disturbed areas.

Enhanced and Future RDT&E Operations

Under Alternative 2, RDT&E operations that could affect water resources include those described under Alternative 1 and the development of a Maritime Directed Energy Test Center at PMRF/Main Base and launches of an Advanced Hypersonic Weapon from the KTF launch site.

Under Alternative 2, if development of a facility results in a total area disturbed greater than 1 acre, a Stormwater Pollution Prevention Plan would be prepared and submitted prior to construction. The plan would specify all of the measures to be used during construction to minimize and avoid adverse water quality impacts. The dry climate, level topography and high permeability of the soils eliminate the potential for impacts to water resources from construction activities.

HRC Enhancements

Under Alternative 2, all HRC enhancements would be the same as those described under Alternative 1; therefore impacts would be the same.

Major Exercises

Major Exercises include combinations of ongoing training operations. Under Alternative 2, the intensity and number of these exercises would be increased; however, since no new areas are proposed for training, impacts would be the same as those described under the No Action Alternative.

4.3.1.2 MAKAHA RIDGE

Table 4.3.1.2-1 lists ongoing operations for the No-action Alternative and proposed operations for Alternatives 1 and 2 at Makaha Ridge. Alternative 2 is the preferred alternative.

Table 4.3.1.2-1. Operations Occurring at Makaha Ridge

Training Operations (land)	Research, Development, Testing, and Evaluation (RDT&E) Operations (land)
• Special Warfare Operations (SPECWAROPS)	• FORCEnet Antenna (Alternative 1) • Enhanced Auto Identification System and Force Protection Capability (Alternative 1)

4.3.1.2.1 Air Quality—Makaha Ridge

4.3.1.2.1.1 No-action Alternative (Air Quality—Makaha Ridge)

HRC Training Operations and Major Exercises

Existing operations will continue at Makaha Ridge and there would be no increase in air emissions. Existing sensor operations will continue to include the intermittent use of diesel power generators, which are authorized under the current non-covered source permit. SPECWAROPS at PMRF includes reconnaissance and survey inserts at Makaha Ridge. These operations cause a short-term elevation in mobile source emissions; however, these emissions are intermittent.

4.3.1.2.1.2 Alternative 1 (Air Quality—Makaha Ridge)

Increased Tempo and Frequency of Training Operations and Major Exercises

Training operations and major exercises would increase in number, as described in Chapter 2.0; however, mobile emissions would be similar to existing emission levels.

HRC Enhancements

Proposed HRC Complex Enhancements at Makaha Ridge include a FORCEnet integration laboratory, an antenna for AIS and Force Protection Capability, and improved fiber optic infrastructure.

The proposed FORCEnet integration laboratory would use an existing building or portable trailer. An antenna would be added to Building 720 as part of the Enhanced AIS and Force Protection Capability. Improved fiber optic infrastructure would require the cable to be hung on existing KUIC poles between PMRF/Main Base and Makaha Ridge. A new underground duct system along the existing Makaha Ridge Road would be required to install the cable between Kokee and Makaha Ridge. Any construction at Makaha Ridge would cause temporary generation of fugitive dust, diesel exhaust emissions, and VOCs from paints, solvents, or cleansers. Specific amounts of each pollutant generated depend upon the number of vehicles involved, the area disturbed, and the length of time the construction would take place. Implementation of standard dust suppression methods (e.g., frequent watering) and a vehicle maintenance program (proper tuning and preventive maintenance of vehicles) would minimize fugitive dust emissions and vehicle exhaust emissions, respectively, and would help to maintain the area's current air quality. Construction impacts would not cause air quality impacts outside the actual construction site.

4.3.1.2.1.3 Alternative 2 (Air Quality—Makaha Ridge)

Increased Tempo and Frequency of Training Operations and Additional Major Exercises – Multiple Strike Group Training

While training operations would increase in number, emissions would be similar to existing levels. The types of exercises that would occur at Makaha Ridge were described in Section 4.3.1.2.1.1. Emissions would continue to be within the existing non-covered source permit.

4.3.1.2.2 Biological Resources (Terrestrial)—Makaha Ridge

4.3.1.2.2.1 No-action Alternative (Biological Resources (Terrestrial)—Makaha Ridge)

HRC Training Operations and Major Exercises

Existing sensors at Makaha Ridge will continue to be used for HRC training operations and Major Exercises. The potential for impacts to birds, including threatened and endangered species, on Makaha Ridge will be minor and similar to those discussed in Section 4.3.1.1.3. The protection provided by the restricted access and grassy habitat within Makaha Ridge will continue to have a positive effect on the small population of nene (Hawaiian goose) (Pacific Missile Range Facility, 2000).

SPECWAROPS at PMRF include reconnaissance and survey activities at Makaha Ridge. Existing cleared areas, trails, and roads are used. All participants will be briefed on current guidelines to avoid undue impacts to vegetation and wildlife, including sensitive biological resource areas. Makaha Ridge will also continue to provide support for MISSILEX and Air Support Operations, which are non-intrusive operations.

Existing radars will not radiate lower than 5 degrees above horizontal, which precludes EMR impacts to wildlife on the ground. It is also unlikely that a bird will remain within the radar beam for any considerable length of time. (Missile Defense Agency, 2005)

4.3.1.2.2.2 Alternative 1 (Biological Resources (Terrestrial)—Makaha Ridge)

Increased Tempo and Frequency of Training Operations and Major Exercises

Under Alternative 1, training operations would increase as shown in Table 2.2.3.1-1. Major Exercises would continue to be supported at Makaha Ridge. While training operations would increase in number, the likelihood of a similar increase in impacts to biological resources on or adjacent to Makaha Ridge would be minimal due to implementation of guidelines established for the exercises as described below.

Vegetation

Training operations and exercises would continue to take place at current locations; no expansion of the area would occur. All participants would continue to be briefed on current guidelines to avoid undue impacts to vegetation. SPECWAROPS troops would avoid sensitive biological resources, such as the dwarf iliau, when possible. Operations would comply with relevant Navy policies and procedures (e.g., blow/wash down of vehicles and equipment between locations), which should limit the potential for introduction of invasive plant species.

Wildlife

Impacts to wildlife would be similar to those described previously for the No-action Alternative. It is unlikely that a listed species or other wildlife would be injured or killed as a result of increased training operations at Makaha Ridge. The additional training operations would comply with relevant Navy policies and procedures, which would minimize the potential for effects on wildlife. This would include the briefing of all participants on current guidelines to avoid undue impacts to wildlife. Radars would not radiate lower than 5 degrees above horizontal, which precludes EMR impacts to wildlife on the ground. It is also very unlikely that a bird would remain within the radar beam for any considerable length of time. (Missile Defense Agency, 2005)

HRC Enhancements

Enhanced Cooperative Engagement Capability

A site would be chosen at Makaha Ridge (Figure 2.2.3.5.4-3) or Kokee (Figure 2.2.3.5.4-4) to be the location of a FORCEnet integration laboratory. The laboratory would be sited in an existing building or in a portable trailer located in a previously disturbed area. Effects on wildlife from the noise and presence of additional personnel during this activity would be minimal.

Enhanced Automatic Identification System and Force Protection Capability

As part of the enhanced AIS and Force Protection Capability, antennas would be added to Building 720 on Makaha Ridge, resulting in temporary elevated noise levels. No vegetation clearing or ground disturbance would be required for this effort. Because construction-related noise would be localized, intermittent, and occur over a relatively short-term, the potential for impacts on biological resources would be minimal.

4.3.1.2.2.3 Alternative 2 (Biological Resources (Terrestrial)—Makaha Ridge)

Increased Tempo and Frequency of Training Operations

Under Alternative 2, the tempo of training exercises would be increased and the frequency of exercises could also increase. As stated in Section 4.3.1.1.3.3, the intensity and duration of wildlife startle responses decrease with the number and frequency of exposures (U.S. Department of the Navy, 2006).

Additional Major Exercises – Multiple Strike Group Training

The exercises proposed could require additional support from the sensors at Makaha Ridge. However, effects to birds and other wildlife would be minor and similar to those occurring during current Major Exercises, as described above.

4.3.1.2.3 Cultural Resources—Makaha Ridge

4.3.1.2.3.1 No-action Alternative (Cultural Resources—Makaha Ridge)

HRC Training Operations and Major Exercises

Makaha Ridge has been surveyed for archaeological, historical, and Native Hawaiian resources and none have been identified. As a result, No-action Alternative operations will not affect cultural resources.

4.3.1.2.3.2 Alternative 1 (Cultural Resources—Makaha Ridge)

Increased Tempo and Frequency of Training Operations

Makaha Ridge has been surveyed for archaeological, historical, and Native Hawaiian resources and none have been identified. As a result, an increase in tempo and frequency of training operations would not affect cultural resources.

HRC Enhancements

Enhanced Cooperative Engagement Capability

A new integration laboratory for FORCEnet would be established at Makaha Ridge. The proposed location for the new facility is shown on Figure 2.2.3.5.4-3. The laboratory would use an existing facility or may be a portable trailer. Because Makaha Ridge has been surveyed for cultural resources and there are none present, no effects are expected. If archaeological or Native Hawaiian resources are unexpectedly encountered as the new facility is established, then the Hawaii SHPO will be notified in accordance with the Programmatic Agreement described in Section 4.1.3.2 (see Appendix I).

Enhanced Automatic Identification System and Force Protection

The AIS provides a ship-to-ship and ship-to-shore communications capability. To enhance the existing system, new antennas would be added to Building 720 on Makaha Ridge (see Figure 2.2.3.5.4-3). Building 720 has not been recommended as eligible for inclusion in the National Register; therefore, installation of a new antenna on this building will not affect cultural resources (Commander, Navy Region Hawai'i, 2005).

4.3.1.2.3.3 Alternative 2 (Cultural Resources—Makaha Ridge)

Increased Tempo and Frequency of Training Operations

Makaha Ridge has been surveyed for archaeological, historical, and Native Hawaiian resources and none have been identified. As a result, an increase in tempo and frequency of training operations would not affect cultural resources. See Section 4.3.1.2.3.1.

4.3.1.2.4 Hazardous Materials and Waste—Makaha Ridge

4.3.1.2.4.1 No-action Alternative (Hazardous Materials and Waste—Makaha Ridge)

HRC Training Operations and Major Exercises

Existing operations at Makaha Ridge will continue. No increase in hazardous material used or generated, will occur. PMRF has appropriate plans in place to manage hazardous materials and waste at Makaha Ridge.

Existing sensor operations will continue to use small amounts of hazardous materials. Reconnaissance and survey inserts associated with SPECWAROPS will continue to have a minimal impact on the hazardous materials used at Makaha Ridge. These materials are handled in accordance with PMRF hazardous materials and hazardous waste plans described in Chapter 3.0. Past handling of these materials at Makaha Ridge has not resulted in any impacts to the environment around the facilities.

4.3.1.2.4.2 Alternative 1 (Hazardous Materials and Waste—Makaha Ridge)

Increased Tempo and Frequency of Training Operations and Major Exercises

While the number of training operations and major exercises would increase, the types of hazardous materials consumed would be similar to existing types and levels currently at Makaha Ridge. The types of hazardous materials used would not result in any changes to the existing hazardous materials management plans currently in place.

HRC Enhancements

Proposed HRC Complex Enhancements at Makaha Ridge include a FORCEnet integration laboratory, an antenna for AIS and Force Protection Capability, and improved fiber optic infrastructure. The proposed FORCEnet integration laboratory would use an existing building or portable trailer. An antenna would be added to building 720 as part of the Enhanced AIS and Force Protection Capability. Improved fiber optic infrastructure would require the cable to be hung on existing KUIC poles between PMRF/Main Base and Makaha Ridge. A new underground duct system along the existing Makaha Ridge Road would be required to install the cable between Kokee and Makaha Ridge. Any construction activities would occur under existing PMRF spill plans, and all hazardous materials and waste would be handled in accordance with State and Federal regulations. No impact from hazardous materials and waste would be anticipated. Due to the exclusion of the public from the immediate vicinity of construction, the public would not be exposed to any hazardous materials or waste.

4.3.1.2.4.3 Alternative 2 (Hazardous Materials and Waste—Makaha Ridge)

Increased Tempo and Frequency of Training Operations and Additional Major Exercises – Multiple Strike Group Training

While the number of training operations and major exercises would increase, it is anticipated that the level of hazardous materials used would continue to be managed by PMRF under appropriate State and Federal requirements.

4.3.1.2.5 Health and Safety—Makaha Ridge

4.3.1.2.5.1 No-action Alternative (Health and Safety—Makaha Ridge)

HRC Training Operations and Major Exercises

Existing operations at Makaha Ridge will continue and PMRF will take every reasonable precaution during planning and execution of operations and training exercises to prevent injury to human life or property.

Hazards to health and safety stemming from existing sensor operations that can potentially occur include generation of EMR at Makaha Ridge. Hazards of EMR to personnel and fuel (called HERP and HERF, respectively) are the primary concerns at Makaha Ridge. To ensure conditions are safe, the site is regularly surveyed for hazardous radiation, and all systems have warning lights to inform personnel when the radar units are operating. SPECWAROPS at PMRF will include reconnaissance and survey inserts at Makaha Ridge. In addition, Makaha Ridge is located at the end of a ridge and away from the public; therefore, there are no adverse public health and safety issues. All hazardous materials used and hazardous waste generated at the site will be handled according to Federal and State requirements.

4.3.1.2.5.2 Alternative 1 (Health and Safety—Makaha Ridge)

Increased Tempo and Frequency of Training Operations and Major Exercises

The number of training operations would increase. However, health and safety concerns would be similar to existing concerns. Established SOPs and procedures would be used.

HRC Enhancements

Proposed HRC Complex Enhancements at Makaha Ridge include a FORCEnet integration laboratory, an antenna for AIS and Force Protection Capability, and improved fiber optic infrastructure.

The proposed FORCEnet integration laboratory would use an existing building or portable trailer. An antenna would be added to Building 720 as part of the Enhanced AIS and Force Protection Capability. Improved fiber optic infrastructure would require the cable to be hung on existing KUIC poles between PMRF/Main Base and Makaha Ridge. A new underground duct system along the existing Makaha Ridge Road would be required to install the cable between Kokee and Makaha Ridge. Construction would be conducted in accordance with the USACE Safety and Health Requirements Manual. Construction is routinely accomplished for both military and civilian operations, and presents safety and health concerns for workers involved in the performance of the construction activity. The siting of facilities would be in accordance with DoD standards, taking into account HERO, HERP, HERF, ESQD, and other facility compatibility issues.

4.3.1.2.5.3 Alternative 2 (Health and Safety—Makaha Ridge)

Increased Tempo and Frequency of Training Operations and Additional Major Exercises – Multiple Strike Group Training

While the number of exercises occurring at Makaha Ridge would increase, current health and safety procedures would continue to be used to ensure that every reasonable precaution is taken to prevent injury to human life or property.

4.3.1.3 KOKEE

Table 4.3.1.3-1 lists ongoing operations for the No-action Alternative and proposed operations for Alternatives 1 and 2 at Kokee. Alternative 2 is the preferred alternative.

Table 4.3.1.3-1. Operations Occurring at Kokee

Research, Development, Testing, and Evaluation (RDT&E) Operations (land)	
• FORCEnet Antenna (Alternative 1)	• Improve Fiber Optics Infrastructure (Alternative 1)

4.3.1.3.1 Air Quality—Kokee

4.3.1.3.1.1 No-action Alternative (Air Quality—Kokee)

HRC Training Operations and Major Exercises

Existing operations will continue at Kokee, and there will be no increase to existing emissions. Existing sensor operations will continue to include the intermittent use of diesel power generators, which are authorized under the current non-covered source permit. Kokee will also continue to provide support for MISSILEX and Air Support Operations through use of sensors.

4.3.1.3.1.2 Alternative 1 (Air Quality—Kokee)

Increased Tempo and Frequency of Training Operations and Major Exercises

Emissions anticipated from the proposed additional exercises would stem from the use of existing sensors at Kokee. Emissions from the generators used to power the sensors are covered under the current non-covered source permit.

HRC Enhancements

Proposed HRC Complex Enhancements at Kokee include a FORCEnet integration laboratory and improved fiber optic infrastructure.

The proposed FORCEnet integration laboratory would use an existing building or portable trailer. A new underground duct system along the existing Makaha Ridge Road would be required to install the cable between Kokee and Makaha Ridge. Construction at Kokee may cause temporary generation of fugitive dust, diesel exhaust emissions, and VOCs from painting operations or solvents or cleansers. Specific amounts of each pollutant generated depend upon the number of vehicles involved, the area disturbed, and the length of time the construction would take place. Additionally, implementation of standard dust suppression methods (e.g., frequent watering) and a vehicle maintenance program (proper tuning and preventive maintenance of vehicles) would minimize fugitive dust emissions and vehicle exhaust emissions, respectively, and would help to maintain the area's current air quality. Construction emissions would not affect air quality outside the actual construction site.

The operation of the proposed FORCEnet laboratory would not cause generator emissions to exceed the levels established in the existing non-covered source permit. If generator usage in support of the Proposed Action were increased, a new permit or revision to the existing permit would be obtained in accordance with Federal and State requirements.

4.3.1.3.1.3 Alternative 2 (Air Quality—Kokee)

Increased Tempo and Frequency of Training Operations and Additional Major Exercises – Multiple Strike Group Training

The increased tempo and frequency of training operations and additional major exercises proposed would be similar to those described in the No-action Alternative for Kokee. While training operations would increase, emissions would be similar to existing levels. Emissions would continue to be within the existing non-covered source permit.

4.3.1.3.2 Biological Resources (Terrestrial)—Kokee

4.3.1.3.2.1 No-action Alternative (Biological Resources (Terrestrial)—Kokee)

HRC Training Operations and Major Exercises

Existing sensors at Kokee will continue to be used for HRC training operations and Major Exercises. The potential for impacts to birds, including threatened and endangered species, at Kokee will be minor and similar to those discussed in Section 4.3.1.1.3. Existing radars will not radiate lower than 5 degrees above horizontal, which precludes EMR impacts to wildlife on the ground. It is also very unlikely that a bird will remain within the radar beam for any considerable length of time. (Missile Defense Agency, 2005) Kokee will continue to provide support for MISSILEX, Air Support Operations, and RDT&E programs. This support is generally non-intrusive in nature.

4.3.1.3.2.2 Alternative 1 (Biological Resources (Terrestrial)—Kokee)

Increased Tempo and Frequency of Training Operations and Major Exercises

Under Alternative 1, training operations would increase as shown in Table 2.2.3.1-1. Major Exercises would continue to be supported at Kokee. While training operations would increase in number, the likelihood of a similar increase in impacts to biological resources on or adjacent to Kokee would be minimal due to implementation of guidelines established for the exercises as described below.

Vegetation

Training operations and exercises would continue to take place at current locations; no expansion of the area would occur. All participants would continue to be briefed on current guidelines to avoid undue impacts to vegetation. Operations would comply with relevant Navy policies and procedures (e.g., blow/wash down of vehicles and equipment between locations), which should limit the potential for introduction of invasive plant species.

Wildlife

Impacts to wildlife would be similar to those described previously for the No-action Alternative. It is unlikely that a listed species or other wildlife would be injured or killed as a result of increased training operations at Kokee. The additional training operations would comply with relevant Navy policies and procedures, which would minimize the potential for effects on wildlife. This would include the briefing of all participants on current guidelines to avoid undue impacts to wildlife. Radars would not radiate lower than 5 degrees above horizontal, which precludes EMR impacts to wildlife on the ground. It is also very unlikely that a bird would remain within the radar beam for any considerable length of time. (Missile Defense Agency, 2005)

HRC Enhancements

Enhanced Cooperative Engagement Capability

A site would be chosen at Makaha Ridge (2.2.3.5.4-3) or Kokee (Figure 2.2.3.5.4-4) to be the location of a FORCEnet integration laboratory. The laboratory would be sited in an existing building or in a portable trailer located in a previously disturbed area. Effects on wildlife from the noise and presence of additional personnel during this activity would be minimal.

Improve Fiber Optic Infrastructure

To improve communications and data transmission, PMRF would install fiber optic cable between the Main Base and the sites at Kokee shown in Figure 2.1-1. This would involve the installation of approximately 23 mi of fiber optic cable. The cable would be hung on existing KIUC poles between PMRF/Main Base and Kokee; however, it is possible that additional poles might need to be installed in some areas where exceptionally long spans are encountered. To minimize ground disturbance and impacts to vegetation, it is expected that all equipment and installation activities would occur along existing public and KIUC access roads. Effects from the noise and presence of additional personnel during this activity would be similar to those discussed in Section 4.3.1.1.3.1, PMRF/Main Base.

4.3.1.3.2.3 Alternative 2 (Biological Resources (Terrestrial)—Kokee)

Increased Tempo and Frequency of Training Operations

Under Alternative 2, the tempo of training exercises would be increased and the frequency of exercises would also increase. As stated in Section 4.3.1.1.3.3, it has been reported that intensity and duration of the wildlife startle responses decrease with the number and frequency of exposures (U.S. Department of the Navy, 2006).

Additional Major Exercises–Multiple Strike Group Training

The major exercises proposed might require additional support from the sensors at Kokee. However, effects to birds and other wildlife would be minor and similar to those occurring during current Major Exercises, as described earlier.

4.3.1.3.3 Hazardous Materials and Waste—Kokee

4.3.1.3.3.1 No-action Alternative (Hazardous Materials and Waste—Kokee)

HRC Training Operations and Major Exercises

Existing operations at Kokee will continue and there will be no increase in hazardous materials used or any hazardous waste generated. PMRF has appropriate plans in place to manage hazardous materials and waste at Kokee. Existing sensors at Kokee will continue to use small amounts of hazardous materials. Kokee will also continue to provide support for MISSILEX and Air Support Operations through use of sensors. These materials would continue to be handled in accordance with PMRF hazardous materials and hazardous waste plans.

4.3.1.3.3.2 Alternative 1 (Hazardous Materials and Waste—Kokee

Increased Tempo and Frequency of Training Operations and Major Exercises

While the tempo and frequency of training operations and the number of major exercises would increase, the types of hazardous materials consumed would be similar to existing types and levels at Kokee. The types of hazardous materials used would not result in any existing changes to the hazardous materials management plans currently in place.

HRC Enhancements

Proposed HRC Complex Enhancements at Kokee include a FORCEnet integration laboratory and improved fiber optic infrastructure.

The proposed FORCEnet integration laboratory would use an existing building or portable trailer. A new underground duct system along the existing Makaha Ridge Road would be required to install the cable between Kokee and Makaha Ridge. Construction activities would be handled under existing PMRF spill plans, and all hazardous materials would be handled in accordance with State and Federal regulations. In addition, operation of the proposed FORCEnet laboratory would not use new types of hazardous materials, and appropriate plans are in place to handle these materials.

4.3.1.3.3.3 Alternative 2 (Hazardous Materials and Waste—Kokee)

Increased Tempo and Frequency of Training Operations and Additional Major Exercises – Multiple Strike Group Training

The increase in tempo and frequency of training operations and additional major exercises proposed would use hazardous materials similar to those described for the No-action Alternative. While the number of operations and exercises would increase, it is anticipated that the level of hazardous materials used would continue to be managed by PMRF under appropriate State and Federal requirements.

4.3.1.3.4 Health and Safety—Kokee

4.3.1.3.4.1 No-action Alternative (Health and Safety—Kokee)

HRC Training Operations and Major Exercises

PMRF will continue to take every reasonable precaution during planning and execution of operations, training exercises, and RDT&E operations to prevent injury to human life or property at Kokee.

Hazards to health and safety can potentially occur as a result of EMR generated at the site during HRC Training Operations. The main concerns at Kokee are HERP and HERF. The only fuel stored at the site (diesel fuel for the electrical generators) is located outside of any EMR generating areas, so there are no HERF issues at the site. Appropriate sector blanking, filtering, and the elevation of the radar units above the ground have eliminated any potential HERP issues at Kokee. To ensure conditions are safe, the site is regularly surveyed for radiation hazards, and all systems have warning lights to inform personnel when the radar units are operating. The public is not exposed to any unsafe EMR levels. All hazardous materials used at the site are handled according to Federal and State regulations. Kokee will also continue to provide support for MISSILEX and Air Support Operations through use of sensors.

4.3.1.3.4.2 Alternative 1 (Health and Safety—Kokee)

Increased Tempo and Frequency of Training Operations and Major Exercises

The number major exercises and the tempo and frequency of training operations would increase, however, the health and safety concerns would be would be similar to existing concerns. Existing SOPs and procedures would be used to prevent injury to human life or property.

HRC Enhancements

Proposed HRC Complex Enhancements at Kokee include a FORCEnet integration laboratory and improved fiber optic infrastructure.

The proposed FORCEnet integration laboratory would use an existing building or portable trailer. A new underground duct system along the existing Makaha Ridge Road would be required to install the cable between Kokee and Makaha Ridge. Construction would be conducted in accordance with Corps of Engineers Safety and Health Requirements Manual. The siting of facilities would be in accordance with DoD standards, taking into account HERO, HERP, HERF, ESQD, and other facility compatibility issues. All hazardous materials used and hazardous waste generated during construction would be handled according to Federal and State requirements.

4.3.1.3.4.3 Alternative 2 (Health and Safety—Kokee)

Increased Tempo and Frequency of Training Operations and Additional Major Exercises – Multiple Strike Group Training

The increased tempo and frequency of training operations and additional major exercises proposed would be similar to those described for the No-action Alternative for Kokee, and health and safety procedures would be similar. Current health and safety procedures would be used to ensure that every reasonable precaution is taken to prevent injury to human life or property.

4.3.1.4 HAWAII AIR NATIONAL GUARD KOKEE

Hawaii Air National Guard Kokee provides operation and maintenance of the Hawaii Digital Microwave system and a radar site. Microwave systems at PMRF provide voice and data communications between PMRF/Main Base and support facilities, including Hawaii Air National Guard Kokee. The Hawaii Digital Microwave System also links the Hawaii Air National Guard facility at Kokee to the Hawaii regional Operations center facility at Wheeler Army Air Field, Oahu. These facilities would continue to be used during ongoing operations for the No-action Alternative and proposed operations for Alternatives 1 and 2. Alternative 2 is the preferred alternative.

4.3.1.4.1 Biological Resources (Terrestrial)—Hawaii Air National Guard Kokee

4.3.1.4.1.1 No-action Alternative (Biological Resources (Terrestrial)—Hawaii Air National Guard Kokee)

HRC Training Operations and Major Exercises

Existing sensors at Hawaii Air National Guard Kokee will continue to be used for HRC training operations. There have been no reports of birds being affected by EMR from the existing sensors located in the Hawaii Air National Guard Kokee complex. Impacts to T&E birds at Kokee will be minor and similar to those discussed in Section 4.3.1.1.3.

Support for MISSILEX provided by the sensors will continue as part of Major Exercises. Due to the non-intrusive continuing nature of these operations, no impacts to biological resources are anticipated.

4.3.1.4.1.2 Alternative 1 (Biological Resources (Terrestrial)—Hawaii Air National Guard Kokee)

Increased Tempo and Frequency of Training Operations

Alternative 1 would include up to six USWEX per year (an increase of two exercises), the RIMPAC biennial exercise, two Strike Groups conducting training exercises simultaneously in the HRC, and other continuing training exercises (See Table 2.2.3.1-1), an overall increase of approximately 9 percent. While sensor usage would increase, the likelihood of a similar increase in impacts to biological resources is minimal. Operations would take place at existing locations; no expansion of the sensor operating area would occur.

4.3.1.4.1.3 Alternative 2 (Biological Resources (Terrestrial)—Hawaii Air National Guard Kokee)

Increased Tempo and Frequency of Training Operations

Under Alternative 2, the tempo of training exercises would be increased and the frequency of exercises could also increase. Thus, the frequency of sensor operation is expected to increase as well. However, effects to birds and other wildlife would be minor and similar to those occurring during current Major Exercises, as described earlier.

Additional Major Exercises – Multiple Strike Group Training

The Major Exercises proposed may require additional support from the sensors at Hawaii Air National Guard Kokee. However, effects to birds and other wildlife would be minor and similar to those occurring during current exercises, as described above.

4.3.1.5 KAMOKALA MAGAZINES

The Kamokala Magazines provide secure storage of ordnance material. The magazines are in continuous use by PMRF, the Hawaii Air National Guard, and the Department of Energy. Other commands conducting exercises and needing storage are also accommodated at the facility intermittently. These facilities would continue to be used during ongoing operations for the No-action Alternative and proposed operations for Alternatives 1 and 2. Alternative 2 is the preferred alternative.

4.3.1.5.1 Hazardous Materials and Waste—Kamokala Magazines

4.3.1.5.1.1 No-action Alternative, Alternative 1, and Alternative 2 (Hazardous Materials and Waste—Kamokala Magazines)

Under the No-action Alternative existing operations at Kamokala Magazines will continue. New hazardous materials will not be used, and new hazardous waste will not be generated. Operations proposed for Alternative 1 and Alternative 2 would not result in the need for additional hazardous materials to be used no hazardous waste to be generated at Kamokala Magazines. Storage and transportation of ordnance are conducted in accordance with established DOT, DoD, and Navy safety procedures. PMRF has appropriate plans in place to manage hazardous materials and waste at Kamokala Magazines.

4.3.1.5.2 Health and Safety—Kamokala Magazines

4.3.1.5.2.1 No-action Alternative, Alternative 1, and Alternative 2 (Health and Safety—Kamokala Magazines)

Under the No-action Alternative, Alternative 1 and Alternative 2, there would be no change in the type of ordnance stored at the Kamokala Magazines and no increased safety risks. Storage and transportation of ordnance are conducted in accordance with established DOT, DoD and Navy safety procedures. The storage magazines have appropriate ESQD arcs for the amount and type of ordnance stored (Figure 4.3.1.1.7-1). The existing uses around the magazine and within the ESQD arcs are considered compatible. If a mishap should occur, the hazard associated with the explosion would be contained within the ESQD arcs.

4.3.1.6 PORT ALLEN

Port Allen is a small, fully developed industrial seaport that supports PMRF's Range Support Boats and maintenance facilities. Port Allen also provides pier space, protected anchorage, and small boat launch facilities. In addition, PMRF leases warehouse space at the facility.

As detailed in Section 3.3.1.6, a review of the 14 environmental resources against program operations determined there would be no impacts from site operations under the No-action Alternative, Alternative 1, or Alternative 2 at Port Allen. Alternative 2 is the preferred alternative. Port Allen hosts PMRF's Range Support Boats and maintenance facilities and provides pier space, protected anchorage, and small-boat launch facilities. Use of Port Allen does not require control of the airspace above this land area. There are no reports of emission from Navy operations affecting the air quality for Port Allen. Because no ground disturbance or building modifications would occur, there would be no impact to biological resources, cultural resources, or geology and soils. Additionally, there are no known significant archaeological sites at Port Allen. Operation of this site does require small amounts of hazardous materials for facility maintenance and generates small amounts of hazardous waste. All hazardous materials used and hazardous waste generated would continue to be managed in accordance with PMRF's hazardous materials management plans as described under PMRFINST 5100.2c and all other applicable regulations. No noise-sensitive land receptors are affected by existing noise levels at the site. All operations at Port Allen are conducted in accordance with OSHA and OPNAVINST 5100.23D, Navy Occupational Safety and Health Program Manual; there are no public health and safety issues. The site is compatible with existing surrounding land uses, and land use does not conflict with recreational activities occurring in or adjacent to the harbor. Any transportation and utility issues associated with Port Allen are included within the PMRF/Main Base discussion. There is no socioeconomic impact from operation of the site, and the site does not block any prominent public vistas. Operations at the site would not generate any waste streams that could impact local water quality.

4.3.1.7 KIKIAOLA SMALL BOAT HARBOR

As detailed in Section 3.3.1.7, a review of the 14 environmental resources against program operations determined there would be no impacts from site operations under the No-action Alternative, Alternative 1, or Alternative 2 at Kikiaola Small Boat Harbor. Alternative 2 is the preferred alternative. The Harbor hosts Range Support Boats and small-boat launch facilities. PMRF's Seaborne Powered Targets are launched from Kikiaola. The Navy does not require control of the airspace above this land area. Any emissions from naval operations associated with the use of range support boats and small-boat-launch facilities do not affect the air quality of the area. Additionally, all operations adhere to Navy policy, statutory and regulatory requirements for hazardous materials and hazardous waste, range safety guidelines, and noise, as discussed in Appendix D. There are no ground-disturbing activities or building modifications that could affect biological and geology and soils resources. Additionally, there are no naval operations that could affect the land-based use, including recreation and tourism-related-activities. The work force assigned to the site would not affect local transportation levels of service or utilities. There is no socioeconomic impact from operating the site, and, the site does not block any prominent public vistas.

4.3.1.8 MT. KAHILI

As detailed in Section 3.3.1.8, a review of the 14 environmental resources against program operations determined there would be no impacts from site operations under the No-action Alternative, Alternative 1, or Alternative 2 at Mount Kahili. Alternative 2 is the preferred alternative. Operations at this site consist of existing telemetry towers and communications, and no building modifications would occur. No air emissions would be generated from operations at the site unless use of diesel generators would be required for backup power. The site does not affect the existing airspace structure in the region. Because no ground disturbance or building modifications would occur, there would be no impact to biological resources, cultural resources, or geology and soils. Operation of this site does require small amounts of hazardous materials for facility maintenance and generates small amounts of hazardous waste. All hazardous materials used and hazardous waste generated would continue to be managed in accordance with applicable regulations. There is no electromagnetic radiation generated at the site; therefore, there are no public health and safety issues. The site is compatible with existing surrounding land uses. No noise is generated by operations at the site. The site, which is only manned during operations, employs two to four persons. Such a small work force would not affect local transportation levels of service or utilities. There is no socioeconomic impact from operation of the site, and the site does not block any prominent public vistas. Operations at the site would not generate any waste streams that could impact local water quality.

4.3.1.9 NIIHAU

Table 4.3.1.9-1 lists ongoing operations for the No-action Alternative and proposed operations for Alternatives 1 and 2 at Niihau. Alternative 2 is the preferred alternative.

Table 4.3.1.9-1. Operations Occurring at Niihau

Training Operations	Research, Development, Testing, and Evaluation (RDT&E) Operations
• Electronic Combat Operations (offshore)	• Electronic Combat/Electronic Warfare(offshore & land)
• Special Warfare Operations (SPECWAROPS) (offshore & land)	• Kingfisher Underwater Training Area (offshore) (Alternative 1)
• Humanitarian Assistance/Non-combatant Evacuation Operations (HAO/NEO) (land)	• Enhanced Electronic Warfare Training (land) (Alternative 1)

4.3.1.9.1 Biological Resources (Terrestrial and Offshore)—Niihau

4.3.1.9.1.1 No-action Alternative (Biological Resources (Terrestrial and Offshore)—Niihau)

HRC Training Operations and Major Exercises

PMRF remotely operates a radar unit at Paniau (northeast corner of the island) and the Niihau Perch site electronic warfare system. In addition, PMRF flies AEGIS drone targets along the east coast of the island away from inhabited areas. These operations will continue intermittently under the No-action Alternative with minimal impacts to biological resources.

Helicopters are airborne with buckets during nearland/overland operations occurring on or near Niihau to deal with potential fire hazards.

SPECWAROPS training operations on Niihau will use existing openings, trails, and roads. Helicopter landings will be in areas designated as suitable and absent of biological resources. SPECWAROPS troops avoid sensitive biological resource areas when possible. HAO/NEO operations at Niihau will be similar to SPECWAROPS training operations.

Vegetation

Vegetation on Niihau is dominated by non-native plant species and plant communities. No threatened or endangered species have been identified. Operations comply with relevant Navy and USFWS policies and procedures (e.g., blow/wash down of vehicles and equipment) during these training operations and Major Exercises, which should limit the potential for introduction of invasive plant species.

Wildlife

Reefs offshore of Niihau are poorly developed and, thus, will not be affected by Major Exercises. Wildlife on Niihau is dominated by non-native species such as feral pigs, sheep, cattle, and horses. Noise and movement of personnel, vehicles, helicopters, and landing craft during these operations can temporarily displace sensitive species, such as the green sea turtle and Hawaiian monk seal. However, all ocean vessel landings are first checked to ensure the sites are clear of monk seals. Also, training operations are not likely to impact green sea turtles because they do not often make nests on island beaches.

Environmentally Sensitive Habitat

An area of 357 acres on the northern portion of Niihau has been designated as critical habitat for the endangered alula (Federal Register, 2003). Training operations will not affect this area and current transmitter sites are not located within the critical habitat.

4.3.1.9.1.2 Alternative 1 (Biological Resources (Terrestrial and Offshore)—Niihau)

Increased Tempo and Frequency of Training Operations and Major Exercises

Alternative 1 would include up to six USWEX per year (an increase of two exercises), the RIMPAC biennial exercise, and two Strike Groups conducting training exercises simultaneously in the HRC, as well as other continuing training exercises (See Table 2.2.3.1-1). While training operations would increase in number, the likelihood of a similar increase in impacts to biological resources is small as discussed below.

Vegetation

Operations at Niihau would take place at existing locations; no expansion of the area would occur. All participants would continue to be briefed on current guidelines to avoid undue impacts to vegetation. Operations would comply with relevant Navy policies and procedures (e.g., blow/wash down of vehicles and equipment between locations), which should limit the potential for introduction of invasive plant species.

Wildlife

Impacts to wildlife would be similar to those described previously for the No-action Alternative. It is unlikely that a listed species or other wildlife would be injured or killed as a result of increased training operations on Niihau. The additional training operations would comply with relevant Navy policies and procedures, which would minimize the potential for effects on wildlife. This would include the briefing of all participants on current guidelines to avoid undue impacts to wildlife. Radars would not radiate lower than 5 degrees above horizontal, which precludes EMR impacts to wildlife on the ground. It is also very unlikely that a bird would remain within the radar beam for any considerable length of time. (Missile Defense Agency, 2005)

HRC Enhancements

Kingfisher Underwater Training Area

PMRF would move the simulated underwater minefield used to exercise the Kingfisher mine detection system closer to Niihau (Figure 2.2.3.5.4-2). This underwater training area would be approximately 2 miles off the southeast coast of Niihau at a depth of between 300 and 400 ft.

The Kingfisher training areas would consist of less than 20 steel sphere-shaped buoys approximately 37 inches in diameter; each anchored to the ocean floor by a clump of chain weighing approximately 2,000 lb and occupying an ocean floor area of approximately 3 ft by 3 ft. The chain may eventually become buried, depending on currents and the softness of the ocean floor. Each buoy would be deployed from a ship in a grid determined by the Navy. There would be no electronics and no emitters on the buoys.

Limited ocean floor disturbance would occur from buoy installation. Reefs offshore of Niihau are poorly developed, thus minimal impacts to coral are anticipated.

4.3.1.9.1.3 Alternative 2 (Biological Resources (Terrestrial and Offshore)—Niihau)

Increased Tempo and Frequency of Training Operations

Under Alternative 2, the tempo of training exercises would be increased and the frequency of exercises could also increase. As stated in Section 4.3.1.1.3.3, it has been reported that intensity and duration of wildlife startle responses decrease with the number and frequency of exposures (U.S. Department of the Navy, 2006).

Additional Major Exercises – Multiple Strike Group Training

Up to three Strike Groups would conduct training exercises simultaneously in the HRC. Proposed exercises would be similar to those of current Major Exercises (RIMPAC and USWEX) with similar impacts to those discussed above.

4.3.1.9.2 Hazardous Materials and Waste—Niihau

4.3.1.9.2.1 No-action Alternative (Hazardous Materials and Waste—Niihau)

HRC Training Operations

Under the No-action Alternative, PMRF will continue ongoing HRC Training Operations at Niihau. The hazardous material/used oil issues associated with these operations are the fueling and maintenance of diesel generators which are operated intermittently to power remotely operated radar and the electronic warfare facility. These materials will continue to be handled by Niihau ranch. Past handling of these materials at Niihau has not resulted in any impacts to the environment around the facilities. PMRF only brings hazardous materials onto the island when required for maintenance. Diesel fuel required for fueling is stored in a portable fuel trailer.

The covert penetration operations only involve military personnel trying to avoid detection by ground observers and do not involve the use of any hazardous materials.

Target drones are currently flown along the east coast of the island away from inhabited areas. The drones do not fly over occupied areas; however, there is the potential for a drone to crash and deposit hazardous waste onto the island. The PMRF Hazardous Material Spill Response Team will be dispatched to the crash site of any mishap to ensure proper removal of all hazardous material/hazardous waste. To date, no crashes of target drones have occurred on Niihau.

Major Exercises

Major Exercises at Niihau include HAO/NEO training exercises. These exercises will use helicopters, trucks, LCAC, LCU and/or CRRC to shuttle supplies. Any diesel fuel required for fueling vehicles will be provided by Niihau Ranch.

4.3.1.9.2.2 Alternative 1 and Alternative 2 (Hazardous Materials and Waste—Niihau)

Increased Tempo and Frequency of Training Operations and Major Exercises

While the tempo and frequency of training operations and the number of major exercises would increase, the types of hazardous materials consumed would be similar to existing types and levels at Niihau. The types of exercises that would occur at Niihau would be similar to those described in Section 4.3.1.9.2.1. The types of hazardous materials used would not result in any procedural changes to the hazardous materials management plans currently in place.

HRC Enhancements

Proposed HRC Complex Enhancements at Niihau include the installation and operation of an antenna for AIS and Force Protection Capability. Potential construction impacts for this antenna would be minimal. Construction would be conducted in accordance with the USACE Safety and Health Requirements Manual. Hazardous materials used during construction could include engine oil, oil filters, paint, paint thinners, and solvents generated during maintenance of equipment. Construction activities would be handled under existing PMRF spill plans, and all hazardous materials and hazardous waste would be handled in accordance with State and Federal requirements.

Operation of the AIS and Force Protection antenna would require minimal use of hazardous materials. However, materials would continue to be handled in accordance with PMRF hazardous materials and hazardous waste plans. Past handling of hazardous materials and hazardous waste at Niihau has not resulted in any impacts to the environment.

4.3.1.9.3 Health and Safety—Niihau

4.3.1.9.3.1 No-action Alternative (Health and Safety—Niihau)

Under the No-action Alternative existing operations at Niihau will continue and there will be no adverse impacts to health and safety. PMRF takes every reasonable precaution during planning and execution of operations, training exercises, and RDT&E operations to prevent injury to human life or property at Niihau.

HRC Training Operations

Under the No-action Alternative, HRC Training Operations will continue ongoing operations on Niihau. The primary health and safety issues associated with these operations are the generation of EMR emissions from radar and electronic warfare operations. The covert penetration operations only involve military personnel trying to avoid detection by ground observers and do not involve any hazardous operations to the public.

EMR emissions do not represent a health and safety risk to the island residents because the radar and Perch site electronic warfare sites are located away from the island village. The radar unit is located on top of a facility and presents no HERP hazards at ground level where any island residents could be affected. During operation of the Perch site, appropriate warning lights and signs are placed around the facility.

Target drones are flown along the east coast of the island away from inhabited areas. Because the drones do not fly over occupied areas, there is no direct health and safety risk; however, there is the potential for a drone to crash and start a brush fire on the island. During operations that present the potential for fires, a ground fire-fighting crew and helicopters with water buckets are airborne to minimize any fire hazard.

Major Exercises

Training operations at Niihau that are a part of Major Exercises include HAO/NEO training exercises. These exercises will use helicopters, trucks, LCAC, LCU and/or CRRC to shuttle supplies. Every reasonable precaution is taken during exercises to prevent injury to human life or property at Niihau; therefore no adverse impacts will occur during ongoing Major Exercises.

4.3.1.9.3.2 Alternative 1 and Alternative 2 (Health and Safety—Niihau)

Increased Tempo and Frequency of Training Operations and Major Exercises

The number of training operations would increase in tempo and frequency and the number of major exercises would increase, however, the health and safety concerns would be similar to existing concerns and existing SOPs and procedures would be used. The types of exercises that would occur at Niihau would be similar to those described in Section 4.3.1.9.3.1 and would not occur simultaneously.

HRC Enhancements

Proposed HRC Complex Enhancements at Niihau includes the installation and operation of an antenna for AIS and Force Protection Capability. Construction would be conducted in accordance with the Corps of Engineers Safety and Health Requirements Manual. It is the policy on Niihau to minimize the contact between island residents and workers brought to the island. This policy would continue under the proposed construction activities, which would minimize the potential for an island resident to contract any illnesses that construction and operations workers may have. Transportation of hazardous materials on Niihau would be conducted under DOT regulations, and any generation of hazardous waste would be in accordance with Federal and State requirements.

Operation of the AIS and Force Protection antenna would result in no adverse impacts to health and safety risk to the island residents; it would be located away from the island village.

4.3.1.10 KAULA

Table 4.3.1.10-1 lists ongoing operations for the No-action Alternative and proposed operations for Alternatives 1 and 2 at Kaula. Alternative 2 is the preferred alternative.

Table 4.3.1.10-1. Operations Occurring at Kaula

Training Operations
• Air-to-Surface Gunnery Exercise (offshore)
• Bombing Exercises (land)
• Air-to-Ground Gunnery Exercise (offshore & land)

4.3.1.10.1 Airspace—Kaula

4.3.1.10.1.1 No-action Alternative, Alternative 1, and Alternative 2 (Airspace—Kaula)

HRC Training Operations and Major Exercises

The ongoing, continuing BOMBEX and GUNEX at Kaula will have no impact on controlled and uncontrolled airspace or special use airspace. Restricted Area R-3107 and the surrounding Warning Area W-187 were specifically designed to accommodate these kinds of hazards to non-participants' operations.

En route airways and jet routes will not be affected. The closest airway, V16, is located 18 nm north of Kaula. There are no airports or airfields in the area. The use of the airspace at Kaula will be coordinated with the FAA and PMRF prior to use during Major Exercises.

4.3.1.10.2 Biological Resources (Terrestrial and Offshore)—Kaula

4.3.1.10.2.1 No-action Alternative (Biological Resources (Terrestrial and Offshore)—Kaula)

HRC Training Operations and Major Exercises

The Navy uses the southeastern tip of Kaula for aircraft gunnery, inert ordnance target practice, Strike Warfare Exercises (STW), and Close Air Support (CASEX). Potential effects on biological resources are discussed below.

Vegetation

Vegetation on Kaula is very sparse and there are no known threatened or endangered plant species. Because of the sparse vegetation, brush fires occurring from gunnery and inert ordnance practice are unlikely to occur and no fires have ever been reported from prior training. Thus, any vegetative impacts on the southeastern tip of the island will be minimal.

Wildlife

Under the No-action Alternative, current GUNEX and STW training operations will continue. Pursuant to a previous Section 7 Consultation and Biological Opinion (National Oceanic and Atmospheric Administration, 2007), the Navy agreed to mitigations that reduce or eliminate any potential impacts to humpback whales. No live fire is used. Mitigations agreed to include seasonal use during periods when humpback whales are not present, surveying the waters off

Kaula to ensure that no whales are present, and limiting the impact area to the southern tip of the island. These mitigation measures are also used for other marine species including Hawaiian monk seals and sea turtles. Impacts to marine mammals were discussed in the Open Ocean Section (4.1.2).

Some individual migratory seabirds may be lost to GUNEX training operations in the designated impact area. Gunnery rounds that may occasionally miss the designated impact area may also result in the loss of some individuals elsewhere on the island. However, current migratory seabird populations appear to be healthy and reproducing normally.

RIMPAC exercises use non-explosive rounds on Kaula. However, impacting and ricocheting projectiles likely will startle nesting birds, and can result in the loss of a few individuals. Spotting charges from practice bombs will likely startle birds nesting near the targets. Birds frightened off their nests may abandon the nest and not breed again that season. Nest abandonment is highly species dependent. If the nest is abandoned, the bird may re-nest during the breeding season or not, depending in large part upon the species and the point in the breeding season at which the nest is abandoned. RIMPAC exercises occur biennially and USWEX operations will occur only up to six times per year, for a maximum of 4 days per exercise. Since these exercises will affect less than 10 percent of the island over less than 10 percent of the year, its effects on seabirds will be reduced to the extent practicable.

Small numbers of Hawaiian monk seals now haul-out on a small limestone bench on Kaula. USWEX/RIMPAC operations may cause monk seals to temporarily leave this haul-out site and enter the water temporarily. Based on the Navy's level of use of Kaula and the number of Hawaiian monk seals continually sighted at Kaula, it is likely that monk seals will return once the disturbance from USWEX operations had ended. USWEX thus will have only an occasional, short-term effect on monk seal's at this site.

Environmentally Sensitive Habitat

Impacts to Kaula, which is an important seabird colony in Hawaii, are discussed above. Critical habitat that has been designated for sea turtles and other listed species is outside the region of influence and will not be affected by current training and exercises (National Oceanic and Atmospheric Administration, 2007).

4.3.1.10.2.2 Alternative 1 (Biological Resources (Terrestrial and Offshore)—Kaula)

Increased Tempo and Frequency of Training Operations and Major Exercises

Under Alternative 1, training operations would increase as shown in Table 2.2.3.1-1. Major Exercises, such as STW and GUNEX, would continue to be supported at Kaula. While training operations would increase in number, the likelihood of a similar increase in impacts to biological resources on or adjacent to Kaula would be minimal due to implementation of guidelines established for the exercises as described below.

Vegetation

No rare, threatened, or endangered plant species are known to occur on Kaula. Operations would continue to take place at current locations; no expansion of the area would occur. All participants would continue to be briefed on current guidelines to avoid undue impacts to vegetation. Operations would comply with relevant Navy, National Marine Fisheries Service (NMFS), and USFWS policies and procedures during these increased training operations.

Wildlife

Impacts to wildlife would be similar to those described previously for the No-action Alternative. The additional training operations would comply with relevant Navy, NMFS, and USFWS policies and procedures, which would minimize the potential for effects on wildlife. All participants would continue to be briefed on current guidelines to avoid undue impacts to wildlife.

4.3.1.10.2.3 Alternative 2 (Biological Resources (Terrestrial and Offshore)—Kaula)

Increased Tempo and Frequency of Training Operations

Under Alternative 2, the tempo of training exercises would be increased and the frequency of exercises could also increase. As stated earlier, it has been reported that intensity and duration of wildlife startle responses decrease with the number and frequency of exposures (U.S. Department of the Navy, 2006). An increased tempo and frequency of GUNEX and inert ordnance target practice would possibly result in an increased loss of individual birds. However, no potential impacts are foreseen to migratory seabird populations, which appear to be healthy and reproducing normally.

Additional Major Exercises—Multiple Strike Group Training

The exercises proposed might require additional operations at Kaula. However, effects to birds and other wildlife would be minor and similar to those occurring during current Major Exercises, as described above.

4.3.1.10.3 Cultural Resources—Kaula

4.3.1.10.3.1 No-action Alternative (Cultural Resources—Kaula)

HRC Training Operations

BOMBEX and GUNEX

The southwestern tip of Kaula (a 10-acre ordnance impact zone) is used for BOMBEX and GUNEX operations. The impact zone has only been partially surveyed for cultural resources because of the presence of unexploded ordnance; however, there are no known sites within that area. The remainder of the islet displays no evidence of long-term human habitation; however, six archaeological sites recorded in the northern portion indicate some level of visitation. None of the identified sites have been recommended as eligible for inclusion in the National Register. As a result, training exercises on Kaula will have no impacts on cultural resources.

Major Exercises

BOMBEX and GUNEX are elements of Major Exercises (e.g., RIMPAC) and have been analyzed in the above discussion on HRC Training Operations. These operations are restricted to the southwestern tip of Kaula and will have had no impacts on cultural resources.

4.3.1.10.3.2 Alternative 1 (Cultural Resources—Kaula)

Increased Tempo and Frequency of Training Operations

Increased tempo and frequency of training operations would not affect Kaula. Training operations are confined to the impact zone at the southwestern tip of the island where there are no known cultural resources. Ongoing operations have not been found to have any effect on cultural resources, and an increased frequency or tempo would also have no effects.

4.3.1.10.3.3 Alternative 2 (Cultural Resources—Kaula)

Increased Tempo and Frequency of Training Operations

Increased frequency or tempo of training operations would not have new or additional effects at Kaula. Ongoing operations have not been found to have any effect on cultural resources and an increased frequency or tempo would also have no effects.

4.3.1.10.4 Geology and Soils—Kaula

4.3.1.10.4.1 No-action Alternative (Geology and Soils—Kaula)

HRC Training Operations

Training operations will include the continued use of the southeast end of Kaula for bombing and air-to-ground GUNEX training. Permanent adverse soil and geologic effects have been noted by the Navy resulting from shattering of rocks in explosions and the possibility of inert ordnance (duds), which may remain in the target area (U.S. Department of the Navy, 1980). The Navy minimizes the impact by managing the targeting to the southeast tip of the island, approximately 8 percent of the island land area (U.S. Department of the Navy, 1980).

Major Exercises

Major Exercises will include the continued use of the southeast end of Kaula for bombing and air-to-ground GUNEX training. Impacts will be the same as described above for Training Operations.

4.3.1.10.4.2 Alternative 1 (Geology and Soils—Kaula)

Increased Tempo and Frequency of Training Operations

Increased tempo and frequency of training would have similar impacts to those described under the No-action Alternative.

Major Exercises

Major Exercises such as RIMPAC and USWEX would include the continued use of the southeast end of Kaula for bombing and air-to-ground GUNEX training. Impacts would be the same as described for the No-action Alternative.

4.3.1.10.4.3 Alternative 2 (Geology and Soils—Kaula)

Increased Tempo and Frequency of Training Operations

Increased tempo and frequency of training would have similar impacts to those described under the No-action Alternative.

Additional Major Exercises – Multiple Strike Group Training

Major Exercises would include Multiple Strike Group training that could include the continued use of the southeast end of Kaula for bombing and air-to-ground GUNEX training. Impacts would be the same as described for the No-action Alternative.

4.3.1.10.5 Health and Safety—Kaula

4.3.1.10.5.1 No-action Alternative, Alternative 1, and Alternative 2 (Health and Safety—Kaula)

Under the No-action Alternative, Kaula will continue to be used for aircraft gunnery and inert ordnance target practice. To minimize health and safety risks, a Surface Danger Zone has been established around the island, and the island and surrounding tidal zone are closed to unauthorized personnel. In addition, prior to any gunnery operations, an aircraft flies over the island and determines if it is safe to conduct the mission. While Alternatives 1 and 2 would result in the total number of exercises and operations to increase, the health and safety concerns would be similar to existing concerns and existing SOPs and procedures would be used.

4.3.1.10.6 Land Use—Kaula

4.3.1.10.6.1 No-action Alternative (Land Use—Kaula)

HRC Training Operations

Approximately 10 acres of the 108-acre island of Kaula will continue to be used for aircraft gunnery practice associated with STW (Table 2.2.3.1-1). The State has included the island within the conservation protective subzone use designation, which will limit any development on the island. The open undeveloped conservation use and designation of the Island is compatible with the Navy's gunnery practice operations. Although the island has been used by the Navy for these types of operations, the State of Hawaii has designated the island a seabird sanctuary. Potential impacts to bird species from gunnery practice are addressed under biological resources. Operations at Kaula will continue to be consistent to the maximum extent practicable with the Hawaii Coastal Zone Management Program. Under the No-action Alternative the land-based use of Kaula will not change.

Major Exercises

STWs and CASEX are current operations included in Major Exercises. Under the No-action Alternative there will be no change in the numbers of operations for STW and CASEX on Kaula.

4.3.1.10.6.2 Alternative 1 (Land Use—Kaula)

Increased Tempo and Frequency of Training Operations

Under Alternative 1, the number of operations for bombing and air-to-ground GUNEX associated with STW would increase. STW include the bombing operations, which would increase by 43 percent (from 165 to 216) and the air-to-ground gunnery operations, which would increase by approximately 13 percent (from 16-18 operations) on Kaula. The cumulative increase for STW is approximately 30 percent (from 181 to 234 operations). Under Alternative 1 the land-base use of Kaula would not change.

Major Exercises

STWs and CASEX are operations included in Major Exercises that would continue to be supported at Kaula. The land-base use of Kaula would not change under major exercises.

4.3.1.10.6.3 Alternative 2 (Land Use—Kaula)

Increased Tempo and Frequency of Training Operations

Under Alternative 2, the number of BOMBEX (land) would increase by approximately 16 percent (from 216 to 250 operations). Under Alternative 2 the land-base use of Kaula would not change.

Additional Major Exercises—Multiple Strike Group Training

Under Alternative 2, there are no increases in the training operations associated with Major Exercises.

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4.4 OAHU

4.4.1 PEARL HARBOR

Pearl Harbor refers to the Pearl Harbor Naval Defensive Sea Area which is all the waters and submerged lands from the shoreline to a 3-mile offshore area (as depicted in Figure 2.1-2) under the Navy's exclusive control.

4.4.1.1 NAVAL STATION PEARL HARBOR

Table 4.4.1.1-1 lists ongoing operations for the No-action Alternative and proposed operations for Alternatives 1 and 2 at Naval Station Pearl Harbor. Alternative 2 is the preferred alternative.

Table 4.4.1.1-1. Operations Occurring at Pearl Harbor

Training Operations	Research, Development, Testing, and Evaluation (RDT&E) Operations
• Visit, Board, Search, and Seizure (offshore)	• Anti-air Warfare RDT&E (offshore)
• Air Operations (land)	• Shipboard Electronic Systems Evaluations Facility Quick Look Tests (offshore)
• Command and Control (land)	
• In-Port Support Operations (offshore & land)	
• Aircraft Support Operations (land)	
• Personnel Support Operations (land)	
• Demolition Exercises (offshore)	
• Special Warfare Operations (SPECWAROPS) (offshore & land)	
• Salvage Operations (offshore)	

4.4.1.1.1 Biological Resources (Terrestrial and Offshore)—Naval Station Pearl Harbor

4.4.1.1.1.1 No-action Alternative (Biological Resources [Terrestrial and Offshore]—Naval Station Pearl Harbor)

HRC Training Operations and Major Exercises

Vegetation

Exotic imported grasses and trees maintained by intensive landscaping efforts make up the majority of the vegetative community at Pearl Harbor. The alien red mangrove dominates vegetation along the shoreline. No threatened and endangered plant species have been identified at Pearl Harbor. Typical In-Port Support Operations include the maintenance and supply of foreign and U.S. warships and submarines berthed at Pearl Harbor. These and other operations do not affect any vegetative habitats in the area. Procedures and practices are in place to minimize impacts to biological resources and to prevent the introduction of invasive plant species (Table 4.4.1.1.1.1-1).

Table 4.4.1.1.1.1-1: Training Guidelines for Resource Protection—All Oahu Training Areas

APPLIES TO	
The following list of actions and limitations applies to all Oahu training areas. Additional limitations are imposed in the Sensitive Ecological and Cultural Resource Areas.	
AUTHORITY	
Enforcement of the following rules is under the authority of the Directorate of Plans, Training, Mobilization and Security, Range and Training Support Division.	
REQUIRED ACTIONS	
Access	Before entering a training area, troops must clean all vehicles, equipment, personal gear, shoes, and clothing.
Fire	All fires must be reported immediately.
	In case of fire, troops will stop training operations and begin fighting the fire.
	Troops will continue to fight the fire until released by the Fire Department.
Water	All aviation or other training area fuels or chemicals and other potentially toxic and polluting substances must be handled and stored to avoid spills and fires.
LIMITATIONS FOR SENSITIVE ECOLOGICAL AND CULTURAL RESOURCE AREAS	
Access	No troops may go beyond signs or fences marking the presence of rare or endangered plants and animals or archaeological sites.
Bivouacking	No bivouacking within 3,280 feet of posted signs marking the presence of rare or endangered native plants and animals or restoration projects.
	No training units larger than platoon size (more than 30 troops) may bivouac outside of reusable bivouac sites provided with portable or fixed latrines.
	No open fires.
	No burying or leaving trash.
	No food preparation.
	No refueling operations.
	No cutting, clearing, or disturbing of vegetation. This includes mosses, grasses, shrubs, bushes, and trees.
Maneuvers	No vehicle traffic off existing roads.
	No use of rocks from rock piles or walls for training purposes.
	No establishment or new vehicle tracks.
	No digging, including entrenchment and foxholes, except in areas specifically designated by Range Control.
	Dillingham Military Reservation and Kahuku Training Area: No pyrotechnic or incendiary training devices except during the wet season (October to April) OR outside areas designed to control fire.
	No new placement of barbed wire or concertina wire near signs marking the presence of sensitive ecological areas or fences.
	Dillingham Military Reservation and Kahuku Training Area: No use of live fire or tracer ammunition.
	No road, trail, or firebreak clearing without permission form Range Control.
	No grading or construction of buildings or other permanent structures without permission from Range Control.

Source: U.S. Department of the Navy, Commander THIRD Fleet, 2002

Wildlife

Current In-Port Support Exercises and Salvage Operations have not resulted in any significant impacts to the four endangered waterbirds that have been identified in the harbor area. The green sea turtle has rarely been seen in the harbor and no nesting has been reported. The Hawaiian monk seal has been seen in the channel, but never reported in the harbor, and only one humpback whale sighting has occurred in the region of influence.

All waters around Pearl Harbor have been designated as Essential Fish Habitat (EFH) for eggs and larvae of a number of species. None of the current training operations have the potential to affect EFH. Acoustic effects on fish are discussed in Section 4.1.2 under Open Ocean Biological Resources. RIMPAC exercises have procedures and practices in place to prevent the introduction of invasive species, consistent with EO 13112 and Navy guidelines (Table 4.4.1.1.1.1-1). The Navy requests that multinational participants purge bilge/ballasts tanks in their ships prior to entering U.S. territorial waters. The movement and berthing of ships and small training operations in the harbor area are part of ongoing operations at Pearl Harbor. Marine mammal collision avoidance and encounter reporting procedures are already in place and implemented.

Environmentally Sensitive Habitat

Current operations and exercises do not occur in the Pearl Harbor National Wildlife Refuge or within wetland areas on the installation.

4.4.1.1.1.2 Alternative 1 (Biological Resources (Terrestrial and Offshore)—Naval Station Pearl Harbor)

Increased Tempo and Frequency of Training Operations and Major Exercises

Alternative 1 would include up to six Undersea Warfare Exercises (USWEXs) per year (an increase of two exercises), the Rim of the Pacific (RIMPAC) biennial exercise, and two Strike Groups conducting training exercises simultaneously in the Hawaii Range Complex (HRC), as well as other continuing training operations (See Table 2.2.2.1-1). While training operations would increase in number, the likelihood of a similar increase in adverse impacts to biological resources is small, as described below.

Vegetation

Operations and exercises would take place at existing locations; no expansion of the area would be involved. Compliance with relevant Pearl Harbor and Navy policies and procedures (Table 4.4.1.1.1.1-1) during training operations would minimize the potential for effects on vegetation, as well as limit the potential for introduction of invasive plant species. No rare, threatened, or endangered plant species are known to occur at Pearl Harbor.

Wildlife

Impacts to wildlife would be similar to those described previously for the No-action Alternative. It is unlikely that a listed bird species or other wildlife at Pearl Harbor would be harmed as a result of increased training operations. The additional training operations would comply with relevant Navy policies and procedures (Table 4.4.1.1.1.1-1), which would minimize the potential for effects on wildlife.

Environmentally Sensitive Habitat

Just as for the No-action Alternative, increased training operations and exercises would not occur in the Pearl Harbor National Wildlife Refuge or within wetland areas on the installation.

4.4.1.1.1.3 Alternative 2 (Biological Resources (Terrestrial and Offshore)—Naval Station Pearl Harbor)

Increased Tempo and Frequency of Training Operations

Under Alternative 2, the tempo of training operations would be increased and the frequency of operations could also increase. Literature on the effects of noise on wildlife suggests that common responses to noise events include a startle or fright response, and ultimately, habituation. It has been reported that the intensity and duration of startle responses decrease with the number and frequency of exposures. (U.S. Department of the Navy, 2006)

Additional Major Exercises—Multiple Carrier Strike Group Training

Up to three Strike Groups would be added to the Major Exercises occurring in the HRC. These ships would not be home ported in Hawaii, but would visit the area for up to 30 days per exercise. The exercises proposed would be similar to those occurring during current RIMPAC and USWEX, with impacts to biological resources similar to those described above.

4.4.1.1.2 Cultural Resources—Naval Station Pearl Harbor

4.4.1.1.2.1 No-action Alternative, Alternative 1, and Alternative 2 (Cultural Resources—Naval Station Pearl Harbor)

HRC Training Operations and Major Exercises

Salvage Operations

Salvage operations provide a realistic training environment for fire at sea, de-beaching of ships, and harbor clearance operations training by Navy diving and salvage units. Activities include battle damage repair, ship and barge salvage, towing, deep ocean recovery, removal of objects from navigable waters, and underwater ship inspection and repair (use of welding and other power equipment). Salvage operations will occur primarily at the Puuloa Underwater Range, within Pearl Harbor, and in the Keehi Lagoon; however, they may also take place in any of the shoal waters, harbors, ports, and inland waterways throughout the HRC.

Pearl Harbor contains the wrecks of World War II-era warships and warship debris fields, Japanese aircraft, and Japanese midget submarines. There are also several Native Hawaiian fishponds within the harbor. Of these submerged cultural resources, several are listed on the National Register and designated National Historic Landmarks (e.g., *USS Arizona* and *USS Utah*). In addition, the entirety of Pearl Harbor is within the Pearl Harbor National Historic Landmark boundary (International Archaeological Resources Institute, Inc., 2002). Salvage operations within Pearl Harbor will be conducted in accordance with the policies, guidelines, and standard operating procedures (SOPs) outlined in the *Integrated Cultural Resources Management Plan (ICRMP), Pearl Harbor Naval Complex* or any other agreement documents (e.g., Memoranda of Agreement or Programmatic Agreements) promulgated since completion of the ICRMP (Helber Hastert & Fee, Planners, 2002).

4.4.1.1.3 Socioeconomics—Naval Station Pearl Harbor

4.4.1.1.3.1 No-action Alternative (Socioeconomics—Naval Station Pearl Harbor

HRC Training Operations

Salvage Operations, In Port Support Operations, Command and Control (C2), Aircraft Support Operations, Personnel Support Operations and Air Operations occur on Pearl Harbor. Under the No-action Alternative the current baseline number for these training operations will not change.

HRC RDT&E Operations

Shipboard Electronic Systems Evaluations Facility (SESEF) Quick Look Test is a research, development, testing, and evaluation (RDT&E) activity associated with Pearl Harbor. Under the No-action Alternative there will be no change in the current baseline number of SESEF operations occurring on Pearl Harbor.

Major Exercises

In Port Support Exercises, C2, Air Operations (AIROPS), Special Warfare Operations (SPECWAROPS), Demolition, Salvage Operations, and Expeditionary Assault are all major exercises associated with Pearl Harbor. Under the No-action Alternative the current baseline training for these operations will not change. The current socioeconomic characteristics of Oahu (Section 3.4.1.1.3) will not change under the No-action Alternative.

4.4.1.1.3.2 Alternative 1 (Socioeconomics—Naval Station Pearl Harbor)

Increased Tempo and Frequency of Training Operations

Under Alternative 1, there are no increases in the occurrence of training operations on Pearl Harbor. Thus, effects would be the same as described for the No-action Alternative.

Increased RDT&E Operations

Under Alternative 1, SESEF Quicklook Test operations would increase by 10 percent (from 3,842 to 4,225 operations - Table 2.2.3.1-1). SESEF tests are conducted to evaluate ship, shore, and aircraft systems that emit or detect electronic emissions. Quick Look Tests are generally conducted during transit to and from port, or while pier side at Pearl Harbor. Quick Look Tests are generally short in duration, require little or no advance scheduling, require little or no shipboard maneuvering, may be accomplished pier side (Communications, LINK-4A and LINK-11 only) and require minimal internal shipboard coordination. The socioeconomic characteristics of Oahu (population size, employment characteristics, income generated and the type and cost of housing) would not change due to an increase in this HRC RDT&E activity.

Major Exercises

Under Alternative 1, USWEX frequency would increase from four to six times per year (a 50 percent increase). Table 2.2.2.5-1 shows the matrix of operations generally used during a USWEX exercise by location and they are listed in Section 4.4.1.1.3.1 above. A review of Table 2.2.3.1-1 indicates that under Alternative 1 there are no increases in the number of these operations.

4.4.1.1.3.3 Alternative 2 (Socioeconomics—Naval Station Pearl Harbor)

Increased Tempo and Frequency of Training Operations

Under Alternative 2, C2, Aircraft Support Operations, and Personnel Support Operations would each increase by 100 percent (from 1 to 2 operations -Table 2.2.4.3-1). The cumulative increase in these three training operations on Pearl Harbor would be approximately 100 percent (from 3-6 operations). Any impact on the socioeconomics characteristics of Oahu from these operations would be associated with the time period in which the training operations would be conducted. No increase in population size, or changes in number of renter-occupied homes or single-family owned homes, would be expected on the Island of Oahu from these training operations.

Additional Major Exercises—Multiple Strike Group Training

Under Alternative 2, up to three Strike Groups would be allowed to conduct training operations simultaneously in the HRC. These Strike Groups would not be home ported in Hawaii, but would be in the area for up to 30 days per exercise. During that time, the Soldiers, Sailors and Marines from usually no more than 1 Strike Group could visit Oahu while transiting. C2 operations, which occur on Pearl Harbor as an activity included in major exercises, would increase by 100 percent (from 1 to 2 operations).

An increase in the income generated on Oahu could be expected for tourism-related services, which in turn could affect the personal income of some Oahu residents during each 30-day training period. No increase in population size, renter-occupied homes or single-family owned homes would be expected, however, due to the increase in C2 operations.

4.4.1.2 FORD ISLAND

Table 4.4.1.2-1 lists ongoing operations for the No-action Alternative and proposed operations for Alternatives 1 and 2 at Ford Island. Alternative 2 is the preferred alternative.

Table 4.4.1.2-1. Operations Occurring at Ford Island

Training Operations (land & offshore)	Research, Development, Testing, and Evaluation (RDT&E) Operations (offshore)
• In-Port Support Operations	• MK-84/MK-72 Pinger Acoustic Training Area (Alternative 1)

4.4.1.2.1 Biological Resources (Terrestrial and Offshore)—Ford Island

4.4.1.2.1.1 No-action Alternative (Biological Resources [Terrestrial and Offshore]—Ford Island)

HRC Training Operations and Major Exercises

Vegetation

Vegetation on Ford Island consists primarily of non-native grasses, shrubs, and trees. No threatened or endangered plant species have been reported. The training operations and Major Exercises that take place in the Ford Island region of influence do not affect island vegetation. As described before, procedures and practices are in place (Table 4.4.1.1.1.1-1) to prevent the introduction of invasive species.

Wildlife

Training operations and Major Exercises have procedures and practices in place to prevent the introduction of invasive species and minimize potential impacts on wildlife. The Navy normally requests that multinational participants purge bilge/ballasts tanks on ships prior to entering U.S. territorial waters. None of the proposed operations or exercises include actions having a potential to affect EFH. Acoustic effects on fish are discussed in Section 4.1.2 under Open Ocean Biological Resources.

The movement and berthing of ships and small training exercises in the harbor area are part of ongoing operations at Pearl Harbor. Marine mammal collision avoidance and encounter reporting procedures are already in place.

Environmentally Sensitive Habitat

No critical habitat has been identified on Ford Island.

4.4.1.2.1.2 Alternative 1 (Biological Resources [Terrestrial and Offshore]—Ford Island)

Increased Tempo and Frequency of Training Operations and Major Exercises

Alternative 1 would include up to six USWEX per year (an increase of two exercises), the RIMPAC biennial exercise, and two Strike Groups conducting training operations simultaneously in the HRC, as well as other continuing training operations (See Table 2.2.3.1-1), an increase of approximately 9 percent. While training operations would increase in number, the likelihood of a similar increase in adverse impacts to biological resources is small as discussed below.

Vegetation

Operations would take place at existing locations; no expansion of the area would be involved. Compliance with relevant Pearl Harbor and Navy policies and procedures (Table 4.4.1.1.1.1-1) during training operations would minimize the potential for effects on vegetation, as well as limit the potential for introduction of invasive plant species. No rare, threatened, or endangered plant species are known to occur on Ford Island.

Wildlife

Impacts to wildlife would be similar to those described previously for the No-action Alternative. It is unlikely that birds or other wildlife on Ford Island would be harmed as a result of increased training operations. The increased training operations would comply with relevant Pearl Harbor and Navy policies and procedures (Table 4.4.1.1.1.1-1), which would minimize the potential for effects on wildlife.

Environmentally Sensitive Habitat

No critical habitat has been identified on Ford Island.

HRC Enhancements

As part of HRC enhancements, the Navy proposes to develop a new open-water Acoustic Test Facility (ATF) adjacent to Pier S291 on Ford Island. Only minor modification to the pier are planned, which include adding electrical cables and pinger attach points. No marine mammals occur in the area and most fish do not respond to pingers (Cetacean Bycatch Resources Center, undated)

4.4.1.2.1.3 Alternative 2 (Biological Resources [Terrestrial and Offshore]—Ford Island)

Increased Tempo and Frequency of Training Operations

Under Alternative 2, the tempo of training operations would be increased and the frequency of operations could also increase. There are no threatened or endangered terrestrial wildlife on Ford Island. Literature on the effects of noise on wildlife suggests that common responses to noise events include a startle or fright response, and ultimately, habituation. It has been reported that the intensity and duration of startle responses decrease with the number and frequency of exposures. (U.S. Department of the Navy, 2006)

Additional Major Exercises—Multiple Strike Group Training

Up to three Strike Groups would be added to the major exercises occurring in the HRC. These ships would not be home ported in Hawaii, but would visit the area for up to 30 days per exercise. The exercises proposed would be similar to those occurring during RIMPAC and USWEX, with impacts to biological resources similar to those described above.

4.4.1.2.2 Cultural Resources—Ford Island

4.4.1.2.2.1 No-action Alternative (Cultural Resources—Ford Island)

There are no training operations or major exercises with the potential to affect cultural resources at Ford Island.

4.4.1.2.2.2 Alternative 1 (Cultural Resources—Ford Island)

Increased Tempo and Frequency of Training Operations

There are no training operations with the potential to affect cultural resources at Ford Island.

HRC Enhancements

MK-84/MK-72 Pinger Acoustic Test Facility

The entirety of Ford Island falls within the Pearl Harbor Naval Complex National Historic Landmark. Ford Island also is a designated Historic Management Zone (see Section 3.4.1.2.2). The proposed location for the new ATF is within an area that might contain intact subsurface archaeological materials. To avoid adverse effects, construction of this new facility would follow the guidance in the Pearl Harbor ICRMP and would require coordination with Navy Region Hawaii's designated cultural resources coordinator (Helber Hastert & Fee, Planners, 2002).

4.4.1.2.2.3 Alternative 2 (Cultural Resources—Ford Island)

There are no Major Exercises or Training Operations with the potential to affect cultural resources at Ford Island.

4.4.1.2.3 Water Resources—Ford Island

4.4.1.2.3.1 No-action Alternative (Water Resources—Ford Island)

Under the No Action Alternative, no HRC training operations or major exercises are occurring at Ford Island; therefore, water resources are not affected.

4.4.1.2.3.2 Alternative 1 (Water Resources—Ford Island)

Under Alternative 1, no HRC training operations would occur at Ford Island; therefore, water resources would not be affected.

HRC Enhancements

Under Alternative 1, HRC enhancements would include the construction of an MK-84/MK-72 Pinger Acoustic Test Facility near the Naval Undersea Warfare Center (NUWC) Ford Island Facility. If the total area disturbed is greater than 1 acre, then a Stormwater Pollution Prevention Plan would be prepared and submitted prior to construction. The plan would specify all of the measures to be used during construction to minimize and avoid adverse water quality impacts. The level topography and permeability of the soils would also limit the potential for impacts to water resources from construction activities.

4.4.1.2.3.3 Alternative 2 (Water Resources—Ford Island)

Under Alternative 2, no HRC training operations or major exercises would occur at Ford Island; therefore, water resources would not be affected.

4.4.1.3 NAVAL INACTIVE SHIP MAINTENANCE FACILITY, PEARL HARBOR

Table 4.4.1.3-1 lists ongoing operations for the No-action Alternative and proposed operations for Alternatives 1 and 2 at Ford Island. Alternative 2 is the preferred alternative.

Table 4.4.1.3-1. Operations Occurring at Naval Inactive Ship Maintenance Facility, Pearl Harbor

Training Operations (offshore)	
• Visit, Board, Search, and Seizure	• Demolition Exercises
• Special Warfare Operations (SPECWAROPS)	

4.4.1.3.1 Biological Resources (Terrestrial and Offshore)—Naval Inactive Ship Maintenance Facility, Pearl Harbor

The Naval Inactive Ship Maintenance Facility is located in the Middle Loch.

4.4.1.3.1.1 No-action Alternative (Biological Resources [Terrestrial and Offshore]—Naval Inactive Ship Maintenance Facility, Pearl Harbor)

HRC Training Operations and Major Exercises

Individual training operations use explosives charges no greater than 20 lb net explosive weight. Up to about 580 lb of explosives would be used per year. Operations would follow the relevant Pearl Harbor and Navy policies and procedures to minimize impacts to biological resources.

Demolition activities in the offshore environment include destruction of inert mines by detonation of less than 20 lb of explosive per inert mine. Standard procedures require tethered mines to be suspended at least 10 ft below the surface of the water. There can be minor and localized loss of some fish and benthic populations from the explosions. There is a fishery in the Middle Loch that no one is allowed to fish in. These shallow areas are not located in areas identified as EFH or Habitat Area of Particular Concern (HAPC), which occur at depths greater than 120 ft. After operations involving underwater detonations, the area is searched for injured animals. Applicable procedures are implemented during charge placement and the detonations occur infrequently.

4.4.1.3.1.2 Alternative 1 (Biological Resources [Terrestrial and Offshore]—Naval Inactive Ship Maintenance Facility, Pearl Harbor)

Increased Tempo and Frequency of Training Operations and Major Exercises

Alternative 1 would include up to six USWEX per year (an increase of two exercises), the RIMPAC biennial exercise, and two Strike Groups conducting training operations simultaneously in the HRC, as well as other continuing training operations (See Table 2.2.3.3-1). While training operations would increase in number, the likelihood of a similar increase in adverse impacts to biological resources is small. Impacts to fish would be similar to those described previously for the No-action Alternative.

4.4.1.3.1.3 Alternative 2 (Biological Resources [Terrestrial and Offshore]—Naval Inactive Ship Maintenance Facility, Pearl Harbor)

Increased Tempo and Frequency of Training Operations

Under Alternative 2, the tempo of training operations would be increased and the frequency of operations could also increase. Impacts would be similar to those described above in Section 4.4.1.3.1.1.

Additional Major Exercises—Multiple Strike Group Training

Up to three Strike Groups would be added to the major exercises occurring in the HRC. These ships would not be home ported in Hawaii, but would visit the area for up to 30 days per exercise. The exercises proposed would be similar to those occurring during RIMPAC and USWEX, with impacts to biological resources similar to those described above in Section 4.4.1.3.1.1.

4.4.1.3.2 Hazardous Materials and Waste—Naval Inactive Ship Maintenance Facility, Pearl Harbor

4.4.1.3.2.1 No-action Alternative, Alternative 1, and Alternative 2 (Hazardous Materials and Waste—Naval Inactive Ship Maintenance Facility, Pearl Harbor)

HRC Training Operations and Major Exercises

Training operations at the Naval Inactive Ship Maintenance Facility, Pearl Harbor would use explosives charges of no more than 20 lb net explosive weight each for a total of about 580 lb per year of explosives. Demolition activities in the offshore environment include destruction of inert mines by detonation of less than 20 lb of explosive per inert mine. The transport, handling, and use of hazardous materials on an infrequent basis would have no effect on ongoing hazardous materials management activities. No Resource Conservation and Recovery act (RCRA) hazardous wastes would be generated by these operations.

4.4.1.3.3 Water Resources—Naval Inactive Ship Maintenance Facility, Pearl Harbor

4.4.1.3.3.1 No-action Alternative, Alternative 1, and Alternative 2 (Water Resources—Naval Inactive Ship Maintenance Facility, Pearl Harbor)

HRC Training Operations and Major Exercises

The detonation of explosives releases fragments and residues of explosives, as well as of associated ordnance constituents (e.g., primers, wires, casings). For underwater detonations, these materials are absorbed into the water column and, excluding those fragments large enough to settle to the bottom, disperse from the detonation site according to the local water circulation pattern. Underwater detonations also may, depending upon their size and placement relative to the bottom, create a crater and disperse the displaced bottom sediments into the water column. The size of explosives charge used in training at the Naval Inactive Ship Maintenance Facility, Pearl Harbor, is not expected to result in substantial craters in the bottom sediments.

4.4.1.4 EOD SHORE RANGE–NAVMAG PEARL HARBOR WEST LOCH

Table 4.4.1.4-1 lists ongoing operations for the No-action Alternative and proposed operations for Alternatives 1 and 2 at the EOD Shore Range-NAVMAG Pearl Harbor West Loch. Alternative 2 is the preferred alternative.

Table 4.4.1.4-1. Operations Occurring at EOD Shore Range-NAVMAG Pearl Harbor West Loch

Training Operations (land)	Research, Development, Testing, and Evaluation (RDT&E) Operations (land)
• Land Demolitions	• Naval Special Warfare and EOD Targets (Alternative 1)

4.4.1.4.1 Biological Resources (Terrestrial and Offshore)—EOD Shore Range–NAVMAG Pearl Harbor West Loch

4.4.1.4.1.1 No-action Alternative (Biological Resources [Terrestrial and Offshore]—EOD Shore Range–NAVMAG Pearl Harbor West Loch)

HRC Training Operations

EOD training at West Loch involves the detonation of explosives with a net explosive weight of up to 2.5 lb. Although training at this facility can take place at any time, training most often occurs during daylight hours. Under the No-action Alternative, up to 85 such training operations can occur per year..

Training at the EOD pit is not expected to have any adverse impacts on vegetation at the site. No direct effects on wildlife are anticipated. No threatened or endangered species have been observed at West Loch. Intrusive noise from the site, however, could startle noise-sensitive wildlife in the vicinity, most notably at the Pearl Harbor National Wildlife Refuge. Assuming that a detonation at the EOD pit generated a noise level of about 95 dB sound exposure level (SEL) at 50 ft, noise levels at 500 ft would be reduced to about 65 dB SEL.

4.4.1.4.1.2 Alternative 1 (Biological Resources [Terrestrial and Offshore]—EOD Shore Range–NAVMAG Pearl Harbor West Loch)

Increased Tempo and Frequency of Training Operations

Under Alternative 1, EOD training intensity at West Loch would not increase. Impacts would be the same as those discussed above for the No-action Alternative.

4.4.1.4.1.3 Alternative 2 (Biological Resources [Terrestrial and Offshore]—EOD Shore Range–NAVMAG Pearl Harbor West Loch)

Increased Tempo and Frequency of Training Operations

Under Alternative 2, EOD training intensity at West Loch would increase from 85 to 93 operations per year, an approximately 9 percent increase. The small increase in operations would result only in minor changes to the noise environment.

4.4.1.4.2 Cultural Resources—EOD Shore Range–NAVMAG Pearl Harbor West Loch)

4.4.1.4.2.1 No-action Alternative, Alternative 1, and Alternative 2 (Cultural Resources—EOD Shore Range–NAVMAG Pearl Harbor West Loch)

There are no ongoing training land-based operations at the EOD Shore Range with the potential to affect cultural resources.

Land demolitions take place at the West Loch EOD Training Facility, and are designed to train forces in the use of explosives. West Loch has been surveyed for archaeological and traditional Hawaiian resources and a number or archaeological sites were identified; however, none were identified within the EOD Shore Range (International Archaeological Resources Institute, Inc., 2002; Jensen, et al., 1997).

The EOD Shore Range facilities used for land demolitions have also been surveyed for their historic significance. This includes two concrete blast chambers and one concrete safety bunker. None of these buildings have been recommended as eligible for inclusion in the National Register of Historic Places.

Proposed increases in operations under Alternative 1 and Alternative 2 would result in increases in training operations; however, no cultural resources would be affected because there are none present in the area.

4.4.1.4.3 Geology and Soils—EOD Shore Range–NAVMAG Pearl Harbor West Loch)

4.4.1.4.3.1 No-action Alternative, Alternative 1, and Alternative 2 (Geology and Soils—EOD Shore Range–NAVMAG Pearl Harbor West Loch)

HRC Training Operations

Navy EOD Training

Navy EOD training is not expected to affect the geology of the EOD Shore Range, inasmuch as no construction or excavation is planned. The nature of the training operations, however, is such that contamination of surface soils is a concern.

The in-place detonation of ordnance typically generates fragments and residues of explosives and other ordnance constituents (e.g., inorganic compounds such as perchlorates and metals such as lead, mercury, chromium, copper, and nickel from primers, wires, and casings). Based on analysis of military blow-in-place operations, ordnance debris, remnants, and residues deposited on and near an EOD pit may account for up to 40 percent of the weight of small ordnance items (the remaining 60 percent being dispersed in the atmosphere as gases or particulates). Larger fragments are periodically cleared from the site during EOD sweeps, whereas fine fragments and residues typically remain in place. This practice is consistent with the Military Munitions Rule, which allows expended munitions and its constituents to remain on the range as long as the range remains open. Fine particulate residues may settle up to 197 ft from the point of detonation.

Some explosives residues will degrade over time while others persist. RDX, for example, resists degradation while trinitrotoluene typically degrades to dinitrotoluene over time. Inorganic salts and metals may react with their surroundings to form insoluble compounds, or may migrate into surface soils and ground water dissolved in rain water. Sheet flows of precipitation during periods of heavy rainfall can disperse surface contaminants laterally. In summary, some ordnance constituents will accumulate in on-site soils while other constituents migrate from the site.

The rate at which ordnance residues accumulate in on-site soils will depend upon the relative rates of generation, degradation, and offsite migration. The degree to which accumulating residues contribute to soil contamination will depend upon the nature of the residue constituents. Under the No-action Alternative and Alternative 1, up to 85 training operations can be held per year at the range, each operation involving no more than 2.5 lb net explosive weight, or ordnance. Under Alternative 2, up to 93 training operations per year could be held. Under the No-action Alternative and Alternative 1, no more than about 85 lb per year of ordnance fragments and residues will be deposited on the site. Under Alternative 2, no more than 03 lb per year of ordnance fragments and residues would be deposited. At this intensity of use, such residues will constitute a very small fraction of the surface materials in the vicinity of the EOD pit. This level of use is not expected to affect soil chemistry at the EOD range.

EOD Shore Range Use by Others

In addition to Navy EOD training, the EOD Shore Range will continue to be used by law enforcement agencies and private companies. The frequency of use by these agencies and the types and amounts of ordnance to be used in their activities are not known. However, the restriction on the maximum net explosive weight of ordnance detonated at the Shore Range, 2.5 lb, will apply to all users of the Shore Range.

Major Exercises

EOD training for major exercises would be the same as described above for HRC Training Operations. Under Alternative 2, Multiple-Strike Group Training would result in an unspecified number of additional training operations at the EOD Shore Range. These additional operations are unlikely to have substantial adverse effects on geology and soils.

4.4.1.4.4 Health and Safety—EOD Shore Range–NAVMAG Pearl Harbor West Loch

4.4.1.4.4.1 No-action Alternative, Alternative 1, and Alternative 2 (Health and Safety—EOD Shore Range–NAVMAG Pearl Harbor West Loch)

HRC Training Operations

Navy EOD Training

EOD Shore Range operations under the No-action Alternative and Alternative 1 will consist of up to 85 training operations per year, using no more than 2.5 lb net explosive weight of ordnance. Under Alternative 2, up to 93 training operations per year would be held. The public will not be exposed to the energetic effects (overpressure and fragments) of the detonations because the ESQD arc for these training munitions lies completely within the West Loch lands and adjacent waters controlled by the Navy and from which the public is excluded. Accordingly, Navy training operations at the EOD Shore Range will have no effect on public safety.

EOD Shore Range Use by Law-Enforcement Agencies

In addition to Navy EOD training, the EOD Shore Range will continue to be used by law enforcement agencies and private companies. The frequency of use by these agencies and the types and amounts of ordnance to be used in their activities are not known. However, the restriction on the maximum net explosive weight of ordnance detonated at the Shore Range, 2.5 lb, would apply to all users of the Shore Range. Thus, law enforcement and private activities at the EOD Shore Range will have no effect on public safety.

Major Exercises

Major Exercises under all Alternatives, such as RIMPAC and USWEX, include training operations and in some cases RDT&E operations. Under Alternative 2, Multiple Strike Group Training would result in an unspecified number of additional training operations at the EOD Shore Range. Potential impacts from Major Exercises would be similar to those described above for training operations and RDT&E operations. These additional training operations are unlikely to have substantial adverse health and safety effects.

4.4.1.4.5 Water Resources—EOD Shore Range–NAVMAG Pearl Harbor West Loch)

4.4.1.4.5.1 No-action Alternative, Alternative 1, and Alternative 2 (Water Resources—EOD Shore Range–NAVMAG Pearl Harbor West Loch)

HRC Training Operations

Under the No-action Alternative and Alternative 1, up to 85 training operations per year can be held at the EOD Shore Range, each operation involving the demolition of up to 2.5 lb net explosive weight of ordnance. Under Alternative 2, up to 93 training operations per year could be held. Based on published accounts, up to 40 percent of the initial weight of the ordnance item, for small ordnance, will be deposited on the ground as fragments or residues. Thus, about 85 to 93 lb/year of solid munitions debris will be deposited on the site.

These solids will include both soluble and insoluble materials, consisting mostly of inorganic metals (e.g., aluminum, steel, iron) and metallic compounds of low to negligible toxicity. Plastics, soft metals, and explosive compounds will disperse during detonation, and thus will be substantially under-represented in the solids deposited on the site. A small, but unknown percentage of the solids on the site will consist of heavy metals (e.g., chromium, cadmium, lead, nickel) and organic residues (e.g., explosives and their breakdown products, polycyclic aromatic hydrocarbons, dioxins).

Assuming for purposes of analysis that the entire weight of these materials are soluble in the rain water falling on the site (about 7.3 acre-ft, as described in Chapter 3.0), then their concentration will be about 36 parts per million (ppm) to 40 ppm. A portion of the rain water will percolate into the soils on the site, but the relatively impermeable capstone underlying the site will prevent downward movement, and shallow groundwater will eventually migrate horizontally into the adjacent waters of Pearl Harbor. Rain water that did not infiltrate the ground - or evaporate - will flow directly overland into Pearl Harbor.

Based on the estimated total concentrations of munitions constituents dissolved in rainwater migrating from the EOD Shore Range, their contribution to concentrations of these constituents in Pearl Harbor will be negligible. Thus, these intermittent, short-term discharges of minute amounts of munitions constituents into surface waters will have no effect on water resources.

Major Exercises

Major Exercises under all Alternatives, such as RIMPAC and USWEX, include training operations and in some cases RDT&E operations. Under Alternative 2, Multiple Strike Group Training would result in an unspecified number of additional training operations at the EOD Shore Range. Potential impacts from Major Exercises would be similar to those described above for training operations and RDT&E operations.

4.4.1.5 LIMA LANDING

Table 4.4.1.5-1 lists ongoing operations for the No-action Alternative and proposed operations for Alternatives 1 and 2 at Lima Landing. Alternative 2 is the preferred alternative.

Table 4.4.1.5-1. Operations Occurring at Lima Landing

Training Operations (offshore & land)	
• Mine Neutralization	• Special Warfare Operations (SPECWAROPS)
• Underwater Demolition	• Land Demolitions

4.4.1.5.1 Biological Resources (Terrestrial and Offshore)—Lima Landing

4.4.1.5.1.1 No-action Alternative (Biological Resources [Terrestrial and Offshore]—Lima Landing)

HRC Training Operations and Major Exercises

Individual training operations use explosives charges no greater than 0.25 lb net explosive weight. Up to about 7 lb of explosives would be used per year. Operations would follow the relevant Pearl Harbor and Navy policies and procedures to minimize impacts to biological resources Table 4.4.1.1.1.1-1.

Explosive Ordnance Disposal Ranges

Vegetation

No threatened or endangered plant species have been identified in the region of influence.

Wildlife

Demolition and Mine Neutralization operations may include destruction of inert mines by detonation of no more than 0.25 lb of explosive per inert mine. Prior to actual detonation, the area would be determined to be clear of marine mammals. Standard procedures require tethered mines to be suspended at least 10 ft below the surface of the water. Explosive charges on or near the shallow water bottom would be placed in sandy areas away from exposed reefs and coral. There can be minor and localized loss of some fish and benthic populations from the explosions. These shallow areas are not located in areas identified as EFH or HAPC, which occur at depths greater than 120 ft. After operations involving underwater detonations, the area would be searched for injured animals. Such detonations occur infrequently.

Environmentally Sensitive Habitat

No environmentally sensitive habitat has been identified in the immediate area.

4.4.1.5.1.2 Alternative 1 (Biological Resources [Terrestrial and Offshore]—Lima Landing)

Increased Tempo and Frequency and Training Operations

Alternative 1 would include up to six USWEX per year (an increase of two exercises), the RIMPAC biennial exercise, and two Strike Groups conducting training operations simultaneously in the HRC, as well as other continuing training operations (See Table 2.2.3.3-1). While training operations would increase in number, the likelihood of a similar increase in adverse impacts to biological resources is small as described below.

Vegetation

Operations would take place at existing locations; no expansion of the area would be involved. Compliance with relevant Navy policies and procedures (Table 4.4.1.1.1.1-1) during training operations would minimize the potential for effects on vegetation, as well as limit the potential for introduction of invasive plant species.

Wildlife

Impacts to wildlife would be similar to those described previously for the No-action Alternative. There would continue to be a minor and localized loss of some fish and benthic populations from the explosions. The increased training operations would comply with relevant Navy policies and procedures (Table 4.4.1.1.1.1-1), which would minimize the potential for effects on wildlife.

Environmentally Sensitive Habitat

No environmentally sensitive habitat has been identified in the immediate area.

4.4.1.5.1.3 Alternative 2 (Biological Resources (Terrestrial and Offshore)—Lima Landing)

Increased Tempo and Frequency of Training Operations

Under Alternative 2, the tempo of training operations would be increased and the frequency of operations could also increase. Literature on the effects of noise on wildlife suggests that common responses to noise events include a startle or fright response, and ultimately, habituation. It has been reported that the intensity and duration of startle responses decrease with the number and frequency of exposures. (U.S. Department of the Navy, 2006)

Additional Major Exercises—Multiple Strike Group Training

Up to three Strike Groups would visit the area for up to 30 days per exercise. The exercises proposed would be similar to those occurring during RIMPAC and USWEX, with impacts to biological resources similar to those described above.

4.4.1.5.2 Cultural Resources—Lima Landing

4.4.1.5.2.1 No-action Alternative, Alternative 1, and Alternative 2 (Cultural Resources—Lima Landing)

Lima Landing is a small underwater range situated within the Pearl Harbor National Historic Landmark boundary. Within the vicinity are numerous submerged cultural resources as noted for Pearl Harbor; however, none are directly within the region of influence for Lima Landing's underwater demolition activities. Given the restricted size of the explosives used during operations (and their associated concussive effects), and the distance from known Landmark features, no effects on underwater cultural resources are expected. If the locations for underwater demolition activities are changed in the future (i.e., expanded north or south where sensitive cultural resources could be encountered), coordination with the Navy Region Hawaii's designated cultural resources coordinator would be required.

4.4.1.5.3 Hazardous Materials and Waste—Lima Landing

4.4.1.5.3.1 No-action Alternative, Alternative 1, and Alternative 2 (Hazardous Materials and Waste—Lima Landing)

HRC Training Operations

Under the No-action Alternative and Alternative 1, up to 62 training operations per year can occur at Lima Landing, or about 5 per month. Under Alternative 2, up to 68 training operations per year could occur. Training operations will use explosives charges of no more than 0.25 lb net explosive weight each, for a total of about 16 lb per year of explosives under the No-action Alternative and Alternative 1, and about 17 lb per year under Alternative 2. The transport, handling, and use of such small quantities of hazardous materials on an infrequent basis will have no effect on ongoing hazardous materials management activities. No Resource Conservation and Recovery Act (RCRA) hazardous wastes will be generated by these operations.

Major Exercises

Major Exercises under all Alternatives, such as RIMPAC and USWEX, include training operations and in some cases RDT&E operations. Under Alternative 2, Multiple Strike Groups would conduct demolition and SPECWAROPs at Lima Landing. This very limited, short-term use of the range is not expected to substantially affect hazardous materials use on or hazardous waste generation from the range. Potential impacts from Major Exercises would be similar to those described above for training and RDT&E operations.

4.4.1.5.4 Health and Safety—Lima Landing

4.4.1.5.4.1 No-action Alternative, Alternative 1, and Alternative 2 (Health and Safety—Lima Landing

HRC Training Operations

Underwater demolition activities at Lima Landing under the No-action Alternative and Alternative 1 will consist of up to 62 training operations per year, using no more than 0.25 lb, net explosive weight of ordnance. Under Alternative 2, up to 68 training operations per year could occur. The public will not be exposed to the energetic effects of the detonations because these effects will be completely contained within the range and adjacent waters controlled by the Navy and from which the public is excluded. Existing Navy safety protocols for the use of explosives will assure that no non-participants would be in the area during training operations. Accordingly, Navy training operations at Lima Landing will have no effect on public health and safety.

Demolition activities will be conducted in accordance with COMNAVSURFPAC Instruction 3120.8F (U.S. Department of the Navy, 1993). COMNAVSURFPAC Instruction 3120.8F specifies detonation procedures for underwater ordnance to avoid endangering the public or impacting other non-military activities, such as shipping, recreational boaters, divers, and commercial or recreational fishermen.

Major Exercises

Major Exercises under all Alternatives, such as RIMPAC and USWEX, include training operations and in some cases RDT&E operations. Under Alternative 2, Multiple Strike Groups would conduct limited, short-term Demolition and SPECWAROPs at Lima Landing. Potential impacts from Major Exercises would be similar to those described above for training and RDT&E operations.

4.4.1.6 PUULOA UNDERWATER RANGE

Table 4.4.1.6-1 lists ongoing operations for the No-action Alternative and proposed operations for Alternatives 1 and 2 at the Puuloa Underwater Range. Alternative 2 is the preferred alternative.

Table 4.4.1.6-1. Operations Occurring at Puuloa Underwater Range

Training Operations (offshore)	
• Mine Neutralization	• Salvage Operations
• Special Warfare Operations (SPECWAROPS)	• Demolition Exercises
• Mobile Diving and Salvage Unit Training Area	

4.4.1.6.1 Biological Resources (Offshore)—Puuloa Underwater Range

4.4.1.6.1.1 No-action Alternative (Biological Resources [Offshore]—Puuloa Underwater Range)

HRC Training Operations and Major Exercises

Under the No-action Alternative, approximately 62 Mine Neutralization training operations per year would occur at Puuloa Underwater Range, or about 5 to 6 per month. Training operations would use explosives charges of no more than 20 lb net explosive weight each for a total of about 1,240 lb per year of explosives. Operations will follow the relevant Navy policies and procedures to minimize impacts to biological resources.

Prior to actual detonation, the area would be determined to be clear of marine mammals. Standard procedures require tethered mines to be suspended at least 10 ft below the surface of the water. Explosive charges on or near the shallow water bottom would be placed in sandy areas away from exposed reefs and coral. Small cutting charges may be utilized during Salvage Operations training on existing underwater wrecks. There can be minor and localized loss of some fish and benthic community populations from the explosions. These shallow areas are not located in areas identified as EFH or HAPC, which occur at depths greater than 120 ft. After operations involving underwater detonations, the area would be searched for injured animals.

Because of the diluting affects of ocean currents and the distance from the range, demolition activities are not expected to impact the aquaculture farm located 0.5 nm outside the range boundary. Any effects from noise, shock, or residual chemicals would be localized and temporary.

SPECWAROPS and Salvage Operations may be performed in conjunction with Demolition and ship fire operations. These operations are non-intrusive in nature.

4.4.1.6.1.2 Alternative 1 (Biological Resources [Offshore]—Puuloa Underwater Range)

Increased Tempo and Frequency of Training Operations and Major Exercises

Alternative 1 would include up to six USWEX per year (an increase of two exercises), the RIMPAC biennial exercise, and two Strike Groups conducting training operations simultaneously in the HRC, as well as other continuing training operations (See Table 2.2.3.3-1). While training operations would increase in number, the likelihood of a similar increase in adverse impacts to biological resources is small. Impacts to biological resources would be similar to those described previously for the No-action Alternative.

4.4.1.6.1.3 Alternative 2 (Biological Resources [Offshore]—Puuloa Underwater Range)

Increased Tempo and Frequency of Training Operations

Under Alternative 2, the tempo of training operations would be increased and the frequency of operations could also increase. Literature on the effects of noise on wildlife suggests that common responses to noise events include a startle or fright response, and ultimately, habituation. It has been reported that the intensity and duration of startle responses decrease with the number and frequency of exposures. (U.S. Department of the Navy, 2006)

Additional Major Exercises—Multiple Strike Group Training

Up to three Strike Groups would visit the area for up to 30 days per exercise. The exercises proposed would be similar to those occurring during RIMPAC and USWEX, with impacts to biological resources similar to those described above.

4.4.1.6.2 Cultural Resources—Puuloa Underwater Training Range

4.4.1.6.2.1 No-action Alternative, Alternative 1, and Alternative 2 (Cultural Resources—Puuloa Underwater Training Range)

No known cultural resources exist in the Puuloa Underwater Range. The area has been used for the purpose of underwater demolition training for many years and no impacts to cultural resources have been identified. No impacts to cultural resources will occur from either the No-action Alternative or Alternative 1 or Alternative 2.

4.4.1.6.3 Hazardous Materials and Waste—Puuloa Underwater Range

4.4.1.6.3.1 No-action Alternative, Alternative 1, and Alternative 2 (Hazardous Materials and Waste—Puuloa Underwater Range)

HRC Training Operations

Under the No-action Alternative and Alternative 1, approximately 62 Mine Neutralization training operations per year will occur at Puuloa Underwater Range, or about 5 to 6 per month. Under Alternative 2, approximately 68 Mine Neutralization training operations per year could occur. In addition, one salvage training operation per year can be held on this range under the No-action Alternative or Alternative 1 or Alternative 2. Training operations will use explosives charges of no more than 20 lb each, net explosive weight. Explosives use will total about 1,240 lb per year under the No-action Alternative and Alternative 1, and about 1,360 lb per year under Alternative 2. The transport, handling, and use of such modest quantities of hazardous materials by trained

Navy personnel on an infrequent basis, primarily within Navy-controlled areas, will have no effect on ongoing hazardous materials management activities. No hazardous wastes would be generated by these operations.

Major Exercises

Major Exercises under all Alternatives, such as RIMPAC and USWEX, include training operations and in some cases RDT&E operations. Under Alternative 2, Multiple-Strike Groups would conduct limited, short-term Demolition and SPECWAROPs at Puuloa Range. Potential impacts from Major Exercises will be similar to those described above for training and RDT&E operations.

4.4.1.6.4 Health and Safety—Puuloa Underwater Range

4.4.1.6.4.1 No-action Alternative, Alternative 1, and Alternative 2 (Health and Safety—Puuloa Underwater Range)

HRC Training Operations

Underwater demolition activities at Puuloa Underwater Range under the No-action Alternative and Alternative 1 will consist of up to 62 training operations per year, using no more than 20 lb, net explosive weight of ordnance. Under Alternative 2, up to 68 Mine Neutralization operations per year could occur. In addition, one salvage training operation per year can be held on this range under the No-action Alternative or Alternative 1 or Alternative 2.

The public will not be exposed to the energetic effects of the detonations because the range will be cleared, and these effects will be completely contained within the range. Existing U.S. Navy safety protocols for the use of explosives will assure that no non-participants will be in the area during training operations. The U.S. Coast Guard is notified of each planned detonation.

Demolition activities will be conducted in accordance with COMNAVSURFPAC Instruction 3120.8F (U.S. Department of the Navy, 1993). COMNAVSURFPAC Instruction 3120.8F specifies detonation procedures for underwater ordnance to avoid endangering the public or impacting other non-military activities, such as shipping, recreational boaters, divers, and commercial or recreational fishermen.

Major Exercises

Major Exercises under all Alternatives, such as RIMPAC and USWEX, include training operations and in some cases RDT&E operations. Under Alternative 2, Multiple-Strike Groups would conduct limited, short-term Demolition and SPECWAROPs at Puuloa Range. Potential impacts from Major Exercises will be similar to those described above for training and RDT&E operations.

4.4.1.7 NAVAL DEFENSIVE SEA AREA

Table 4.4.1.7-1 lists ongoing operations for the No-action Alternative and proposed operations for Alternatives 1 and 2 at the Naval Defensive Sea Area. Alternative 2 is the preferred alternative.

Table 4.4.1.7-1. Operations Occurring at Naval Defensive Sea Area

Enhancements (offshore)	
• Salvage Operations	• Mobile Diving and salvage Unit Training Area (Alternative 1)

4.4.1.7.1 Biological Resources (Offshore)—Naval Defensive Sea Area

4.4.1.7.1.1 No-action Alternative, Alternative 1 and Alternative 2 (Biological Resources [Offshore]—Naval Defensive Sea Area)

HRC Training Operations and Major Exercises

Current Salvage Operations have not resulted in any significant impacts to the four endangered waterbirds that have been identified. The green sea turtle has rarely been seen in the harbor and no nesting has been reported. The Hawaiian monk seal has been seen in the channel, but never reported in the harbor, and only one humpback whale sighting has occurred in the region of influence.

All waters around Pearl Harbor have been designated as Essential Fish Habitat (EFH) for eggs and larvae of a number of species. None of the current Salvage Operations have the potential to affect EFH. Acoustic effects on fish are discussed in Section 4.1.2 under Open Ocean Biological Resources. RIMPAC exercises have procedures and practices in place to prevent the introduction of invasive species, consistent with EO 13112 and Navy guidelines (Table 4.4.1.1.1.1-1). The Navy requests that multinational participants purge bilge/ballasts tanks in their ships prior to entering U.S. territorial waters. The movement and berthing of ships and small training operations in the harbor area are part of ongoing operations at Pearl Harbor. Marine mammal collision avoidance and encounter reporting procedures are already in place and implemented.

HRC Enhancements

The proposed underwater training area in which Mobile Diving and Salvage Unit ONE would conduct military diving and salvage training, including submerging a 100-ft by 50-ft barge. Figure 2.2.3.5.2-2 shows the alternative sites in the Naval Defensive Sea Area. The type of training to be conducted would consist of various underwater projects designed to develop mission critical skills, such as hot tapping, welding, cutting, patching, plugging, drilling, tapping, and grinding. The proposed activities would not involve detonation of explosives and would cause minimal disturbance.

4.4.1.7.2 Cultural Resources—Naval Defensive Sea Area

4.4.1.7.2.1 No-action Alternative, Alternative 1, and Alternative 2 (Cultural Resources—Naval Defensive Sea Area)

No known cultural resources exist in the Naval Defensive Sea Area. The area has been used for the purpose of underwater training for many years and no impacts to cultural resources have been identified. No impacts to cultural resources will occur from either the No-action Alternative or Alternative 1 or Alternative 2.

4.4.1.7.3 Health and Safety—Naval Defensive Sea Area

4.4.1.7.3.1 No-action Alternative, Alternative 1, and Alternative 2 (Health and Safety—Naval Defensive Sea Area)

HRC Training Operations and Major Exercises

Salvage training operations can be held on this range under the No-action Alternative or Alternative 1 or Alternative 2. The public will not be exposed to operations occurring in the Naval Defensive Sea Area because the area will be cleared, and the operations will be completely contained. Existing U.S. Navy safety protocols will assure that no non-participants will be in the area during training operations. The U.S. Coast Guard is notified of each planned operation.

HRC Enhancements

The proposed underwater training area in which Mobile Diving and Salvage Unit ONE would conduct military diving and salvage training, including submerging a 100-ft by 50-ft barge. Figure 2.2.3.5.2-2 shows the alternative sites in the Naval Defensive Sea Area. The type of training to be conducted would consist of various underwater projects designed to develop mission critical skills, such as hot tapping, welding, cutting, patching, plugging, drilling, tapping, and grinding. Because the Navy has jurisdiction over the Naval Defense Sea Area, the proposed training operations would be are restricted to vessels owned and operated by military and DoD personnel. The restricted access in this area would minimize the potential for public safety issues.

4.4.2 U.S. COAST GUARD AIR STATION BARBERS POINT/KALAELOA AIRPORT

Table 4.4.2-1 lists ongoing operations for the No-action Alternative and proposed operations for Alternatives 1 and 2 at the U.S. Coast Guard Air Station Barbers Point/Kalaeloa Airport. Alternative 2 is the preferred alternative.

Table 4.4.2-1. Operations Occurring at Coast Guard Air Station Barbers Point/Kalaeloa Airport

Training Operations (land)	
• Air Operations	• Special Warfare Operations (SPECWAROPS)
• Aircraft Support Operations	

4.4.2.1 AIRSPACE—U.S. COAST GUARD AIR STATION BARBERS POINT/KALAELOA AIRPORT

4.4.2.1.1 No-action Alternative (Airspace—U.S. Coast Guard Air Station Barbers Point/Kalaeloa Airport)

HRC Training Operations

Aircraft support operations will require coordination with the State of Hawaii and the U.S. Coast Guard and will use existing facilities for fueling and minor maintenance.

No new airspace proposal or any modification to the existing controlled airspace has been identified to accommodate aircraft support operations. Special use airspace will not be used and aircraft will use existing approach and departure procedures. Coordination with Kalaeloa Airport will be the same as for other military aircraft using the runways.

Major Exercises

Major Exercises such as RIMPAC and USWEX can include aircraft support operations at Kalaeloa Airport. These major exercises include extensive planning and coordination with the FAA. RIMPAC planning conferences, which include coordination with the FAA, are conducted beginning in March of the year prior to each RIMPAC. Each of the USWEX training operations, up to four per year, will include coordination with the FAA well in advance of the 3 or 4 day exercise.

4.4.2.1.2 Alternative 1 (Airspace—U.S. Coast Guard Air Station Barbers Point/Kalaeloa Airport)

Increased Tempo and Frequency of Training Operations

Aircraft support operations would require coordination with the State of Hawaii and the Coast Guard and would use existing facilities for fueling and minor maintenance. Increased training would result in a minor increase in the number of aircraft support operations.

No new airspace proposal or any modification to the existing controlled airspace has been identified to accommodate aircraft support operations. Special use airspace would not be used and aircraft would use existing approach and departure procedures. Coordination with Kalaeloa Airport would be the same as for other military aircraft using the runways.

Major Exercises

RIMPAC planning conferences, which include coordination with the FAA, are conducted beginning in March of the year prior to each RIMPAC. Each of the USWEX training operations, up to six per year, would include coordination with the FAA well in advance of the 3- or 4-day exercise.

4.4.2.1.3 Alternative 2 (Airspace—U.S. Coast Guard Air Station Barbers Point/Kalaeloa Airport)

Increased Tempo and Frequency of Training Operations

An increased tempo and frequency of training would be similar to the ongoing training support. Aircraft support operations would require coordination with the State of Hawaii and the U.S. Coast Guard and would use existing facilities for fueling and minor maintenance. Increased tempo and frequency of training would result in a minor increase in the number of aircraft support operations.

No new airspace proposal or any modification to the existing controlled airspace has been identified to accommodate aircraft support operations. Special use airspace would not be used and aircraft would use existing approach and departure procedures. Coordination with Kalaeloa Airport would be the same as for other military aircraft using the runways.

Additional Major Exercises—Multiple Strike Group Training

The aircraft support operations during Multiple Strike Group Training would be similar to that described above for Alternative 1. Multiple Strike Group training would include coordination with the FAA well in advance of the exercise.

4.4.2.2 BIOLOGICAL RESOURCES (TERRESTRIAL AND OFFSHORE)—U.S. COAST GUARD AIR STATION BARBERS POINT/KALAELOA AIRPORT

4.4.2.2.1 No-action Alternative (Biological Resources [Terrestrial and Offshore]—U.S. Coast Guard Air Station Barbers Point/Kalaeloa Airport)

HRC Training Operations and Major Exercises

SPECWAROPS use existing facilities, concrete aprons, hangers, and adjacent open areas for various operations.

Vegetation

Areas known to contain the endangered ‘akoko shrub or the round-leafed chaff-flower are avoided.

Wildlife

Major Exercises do not affect threatened green sea turtles in the offshore area or the endangered Hawaiian black-necked stilt, which has been observed in the vicinity.

Environmentally Sensitive Habitat

No environmentally sensitive habitat has been identified at the airport.

4.4.2.2.2 Alternative 1 (Biological Resources [Terrestrial and Offshore]—U.S. Coast Guard Air Station Barbers Point/Kalaeloa Airport)

Increased Tempo and Frequency of Training Operations and Major Exercises

Alternative 1 would include up to six USWEX per year (an increase of two exercises), the RIMPAC biennial exercise, and two Strike Groups conducting training operations simultaneously in the HRC, as well as other continuing training operations (See Table 2.2.1-1). While training operations would increase in number, the likelihood of a similar increase in adverse impacts to biological resources is small, as discussed below.

Vegetation

Operations would take place at existing locations; no expansion of the area would be involved. Compliance with relevant U.S. Coast Guard and Navy policies and procedures (Table 4.4.1.1.1.1-1) during training operations would minimize the potential for effects on vegetation, as well as limit the potential for introduction of invasive plant species. No threatened or endangered plant species are known to occur at the airport.

Wildlife

Although not necessarily their preferred habitat, there is additional suitable habitat nearby for wildlife on U.S. Coast Guard Air Station Barbers Point/Kalaeloa Airport to use if they temporarily leave the area affected by an increase in training operations. The increased training operations would comply with relevant U.S. Coast Guard and Navy policies and procedures (Table 4.4.1.1.1.1-1), which would further reduce the potential for effects on wildlife.

Environmentally Sensitive Habitat

No environmentally sensitive habitat has been identified at the airport.

4.4.2.2.3 Alternative 2 (Biological Resources [Terrestrial and Offshore]—U.S. Coast Guard Air Station Barbers Point/Kalaeloa Airport)

Increased Tempo and Frequency of Training Operations

Under Alternative 2, the tempo of training operations would be increased and the frequency of operations could also increase. Literature on the effects on wildlife from noise suggests that common responses to noise events include a startle or fright response, and ultimately, habituation. It has been reported that the intensity and duration of startle responses decrease with the number and frequency of exposures. (U.S. Department of the Navy, 2006)

Additional Major Exercises—Multiple Strike Group Training

Up to three Strike Groups would be added to the major exercises occurring in the HRC. These ships would visit the area for up to 30 days per exercise. The exercises proposed would be similar to those occurring during RIMPAC and USWEX, with impacts to biological resources similar to those described above.

4.4.2.3 NOISE—U.S. COAST GUARD AIR STATION BARBERS POINT/KALAELOA AIRPORT

Impacts of noise on human receptors are evaluated based on whether or not a noise event would exceed Department of Defense (DoD) or Occupational Safety and Health Administration (OSHA) guidelines.

4.4.2.3.1 No-action Alternative, Alternative 1, and Alternative 2 (Noise—U.S. Coast Guard Air Station Barbers Point/Kalaeloa Airport)

HRC Training Operations and Major Exercises

Under the No-action Alternative, aircraft support operations, SPECWAROPS, and air operations will continue to occur at U.S. Coast Guard Station Barbers Point/ Kalaeloa Airport. SPECWAROPS use existing facilities, concrete aprons, hangers, and adjacent open areas for various operations. Due to the non-intrusive nature of these operations, a limited amount of noise will continue to be produced and will stay within the existing noise contours. These same operations are proposed for Alternatives 1 and 2. Noise levels associated with the increased tempo and frequency of training operations and major exercises would be similar to existing noise levels. The total number of training operations that affect noise would increase; however, there would be no anticipated increase to the level of noise produced.

4.4.3 MARINE CORPS BASE HAWAII (MCBH)

Table 4.4.3-1 lists ongoing operations for the No-action Alternative and proposed operations for Alternatives 1 and 2 at Marine Corps Base Hawaii (MCBH). Alternative 2 is the preferred alternative.

Table 4.4.3-1. Operations Occurring at Marine Corps Base Hawaii

Training Operations	
• Air Operations (land)	• Command and Control (land)
• Humanitarian Assistance/Non-combatant Evacuation Operations (HAO/NEO) (land)	• Humanitarian Assistance/Disaster Relief Operations (HA/DR) (land)
• Aircraft Support Operations (land)	• Underwater Mine Warfare Exercise (offshore)
• Field Carrier Landing Practice (Alternative 1) (land)	• Expeditionary Assault (offshore & land)
• Special Warfare Operations (SPECWAROPS) (offshore & land)	

4.4.3.1 AIRSPACE—MCBH

4.4.3.1.1 No-action Alternative (Airspace—MCBH)

HRC Training Operations

No use of controlled airspace is planned for HRC operations other than localized use of rotary and fixed-wing aircraft craft within predefined areas.

Major Exercises

Major Exercises such as RIMPAC and USWEX include training operations and, in some cases RDT&E operations. At Marine Corps Base Hawaii (MCBH) these operations will include rotary and fixed wing aircraft. These aircraft operations are a part of on-going training operations routinely conducted by the air wings at MCBH. RIMPAC planning conferences, which include coordination with the Federal Aviation Administration (FAA), are conducted beginning in March of the year prior to each RIMPAC. Each of the USWEX training operations, up to four per year, will include coordination with the FAA well in advance of the 3- or 4-day exercise.

4.4.3.1.2 Alternative 1 (Airspace—MCBH)

Increased Tempo and Frequency of Training Operations

Increased training operations would involve minor increases in the use of rotary and fixed-wing aircraft.

Major Exercises

An additional proposed training activity associated with major exercises is Field Carrier Landing Practice (FCLP). This activity involves pilots from an aircraft carrier air wing practicing landings at a land runway. As discussed in Chapter 2.0, the runway at MCBH could be used for FCLP. For each pilot the FCLP would include 8 to 10 touch and go landings at the MCBH runway during both daytime and at night. The carrier wing aircraft would be operating within the MCBH Class D and Class E airspace and the adjacent area. FCLP operations would be below and north of the V-12-13 airway.

RIMPAC planning conferences, which include coordination with the FAA, are conducted beginning in March of the year prior to each RIMPAC. Each of the USWEX training operations, up to six per year, would include coordination with the FAA well in advance of the 3 or 4 day exercise. FAA coordination would include discussions regarding the anticipated number of aircraft including FCLP operations.

4.4.3.1.3 Alternative 2 (Airspace—MCBH)

Increased Tempo and Frequency of Training Operations

Increased training operations would involve minor increases in the use of rotary and fixed-wing aircraft.

Additional Major Exercises—Multiple Strike Group Training

Multiple Strike Group training would include rotary and fixed wing aircraft. These aircraft operations are a part of on-going training exercises routinely conducted by the air wings at MCBH.

An additional proposed training activity associated with major exercises is FCLP. This activity involves pilots from an aircraft carrier air wing practicing landings at a land runway. As discussed in Chapter 2.0, the runway at MCBH could be used for FCLP. For each pilot the FCLP would include 8 to 10 touch and go landings at the MCBH runway during both daytime and at night. The carrier wing aircraft would be operating within the MCBH Class D and Class E airspace and the adjacent area. FCLP operations would be below and north of the V-12-13 airway.

Multiple Strike Group training would include coordination with the FAA well in advance of the exercise. FAA coordination would include discussions regarding the anticipated number of aircraft including FCLP operations.

4.4.3.2 BIOLOGICAL RESOURCES (TERRESTRIAL AND OFFSHORE)—MCBH

4.4.3.2.1 No-action Alternative (Biological Resources [Terrestrial and Offshore]—MCBH)

HRC Training Operations and Major Exercises

Vegetation

The terrestrial habitat typically consists of sparse ground cover composed of indigenous grasses and shrubs. Most of the vegetation on MCBH is dominated by introduced species. HAO/NEO and HA/DR operations use existing open areas and facilities. Some temporary structures, including tents, may be used. All participants are briefed on current guidelines to avoid undue impacts to vegetation. Operations follow the guidelines provided in Table 4.4.1.1.1.1-1, which assist in minimizing the potential for impacts to beach vegetation.

Wildlife

Landing sites are selected to minimize potential impacts to exposed reefs and coral colonies, and associated benthic communities. Assault amphibious vehicles and LCU with drafts exceeding 6 ft could inadvertently damage live coral present in shallow offshore waters at the Hale Koa/West Field and Fort Hase beach areas. Landing Craft, Air Cushion (LCACs) and combat rubber reconnaissance crafts have drafts less than 3 ft and are unlikely to have such impacts.

LCAC landings are allowed at Hale Koa/West Field Beach, but they are restricted from Pyramid Rock and Fort Hase beaches. The physical boundaries of the landing sites are marked to avoid impacts to live coral and unique habitats. Landing craft, utility landings are restricted to Pyramid Rock Beach or the landing craft, utility ramp at the Base Fuel Pier.

Noise and movement of personnel, vehicles, helicopters, and landing craft may temporarily displace sensitive bird species such as the koloa maoli (Hawaiian duck), 'alae ke'oke'o (Hawaiian coot), ‘alae ‘ula (Hawaiian common moorhen) and ae'o (Hawaiian stilt) from feeding, resting, and nesting areas. However, training operations are short in duration and are not expected to affect the areas where the birds are most likely to nest. Training within the range areas regularly used for operations should not substantially increase the threat to these species. Night lighting is shielded to the extent practical to minimize its potential effect on night-flying species in the beach area.

Pre-exercise beach surveys are conducted to identify any sea turtle nests. If present, these sites are marked and the immediate area placed off limits to personnel. Adherence to established standard operating procedures at MCBH results in minimal impacts to the physical environment and avoids potential impacts to threatened and endangered species. The beach and offshore waters are monitored for the presence of marine mammals and sea turtles 1 hour before and during Major Exercises. If any are seen, the exercise is delayed until the animals leave the area.

Environmentally Sensitive Habitat

Nearby wetlands, including the Nuupia Ponds complex at the southern boundary of the base, are avoided during range operations.

4.4.3.2.2 Alternative 1 (Biological Resources [Terrestrial and Offshore]—MCBH)

Increased Tempo and Frequency of Training Operations and Major Exercises

Alternative 1 would include up to six USWEX per year (an increase of two exercises), the RIMPAC biennial exercise, and two Strike Groups conducting training operations simultaneously in the HRC, as well as other continuing training operations (See Table 2.2.3.3-1). While training operations would increase in number, the likelihood of a similar increase in adverse impacts to biological resources is small as discussed below.

Vegetation

Operations would take place at existing locations; no expansion of the area would be involved. Compliance with relevant Marine Corps and Navy policies and procedures (Table 4.4.1.1.1.1-1) during training operations would minimize the potential for effects on vegetation, as well as limit the potential for introduction of invasive plant species. No threatened or endangered plant species are known to occur on MCBH.

Wildlife

Although not necessarily their preferred habitat, there is additional suitable habitat nearby for birds on MCBH to use if they temporarily leave the area affected by an increase in training operations. The increased training operations would comply with relevant Marine Corps and Navy policies and procedures (Table 4.4.1.1.1.1-1), which would further reduce the potential for effects on wildlife.

The beach and offshore waters would continue to be monitored for the presence of marine mammals and sea turtles 1 hour before and during operations. If any are seen, then the exercise would be delayed until the animals leave the area.

Environmentally Sensitive Habitat

Nearby wetlands, including the Nuupia Ponds complex at the southern boundary of the base, would be avoided during operations.

4.4.3.2.3 Alternative 2 (Biological Resources [Terrestrial and Offshore]—MCBH)

Increased Tempo and Frequency of Training Operations

Under Alternative 2, the tempo of training operations would be increased and the frequency of operations could also increase. The increased tempo and frequency of training operations would comply with relevant Marine Corps and Navy policies and procedures (Table 4.4.1.1.1.1-1), which would further reduce the potential for effects on wildlife. Literature on the effects of noise on wildlife suggests that common responses to noise events include a startle or fright response, and ultimately, habituation. It has been reported that the intensity and duration of startle responses decrease with the number and frequency of exposures. (U.S. Department of the Navy, 2006)

Additional Major Exercises—Multiple Strike Group Training

Up to four Strike Groups would be added to the major exercises occurring in the HRC. These ships would not be home ported in Hawaii, but would visit the area for up to 30 days per exercise. The exercises proposed would be similar to those occurring during RIMPAC and USWEX, with impacts to biological resources similar to those described above.

4.4.3.3 CULTURAL RESOURCES—MCBH

4.4.3.3.1 No-action Alternative (Cultural Resources—MCBH)

HRC Training Operations and Major Exercises

HAO/NEO and HA/DR

Training operations with the potential to affect terrestrial cultural resources at MCBH include HAO/NEO, and HA/DR. Both of these operations exhibit similar activities that involve personnel and equipment (e.g., AAVs, SDVs, supply trucks) crossing beach areas or following existing transit routes from the shoreline and dispersing into designated areas for from 1 to 18 days of realistic training. HA/DR operations also include the establishment of a safe haven camp or Civil-Military Operations Center, which can use either existing buildings or the erection of tents and portable latrines. The MCBH insertion points are shown in Appendix D. Operations will take place within a landing zone that has been heavily disturbed through long-term use by the military and the public and near existing, heavily used trails and roads. Roads may require grading; however, the grading will not exceed the existing road width or alignment. Although there are areas of MCBH that are sensitive for cultural resources, none have been identified within the HAO/NEO or HA/DR operational areas. Training overlays that identify the transit route, camp location, and any nearby restricted areas or sensitive biological and cultural resource areas are used by participants. As a result, adverse effects on cultural resources are not expected. However, in the event unanticipated cultural remains are identified (particularly human remains), all operations will cease in the immediate vicinity and the Hawaii State Historic Preservation Officer (SHPO) immediately notified in accordance with the Programmatic Agreement (see Appendix I).

According to NOAA's location maps (see Figure 3.1.3-1 through 3.1.3-3 and 3.4.1.1.2-1) there are several shipwrecks and Native Hawaiian fishponds in the vicinity of MCBH; however, none are located within the direct offshore region of influence for HA/DR insertion.

4.4.3.3.2 Alternative 1 (Cultural Resources—MCBH)

Increased Tempo and Frequency of Training Operations

Increased tempo and frequency of training operations under Alternative 1 would not increase the potential for impacts to occur to cultural resources in sensitive areas. There are no sensitive cultural resources within or adjacent to the operations areas for HAO/NEO and HA/DR at MCBH. Operations currently use designated beach zones, transit routes and staging areas, and mitigation measures are in place that would avoid adverse impacts. No impacts to cultural resources will occur as a result of the additional operations and frequency of conducting those operations under Alternative 1.

4.4.3.3.3 Alternative 2 (Cultural Resources—MCBH)

Increased Tempo and Frequency of Training Operations

Increased tempo and frequency of training operations under Alternative 2 would not increase the potential for impacts to occur on cultural resources in sensitive areas. Operations currently use designated beach zones and transit routes and mitigation measures are in place that would avoid adverse impacts. No impacts to cultural resources would occur as a result of the additional training operations under Alternative 2.

4.4.3.4 NOISE—MCBH

Impacts of noise on human receptors are evaluated based on whether or not a noise event would exceed DoD or OSHA guidelines. Noise effects on wildlife are discussed in Section 4.4.3.2, Biological Resources (Terrestrial and Offshore).

4.4.3.4.1 No-action Alternative (Noise—MCBH)

Under the No-action Alternative existing operations at MCBH will continue and there would be no increase to existing noise levels. MCBH maintains a hearing protection program that includes monitoring the hearing of personnel exposed to high noise levels and identifying and posting notification of noise hazard areas. Personnel required to work in are noise hazard areas are required to use appropriate hearing protection to bring noise levels within established safety levels.

HRC Training Operations

The Navy does not currently conduct training operations at MCBH.

Major Exercises

Under the No-action Alternative existing Major Exercises at MCBH typically include C2, Air Operations, Underwater Mine Warfare Exercises, HAO/NEO, HA/DR, SPECWAROPS, and Expeditionary Assault.

During a typical exercise at MCBH, a combination of ambient noise and noise produced during the exercise will be heard. Ambient noise sources can include wind, surf, highway traffic, aircraft operations, and other local noise-generating land uses. Noise sources from the listed exercises can include helicopter operations and amphibious assault vehicles and craft.

Typical Amphibious Assault Operations include landings at MCTAB and Barking Sands by three to four AAVs or one LCAC and will in the future include EFVs. LCAC craft, powered by four gas turbine engines, produce noise in proportion to their lift (i.e., load requirements). Noise levels associated with LCAC operations have been known to exceed 95 to 105 dBA at 50 ft from the source. Measured noise levels for the AAV moving over land are 87 dBA SEL, and for EFV are slightly higher at 90 dBA. Four EFVs operating simultaneously will generate an increased source level of approximately 96 dBA. These operations are conducted in the offshore and on-island environment, and the nearest non-participant human receptors will be at MCTAB, where a housing development lies approximately 2,500 ft southwest of the expeditionary assault operations. Using a single LCAC at 105 dBA as the greatest source level, the sound will decrease to a theoretical level of less than 75 dBA (which assumes a 6 dB drop each doubling of the distance). The actual received level will be lower due to the sound attenuation caused by almost solid tree cover between the operations location and the housing area, likely to a level of 60-65 dBA. Therefore, no adverse impacts are expected.

The noise levels of landing craft operations are less than those projected for current airfield operations. However, under certain weather conditions, the sound generated by a landing craft can reach off-post areas. This impact will be mitigated by public notification and restricting training in the bay to daylight hours.

4.4.3.4.2 Alternative 1 (Noise—MCBH)

Increased Tempo and Frequency of Training Operations

Noise levels associated with increased tempo and frequency of training operations would be similar to existing noise levels. The total number of training operations that affect noise would increase by approximately 9 percent above the No-action Alternative. Operations would take place at existing locations. While the number of operations would increase, the types of operations would be the same and there would be no anticipated increase to the level of noise produced.

The Navy proposes to conduct an FCLP for a small number of pilots each year in Hawaii. An FCLP is a series of touch-and-go landings conducted during day or night periods, each consisting of six to eight touch-and-go landings per pilot. The MCBH is one of the sites proposed for this operation in Hawaii.

FCLPs have occurred previously at MCBH with F/A-18. In 1993, 12,692 day F/A-18 flight operations and 99 night F/A-18 flight operations occurred and were considered in the *1990 AICUZ Update for MCBH Kaneohe Bay.* Figure 4.4.3.4.2-1 shows the modeled noise contours for the 1990 AICUZ aircraft operations, including F/A-18 operations. The AICUZ determined that at MCBH, the industrial area near Runway 04/22, maintenance facilities, and portions of the officers' and enlisted housing were the areas within the 75 dB noise contour. The 65 dB contour included portions of the hill top housing, the administration and medical complex, portions of the golf course, and beach areas. (Naval Facilities Engineering Command, 2003) Alternative 1 proposes that to accommodate the needs of three pilots per year that may arrive in Hawaii in need of field qualification, 12 FCLP periods would be required. This level of flight operations would be considerably less than what was modeled for the 1990 AICUZ at MCBH.

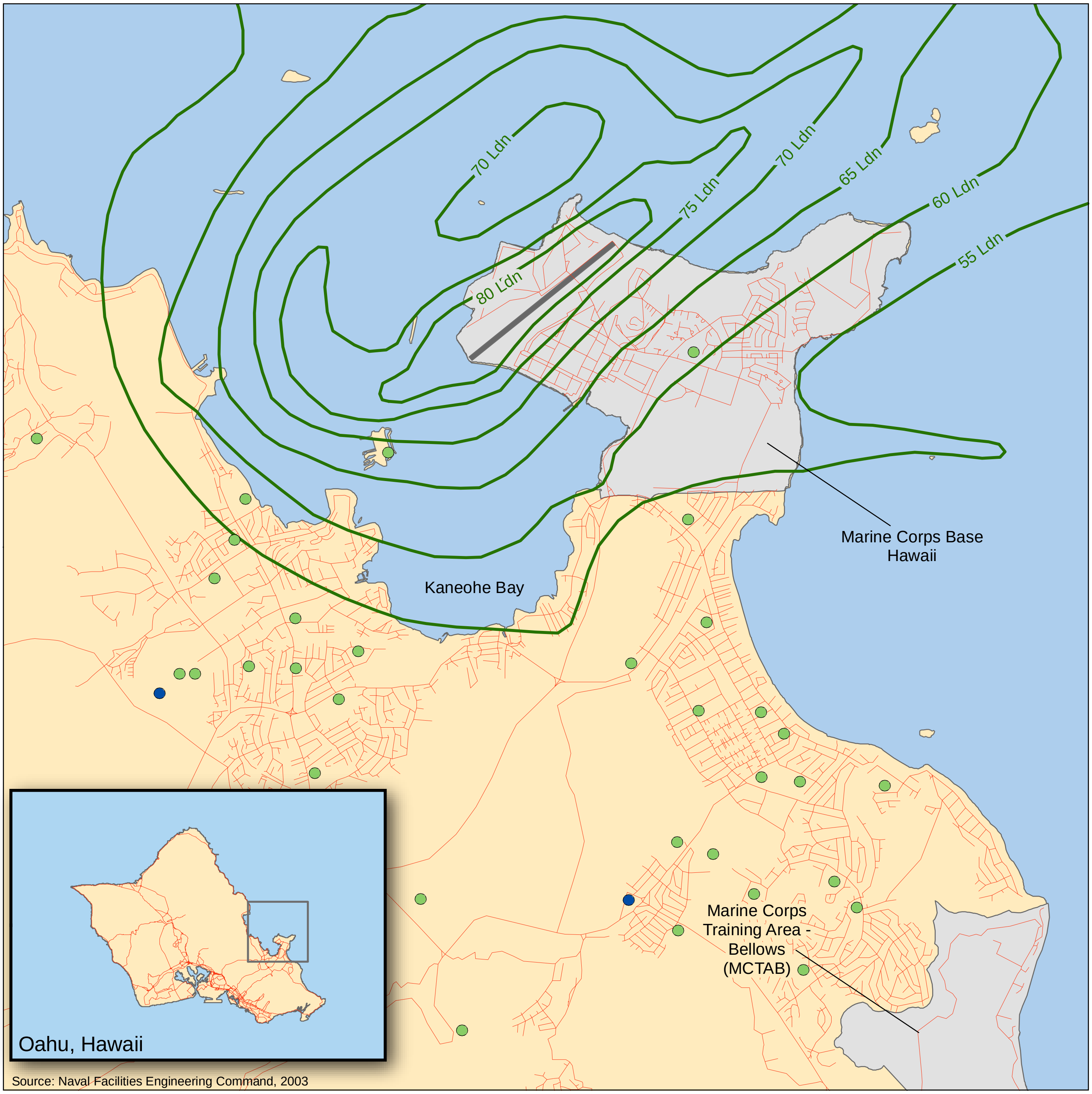
4.4.3.4.3 Alternative 2 (Noise—MCBH)

Increased Tempo and Frequency of Training Operations

Noise levels associated with increased training operations would be similar to existing noise levels. The total number of training operations that affect noise would increase, but there would be no anticipated increase to the level of noise produced.

Additional Major Exercises—Multiple Strike Group Training

Up to three Strike Groups would be added to the major exercises occurring in the HRC. These ships would not be home ported in Hawaii, but would be in the area for up to 30 days per exercise. The operations proposed would be similar to those occurring during current Major Exercises, with impacts to noise levels similar to those described above.



EXPLANATION

- Hospital
- School
- 1990 Ldn Contour
- Road
- Runway
- Installation Area
- Land

Ldn = Day-Night Average Sound Level

NORTH

0 3,000 6,000 12,000 Feet

Marine Corps Base Hawaii Noise Contours for 1990 Aircraft Operations

Oahu, Hawaii

Figure 4.4.3.4.2-1

4.4.4 MARINE CORPS TRAINING AREA/BELLOWS (MCTAB)

Table 4.4.4-1 lists ongoing operations for the No-action Alternative and proposed operations for Alternatives 1 and 2 at Marine Corps Training Area/Bellows (MCTAB). Alternative 2 is the preferred alternative.

Table 4.4.4-1. Operations Occurring MCTAB

Training Operations	
• Expeditionary Assault (offshore)	• Swimmer Insertion/Extraction (offshore)
• Mine Neutralization (offshore)	• Special Warfare Operations (SPECWAROPS) (offshore & land)
• Humanitarian Assistance/Non-combatant Evacuation Operations (HAO/NEO) (land)	• Humanitarian Assistance/Disaster Relief Operations (HA/DR) (land)

4.4.4.1 BIOLOGICAL RESOURCES (TERRESTRIAL AND OFFSHORE)—MCTAB

4.4.4.1.1 No-action Alternative (Biological Resources [Terrestrial and Offshore]—MCTAB)

HRC Training Operations and Major Exercises

Vegetation

Native vegetation on Marine Corps Training Area Bellows (MCTAB) has largely been replaced by exotic species. However, unique strand vegetation can be found on sea cliffs and sand dunes at MCTAB. Mine Countermeasure (MCM) operations would not affect vegetation. Amphibious landings have taken place for many years at MCTAB. According to previous research, Marines and Soldiers training on foot are not expected to adversely affect vegetation in the beach landing areas. Damage to vegetation from tracked vehicles during Expeditionary Assault exercises is not likely if the vehicles are restricted to existing tank trails and do not travel off-road. Training guidelines for resource protection on Oahu are listed Table 4.4.1.1.1.1-1.

Humanitarian Assistance/Non-combatant Evacuation Operations (HAO/NEO) and Humanitarian Assistance/Disaster Relief Operations (HA/DR) operations use existing open areas and facilities. Some temporary structures, including tents, may be used. All participants are briefed on current guidelines to avoid undue impacts to vegetation. Amphibious landings have taken place for many years at MCTAB and damage to vegetation from operations is not likely if vehicles are restricted to existing tank trails and do not travel off-road. No rare, threatened, or endangered plant species are known to occur on or near MCTAB.

Wildlife

Threatened and endangered bird species (the endangered koloa maoli [Hawaiian duck], ‘alae ke’ok’o [Hawaiian coot], alae ula [Hawaiian common moorhen], and ae’o [Hawaiian black-necked stilt]) have been observed in wetlands along Waimanalo Stream north of the amphibious landing beach. Noise and movement of personnel, vehicles, helicopters, and landing craft may temporarily displace sensitive bird species from feeding, resting, and nesting areas. Training operations are short in duration, however, and are not expected to affect the areas where the birds are most likely to nest. Training within the range areas regularly used for current operations should not substantially increase the threat to these species.

There are no live coral colonies along the coastal areas because of shifting sand and scouring caused by wave action. Impacts to live coral from tracked vehicles have not been found to be significant in previous studies, and are minimized by use of regular transit routes through sandy bottom areas. No shapes are placed on live coral. The inert shapes and equipment used in operations are locally maintained and thoroughly cleaned and dried prior to use to minimize the potential for introduction of invasive species.

Green sea turtles occur frequently in the offshore water and hawksbill sea turtles occasionally feed in these waters. Hawaiian monk seals have also been sighted in the area. An occasional humpback whale could use Waimanalo Bay. Well-trained crews follow established procedures, such as having a designated lookout watching for other vessels, obstructions to navigation, marine mammals, or sea turtles. The landing routes and beach areas would continue to be determined clear of marine mammals and sea turtles within 1 hour of the landing operations. If any are seen, the exercise would be delayed until the animals leave the area.

To further minimize potential impacts to biological resources, instructions to Service elements engaged in Swimmer Insertion/Extraction, Expeditionary Assault, HAO/NEO, HA/DR, and MCM operations would include:

- Conducting surveys prior to use of amphibious launch vehicles to ensure that humpback whales are not disturbed.
- Establishing buffer zones in locations where green sea turtles are known to feed so that amphibious exercises do not disturb these areas.
- Marking and monitoring green sea turtle nests discovered on beaches so they are not affected by training operations.

Environmentally Sensitive Habitat

Regular transit routes are used to avoid wetland acreage on MCTAB.

4.4.4.1.2 Alternative 1 (Biological Resources [Terrestrial and Offshore]—MCTAB)

Increased Tempo and Frequency of Training Operations

Alternative 1 would include up to six Undersea Warfare Exercises (USWEXs) per year (an increase of two exercises), the Rim of the Pacific (RIMPAC) biennial exercise, and two Strike Groups conducting training operations simultaneously in the HRC, as well as other continuing training operations (See Table 2.2.3.3-1). While training operations would increase in number, the likelihood of a similar increase in adverse impacts to biological resources is small as discussed below.

Vegetation

Operations would take place at existing locations; no expansion of the area would be involved. Compliance with relevant MCTAB and Navy policies and procedures during training operations would minimize the potential for effects on vegetation, as well as limit the potential for introduction of invasive weed plant species. No rare, threatened, or endangered plant species are known to occur on or near MCTAB.

Wildlife

Impacts to wildlife would be similar to those described previously for the No-action Alternative. It is not likely that a bird or any other species of wildlife on MCTAB would be injured or killed as a result of increased training operations. The increased training operations would comply with relevant MCTAB and Navy policies and procedures (Table 4.4.1.1.1.1-1), which would further reduce the potential for effects on wildlife.

Environmentally Sensitive Habitat

The continued use of regular transit routes should avoid the wetland acreage on MCTAB.

4.4.4.1.3 Alternative 2 (Biological Resources [Terrestrial and Offshore]—MCTAB)

Increased Tempo and Frequency of Training Operations

Under Alternative 2, the tempo of training operations would be increased and the frequency of operations could also increase. Wildlife exhibits a wide variety of responses to noise. Some species are more sensitive to noise disturbances than others. Literature on the effects of noise on wildlife suggests that common responses to noise events include a startle or fright response, and ultimately, habituation. It has been reported that the intensity and duration of startle responses decrease with the number and frequency of exposures. (U.S. Department of the Navy, 2006)

Additional Major Exercises—Multiple Strike Group Training

Up to three Strike Groups would be added to the major exercises occurring in the HRC. These ships would not be home ported in Hawaii, but would be in the area for up to 30 days per exercise. The exercises proposed would be similar to those occurring during RIMPAC and USWEX, with impacts to biological resources similar to those described above.

4.4.4.2 CULTURAL RESOURCES—MCTAB

4.4.4.2.1 No-action Alternative (Cultural Resources—MCTAB)

HRC Training Operations and Major Exercises

Training operations with the potential to affect terrestrial cultural resources at MCTAB include swimmer insertion/extraction, expeditionary assault, boat raids, HAO/NEO, and HA/DR.

All of these exercises similarly involve personnel and equipment (e.g., AAVs, SDVs) crossing beach areas or following existing transit routes from the shoreline and dispersing into designated areas for from 1 to 18 days of realistic training. HA/DR exercises also include the establishment of a safe haven camp or Civil-Military Operations Center, which can use either existing buildings or erect tents and portable latrines. At MCTAB, the insertion point for operations is within a landing zone that has been heavily disturbed through long-term use by the military and the public and has been specifically designated for these types of exercises (see Appendix D).

Nonetheless, large portions of MCTAB are sensitive for archaeological and traditional Hawaiian resources, in particular the banks of Waimanalo and Inoaole Streams and some sections of beach dunes. Archaeological excavation at a former waste disposal site adjacent to the northern end of the amphibious landing beach yielded no artifacts of traditional Hawaiian manufacture (U.S. Air Force, 15th Airlift Wing, 2004). However, an EIS prepared for the Bellows Air Force Station (AFS) land use and development plan determined that crossing Waimanalo Stream and other training operations can adversely affect cultural resources. Measures identified to mitigate this potential impact include having proper documents in place in advance, crossing streams only at pre-selected locations, restricting vehicle crossings to existing bridges or pre-selected fords with no sensitive resources, and selecting stream crossings to avoid known cultural deposits. In the event unanticipated cultural remains are identified (particularly human remains), all operations will cease in the immediate vicinity and the Bellows AFS designated cultural resources coordinator notified.

There are known terrestrial archaeological areas within and adjacent to MCTAB. There are no underwater cultural resources within the direct MCM region of influence. The nearest cultural resources include scattered shipwrecks in nearby waters (see Figure 3.1.3-2) and Site 4854 (a shoreline burial complex) north of the region of influence. With the implementation of established procedures no impacts to cultural resources will occur.

4.4.4.2.2 Alternative 1 (Cultural Resources—MCTAB)

Increased Tempo and Frequency of Training Operations

Increased tempo and frequency of training operations under Alternative 1 would increase the potential for impacts to occur to cultural resources in sensitive areas. For MCTAB, this would be most apparent within the archaeologically sensitive beach areas where operations would be conducted. Operations currently use designated beach zones and transit routes. The same beach zones and transit routes would be used for the increased operations. Mitigation measures are in place that would minimize adverse impacts from the increase in training operations.

4.4.4.2.3 Alternative 2 (Cultural Resources—MCTAB)

Increased Tempo and Frequency of Training Operations

The tempo and frequency of training operations under Alternative 2 would increase the potential for impacts to occur to cultural resources in sensitive areas. However, operations currently use designated beach zones and transit routes, and mitigation measures are in place that would avoid adverse impacts from the additional tempo and frequency of training operations under Alternative 2. Alternative 2 will not result in additional impacts.

4.4.5 HICKAM AFB

Table 4.4.5-1 lists ongoing operations for the No-action Alternative and proposed operations for Alternatives 1 and 2 at Hickam Air Force Base (AFB). Alternative 2 is the preferred alternative.

Table 4.4.5-1. Operations Occurring at Hickam AFB

Training Operations (land)	
• Air Operations	• Aircraft Support Operations
• Command and Control	• Special Warfare Operations (SPECWAROPS)

4.4.5.1 AIRSPACE—HICKAM AFB

4.4.5.1.1 No-action Alternative (Airspace—Hickam AFB)

HRC Training Operations

Aircraft support operations will require coordination with the Air Force and will use existing facilities for fueling and minor maintenance.

No new airspace proposal or any modification to the existing controlled airspace has been identified to accommodate aircraft support operations. Special use airspace will not be used and aircraft will use existing approach and departure procedures. Coordination with Honolulu International Airport will be the same as for other military aircraft using the runways.

Major Exercises

Major Exercises such as RIMPAC and USWEX can include aircraft support operations at Hickam AFB. These major exercises include extensive planning and coordination with the FAA. RIMPAC planning conferences are conducted beginning in March of the year prior to each RIMPAC. Each of the USWEX training operations, up to four per year, will include coordination with the FAA well in advance of the 3- or 4-day exercise.

4.4.5.1.2 Alternative 1 (Airspace—Hickam AFB)

Increased Tempo and Frequency of Training Operations and Major Exercises

Aircraft support operations would require coordination with the Air Force and would use existing facilities for fueling and minor maintenance. Increased training would result in a minor increase in the number of aircraft support operations.

No new airspace proposal or any modification to the existing controlled airspace has been identified to accommodate aircraft support operations. Special use airspace would not be used and aircraft would use existing approach and departure procedures. Coordination with Honolulu International Airport would be the same as for other military aircraft using the runways.

4.4.5.1.3 Alternative 2 (Airspace—Hickam AFB)

Increased Tempo and Frequency of Training Operations

An increased tempo and frequency of training operations would require similar training support as at present. Aircraft support operations would require coordination with the Air Force and would use existing facilities for fueling and minor maintenance. No new airspace proposal or any modification to the existing controlled airspace has been identified to accommodate aircraft support operations. Special use airspace would not be used and aircraft would utilize existing approach and departure procedures. Coordination with Honolulu International Airport would be the same as for other military aircraft using the runways.

Additional Major Exercises—Multiple Strike Group Training

The aircraft support operations during Multiple Strike Group Training would be similar to the requirements for a USWEX. The requirements would be developed well in advance of the exercise and would include coordination with the FAA.

4.4.5.2 BIOLOGICAL RESOURCES (TERRESTRIAL)—HICKAM AFB

4.4.5.2.1 No-action Alternative (Biological Resources [Terrestrial]—Hickam AFB)

HRC Training Operation and Major Exercises

Training operations and Major Exercises would continue to follow the Navy guidelines provided in Table 4.4.1.1.1.1-1, along with applicable Hickam AFB procedures, to assist in minimizing impacts to biological resources on the base and in offshore waters.

Vegetation

Vegetation on Hickam AFB consists primarily of managed landscaping. There are no threatened or endangered vegetation species on the base. Operations are conducted in existing open areas and facilities.

Wildlife

Noise and movement of personnel, vehicles, helicopters, and landing craft may temporarily displace sensitive bird species such as the ae’o (Hawaiian stilt) from feeding and resting areas. However, training operations are generally short in duration and they occur in areas regularly used for such operations. Air operations in support of Major Exercises are a routine occurrence on the base. All participants in training operations are to adhere to the Navy guidelines provided in Table 4.4.1.1.1.1-1, along with applicable Hickam AFB procedures, to assist in minimizing impacts to biological resources on the base and in offshore waters.

Environmentally Sensitive Habitat

Wetlands on Hickam AFB are avoided during Major Exercises.

4.4.5.2.2 Alternative 1 (Biological Resources (Terrestrial)—Hickam AFB)

Increased Tempo and Frequency of Training Operations and Major Exercises

Alternative 1 would include up to six USWEX per year (an increase of two exercises), the RIMPAC biennial exercise, and two Strike Groups conducting training operations simultaneously in the HRC, as well as other continuing training operations (See Table 2.2.3.3-1). While training operations would increase in number, the likelihood of a similar increase in adverse impacts to biological resources is small as discussed below.

Vegetation

Operations would take place at existing locations; no expansion of the area would be involved. Compliance with relevant Navy guidelines (Table 4.4.1.1.1.1-1), and other applicable Hickam AFB procedures, during training operations would minimize the potential for effects on vegetation, as well as limit the potential for introduction of invasive plant species. No threatened or endangered plant species are known to occur on Hickam AFB.

Wildlife

Impacts to wildlife would be similar to those described previously for the No-action Alternative. The increased training operations would comply with relevant Air Force and Navy policies and procedures, which would further reduce the potential for effects on birds and other wildlife species.

Environmentally Sensitive Habitat

Wetlands on Hickam AFB would be avoided during increased training operations.

4.4.5.2.3 Alternative 2 (Biological Resources [Terrestrial]—Hickam AFB)

Increased Tempo and Frequency of Training Operations

Under Alternative 2, the tempo of training operations would be increased and the frequency of operations could also increase. Literature on the effects of noise on wildlife suggests that common responses to noise events include a startle or fright response, and ultimately, habituation. It has been reported that the intensity and duration of startle responses decrease with the number and frequency of exposures. (U.S. Department of the Navy, 2006)

Additional Major Exercises—Multiple Strike Group Training

Up to three Strike Groups would be added to the major exercises occurring in the HRC. These ships would not be home ported in Hawaii, but would visit the area for up to 30 days per exercise. The exercises proposed would be similar to those occurring during RIMPAC and USWEX, with impacts to biological resources similar to those described above.

4.4.6 WHEELER ARMY AIRFIELD

Table 4.4.6-1 lists ongoing operations for the No-action Alternative and proposed operations for Alternatives 1 and 2 at Wheeler Army Airfield. Alternative 2 is the preferred alternative.

Table 4.4.6-1. Operations Occurring at Wheeler Army Airfield

Training Operations (land)	
• Air Operations	• Aircraft Support Operations
• Command and Control	• Special Warfare Operations (SPECWAROPS)

4.4.6.1 AIRSPACE—WHEELER ARMY AIRFIELD

4.4.6.1.1 No-action Alternative (Airspace—Wheeler Army Airfield)

HRC Training Operations

Aircraft support operations will require coordination with the Army and will use existing facilities for fueling and minor maintenance.

No new airspace proposal or any modification to the existing controlled airspace has been identified to accommodate aircraft support operations. Special use airspace will not be used and aircraft will use existing approach and departure procedures.

Major Exercises

Major Exercises such as RIMPAC and USWEX can include aircraft support operations at Wheeler Army Airfield. These major exercises include extensive planning and coordination with the FAA. RIMPAC planning conferences are conducted beginning in March of the year prior to each RIMPAC. Each of the USWEX training operations, up to four per year, will include coordination with the FAA well in advance of the 3- or 4-day exercise.

4.4.6.1.2 Alternative 1 (Airspace—Wheeler Army Airfield)

Increased Tempo and Frequency of Training Operations

Aircraft support operations would require coordination with the Army and would use existing facilities for fueling and minor maintenance. Increased training would result in a minor increase in the number of aircraft support operations.

No new airspace proposal or any modification to the existing controlled airspace has been identified to accommodate aircraft support operations. Special use airspace would not be used and aircraft would use existing approach and departure procedures.

4.4.6.1.3 Alternative 2 (Airspace—Wheeler Army Airfield)

Increased Tempo and Frequency of Training Operations

An increased tempo and frequency of training operations would require similar training support as at present. Aircraft support operations would require coordination with the Army and would use existing facilities for fueling and minor maintenance.

No new airspace proposal or any modification to the existing controlled airspace has been identified to accommodate aircraft support operations. Special use airspace would not be used and aircraft would use existing approach and departure procedures.

Additional Major Exercises—Multiple Strike Group Training

The aircraft support operations during Multiple Strike Group Training could be similar to the requirements for RIMPAC, although the use of Wheeler AAF is highly unlikely. The requirements would be developed well in advance of the exercise and would include coordination with the FAA.

4.4.6.2 BIOLOGICAL RESOURCES (TERRESTRIAL)—WHEELER ARMY AIRFIELD

4.4.6.2.1 No-action Alternative (Biological Resources [Terrestrial]—Wheeler Army Airfield)

HRC Training Operations and Major Exercises

Training operations and Major Exercises adhere to the Navy's guidelines provided in Table 4.4.1.1.1.1-1, along with applicable Army procedures, to assist in minimizing impacts to biological resources at the airfield.

Vegetation

Wheeler Army Airfield is a developed area containing mostly nonnative urban vegetation with no known threatened or endangered species. No impacts to vegetation are anticipated from use of existing runways and associated facilities and cleared areas.

Wildlife

Noise and movement of personnel, vehicles, helicopters, and landing craft may temporarily displace wildlife from feeding and resting areas. However, training operations are short in duration and they occur in areas regularly used for such operations. Air operations in support of Major Exercises are a routine occurrence at the airfield.

Environmentally Sensitive Habitat

No critical habitat has been identified on Wheeler Army Airfield.

4.4.6.2.2 Alternative 1 (Biological Resources (Terrestrial)—Wheeler Army Airfield

Increased Tempo and Frequency of Training Operations and Major Exercises

Alternative 1 would include up to six USWEX per year (an increase of two exercises), the RIMPAC biennial exercise, and two Strike Groups conducting training operations simultaneously in the HRC, as well as other continuing training operations (See Table 2.2.3.3-1). While training operations would increase in number, the likelihood of a similar increase in adverse impacts to biological resources is small as discussed below.

Vegetation

Operations would continue to take place at existing locations; no expansion of the area would be involved. Compliance with relevant Navy guidelines (Table 4.4.1.1.1.1-1), and other applicable Army procedures, during training operations would minimize the effects on vegetation, as well as limit the potential for introduction of invasive plant species. No threatened or endangered plant species are known to occur on Wheeler Army Airfield.

Wildlife

Impacts to wildlife would be similar to those described previously for the No-action Alternative. The increased training operations and Major Exercises would comply with relevant Army and Navy policies and procedures, which would further reduce the potential for effects on wildlife.

Environmentally Sensitive Habitat

No critical habitat has been identified at the airfield.

4.4.6.2.3 Alternative 2 (Biological Resources [Terrestrial]—Wheeler Army Airfield)

Increased Tempo and Frequency of Training Operations

Under Alternative 2, the tempo of training operations would be increased and the frequency of operations could also increase. Literature on the effects of noise on wildlife suggests that common responses to noise events include a startle or fright response, and ultimately, habituation. It has been reported that the intensity and duration of startle responses decrease with the number and frequency of exposures. (U.S. Department of the Navy, 2006)

Additional Major Exercises—Multiple Strike Group Training

Up to three Strike Groups would be added to the major exercises occurring in the HRC. These ships would visit the area for up to 30 days per exercise. The exercises proposed would be similar to those occurring during RIMPAC and USWEX, with impacts to biological resource similar to those described above.

4.4.7 MAKUA MILITARY RESERVATION

Table 4.4.7-1 lists ongoing operations for the No-action Alternative and proposed operations for Alternatives 1 and 2 at Makua Military Reservation. Alternative 2 is the preferred alternative.

Table 4.4.7-1. Operations Occurring at Makua Military Reservation

Training Operations	
• Special Warfare Operations (SPECWAROPS) (land & offshore)	• Live Fire Exercise (land)

4.4.7.1 BIOLOGICAL RESOURCES (TERRESTRIAL AND OFFSHORE)—MAKUA MILITARY RESERVATION

4.4.7.1.1 No-action Alternative (Biological Resources [Terrestrial and Offshore]—Makua Military Reservation)

HRC Training Operations and Major Exercises

LFX and SPECWAROPS operations follow the Navy's guidelines provided in Table 4.4.1.1.1.1-1, along with applicable Army procedures, to assist in minimizing the potential for impacts to biological resources.

Vegetation

Makua Military Reservation contains 31 endangered plant species. These species are generally confined to remote mountainous areas along the fringe of the range, outside maintained open areas and the impact area. Army procedures restrict operations and exercises to areas that are outside of sensitive habitat. An Endangered Species Management Plan has been prepared for the Reservation that establishes a series of preventative and restorative activities appropriate to these resources. Major Exercises follow the preventive measures outlined in the management plan.

Wildlife

In 1999, the USFWS issued a Biological Opinion concluding that routine military training would not jeopardize the endangered species on Makua Military Reservation if certain conditions were met. These include restrictions to military training, and preparation and implementation of a Wildland Fire Management Plan. The Army is also required to complete an Implementation Plan to stabilize the targeted plant and animal populations. (U.S. Department of the Army, 2005) Major Exercises comply with these restrictions.

Potential SPECWAROPS operations generally include reconnaissance activities and a helicopter raid. Noise from munitions during LFX is considered momentary (intrusive noise), while noise from helicopters or other mobile sources is continuous. Short helicopter hovering periods result in noise levels at Makua Beach of 88 dB. Although these noise levels can cause flushing of birds, the affects are temporary and birds return to the area following completion of operations.

The Army funded a study at Schofield Barracks of the effects of artillery noise on the Oahu ‘elepaio. Noise from 155-mm and 105-mm howitzers, 81-mm and 60-mm mortars, and hand grenades were investigated. Results determined that ‘elepaio nesting behavior was not significantly affected and the population was not seriously disturbed by artillery training. Nesting attendance and nestling survival rates during training periods were similar to rates in Honouliuli, where there is no military training. (U.S. Department of the Army, 2005)

The only marine mammals that might exist in the region of influence are the Hawaiian monk seal and the humpback whale. Of the five species of sea turtles that occur in Hawaiian waters, only the green sea turtle and leatherback sea turtle are likely to be in the region of influence. All participants in training operations are to adhere to the Navy guidelines provided in Table 4.4.1.1.1.1-1, along with applicable Army procedures, to assist in minimizing impacts to biological resources on the Reservation and in offshore waters. The beach and offshore waters would continue to be monitored for the presence of marine mammals and sea turtles 1 hour before and during an increase in Major Exercises. If any are seen, the exercise would be delayed until the animals leave the area. Underwater noise effects are discussed in Section 4.1.2.

Environmentally Sensitive Habitat

The USFWS designated critical habitat on Makua Military Reservation in 2001 for the Oahu ‘elepaio, which is avoided where possible. Critical habitat for endangered plants is located outside the boundary of the reservation.

4.4.7.1.2 Alternative 1 (Biological Resources [Terrestrial and Offshore]—Makua Military Reservation)

Increased Tempo and Frequency of Training Operations and Major Exercises

Alternative 1 would include up to six USWEX per year (an increase of two exercises), the RIMPAC biennial exercise, and two Strike Groups conducting training operations simultaneously in the HRC, as well as other continuing training operations (See Table 2.2.3.3-1). While training operations would increase in number, the likelihood of a similar increase in adverse impacts to biological resources is small as described below.

Vegetation

Operations would take place at existing locations; no expansion of the area would be involved. Compliance with relevant Navy guidelines (Table 4.4.1.1.1.1-1), and other applicable Army procedures, during training operations would minimize the potential for effects on vegetation, as well as limit the potential for introduction of invasive plant species.

Wildlife

Impacts to wildlife would be similar to those described previously for the No-action Alternative. The increased training operations would comply with relevant Army and Navy policies and procedures, which would further reduce the effects on wildlife.

Environmentally Sensitive Habitat

Critical habitat areas would continue to be avoided, where possible.

4.4.7.1.3 Alternative 2 (Biological Resources [Terrestrial and Offshore]—Makua Military Reservation)

Increased Tempo and Frequency of Training Operations

Under Alternative 2, the tempo of training operations would be increased and the frequency of operations could also increase. Operations would take place at existing locations; no expansion of the area would be involved. Literature on the effects of noise on wildlife suggests that common responses to noise events include a startle or fright response, and ultimately, habituation. It has been reported that the intensity and duration of startle responses decrease with the number and frequency of exposures. (U.S. Department of the Navy, 2006)

Additional Major Exercises—Multiple Strike Group Training

Up to three Strike Groups would visit the area for up to 30 days per exercise. The exercises proposed would be similar to those occurring during RIMPAC and USWEX, with impacts to biological resources similar to those described above.

4.4.7.2 CULTURAL RESOURCES—MAKUA MILITARY RESERVATION

4.4.7.2.1 No-action Alternative (Cultural Resources—Makua Military Reservation)

HRC Training Operations

Live Fire Exercises

Operations at Makua Military Reservation with the potential to affect cultural resources include LFX, which involves the movement of troops through target objectives using a wide range of air/ground weapons. Troop levels range from a few personnel to brigade level (3,000-5,000 personnel). At Makua Military Reservation, operations occur within the RIMPAC (Pililaau Range) areas shown in Appendix D.

The traditional and cultural use of Makua Military Reservation is extensive. Approximately 25 percent of the lands at Makua Military Reservation have been surveyed for the presence of cultural sites, and a large number and wide range of site types have been identified. There is a high probability for additional cultural sites in the areas not yet surveyed. Many of the sites are located adjacent to training areas and training restrictions are in place. The management of cultural resources at Makua Military Reservation is guided by a Programmatic Agreement among the Army, the Hawaii SHPO, and the Council (see Section 3.4.7.2), and an updated ICRMP for all Army installations in Hawaii is in progress. An Ecosystem Management Plan Report for the protection of these resources has also been developed (U.S. Army Garrison, Hawaii and U.S. Army Corps of Engineers, 1998) that focuses on identification, education, and avoidance of known archaeological sites.

Limited LFX can be conducted at Makua Military Reservation under a court-approved settlement plan of October 2001. Any operations proposed for Makua Military Reservation are reviewed by the Army before operations are conducted. Extensive planning for operations is required and includes coordination meetings 8 weeks and 30 days before the exercise, a written plan of maneuver and fire support, and a risk assessment of the exercise. Standard operating procedures require troops to review training overlays that identify insertion points and any nearby restricted areas. Sensitive biological and cultural resource areas are avoided. (U.S. Department of the Navy, Commander, Third Fleet, 2002, 2004, 2006)

In the event cultural materials of any type are unexpectedly encountered during LFX (particularly human remains), all operations in the immediate vicinity of the find would cease and the Schofield Barracks Cultural Resources Manager notified.

In accordance with the 2000 Programmatic Agreement, access for Native Hawaiians to Makua Military Reservation is granted on a case-by-case basis (see Appendix I).

Major Exercises

Any operations proposed for Makua Military Reservation are reviewed by the Army before exercises are conducted. Extensive planning for exercises is required and sensitive biological and cultural resource areas are avoided. (U.S. Department of the Navy, Commander, Third Fleet, 2002, 2004, 2006). In the event cultural materials of any type are unexpectedly encountered during exercises, all operations in the immediate vicinity of the find would cease and the Schofield Barracks Cultural Resources Manager notified.

4.4.7.2.2 Alternative 1 (Cultural Resources—Makua Military Reservation)

Increased Tempo and Frequency of Training Operations

Training operations under Alternative 1 would increase the potential for impacts to occur to cultural resources in sensitive areas. However, operations currently use designated training areas and mitigation measures are in place that avoid adverse impacts.

4.4.7.2.3 Alternative 2 (Cultural Resources—Makua Military Reservation)

Increased Tempo and Frequency of Training Operations

The tempo and frequency of training operations under Alternative 2 would increase the potential for impacts to cultural resources in sensitive areas. However, operations currently use designated training areas and mitigation measures are in place that would avoid adverse impacts. The increased frequency of training over and above Alternative 1 is not expected to cause adverse effects.

4.4.7.3 HEALTH AND SAFETY—MAKUA MILITARY RESERVATION

4.4.7.3.1 No-action Alternative (Health and Safety—Makua Military Reservation

Under the No-action Alternative existing operations at the Makua Military Reservation will continue and there will be in no adverse impacts to health and safety. The Makua Military Reservation takes every reasonable precaution during planning and execution of operations and training operations to prevent injury to human life or property.

HRC Training Operations

The Navy does not currently conduct routine training operations at Makua Military Reservation.

Major Exercises

LFX and SPECWAROPS typically occur at Makua Military Reservation as part of Major Exercises. Under the No-action Alternative, there will be no impacts to health and safety at the reservation. Every reasonable precaution is taken during the planning and execution of the operation of training operations to prevent injury to human life or damage to property. Specific safety plans have been developed to ensure that each operation is in compliance with applicable policy and requirements, and to ensure that the general public and range personnel and assets are provided an acceptable level of safety. In addition, SOPs have been developed which outline all safety requirements for use of Makua Military Reservation.

4.4.7.3.2 Alternative 1 (Health and Safety—Makua Military Reservation

Increased Tempo and Frequency of Training Operations and Major Exercises

An increase in tempo and frequency of training operations and major exercises is not anticipated to adversely impact health and safety at Makua Military Reservation. The total number of training operations that affect health and safety would increase by approximately 9 percent above the No-action Alternative. While the number of operations would increase, the types of operations would remain the same and existing SOPs would be used.

4.4.7.3.3 Alternative 2 (Health and Safety—Makua Military Reservation)

Increased Tempo and Frequency of Training Operations

An increase in tempo and frequency of training operations is not anticipated to adversely impact health and safety at Makua Military Reservation. While the number of operations would increase, the types of operations would remain the same and existing SOPs would be used.

Additional Major Exercises—Multiple Strike Group Training

Up to three Strike Groups would be added to the major exercises occurring in the HRC. These ships would operate in the vicinity of Hawaii. The exercises proposed would be similar to those occurring during Major Exercises, with impacts to health and safety at Makua Military Reservation similar to those described in above.

4.4.7.4 NOISE—MAKUA MILITARY RESERVATION

Impacts of noise on human receptors are evaluated based on whether or not a noise event would exceed DoD or OSHA guidelines. Noise effects on wildlife are discussed in Section 4.4.7.1, Biological Resources (Terrestrial and Offshore).

4.4.7.4.1 No-action Alternative (Noise—Makua Military Reservation)

Under the No-action Alternative, existing operations at the U.S. Army's Makua Military Reservation will continue, and there will be no increase to existing noise levels. The Makua Military Reservation maintains a hearing protection program that includes monitoring the hearing of personnel exposed to high noise levels and identifying and posting notification of noise hazard areas. Personnel working in are noise hazard areas are required to use appropriate hearing protection to bring noise levels within established safety levels.

HRC Training Operations

The Navy does not currently conduct routine training operations at Makua Military Reservation.

Major Exercises

LFX and SPECWAROPS typically occur at Makua Military Reservation as part of Major Exercises. There will be no increase to existing noise levels during the continuing exercises listed above. The total perceived noise will be the combination of ambient noise and noise from the exercises. Ambient noise sources may include wind, surf, highway traffic, aircraft operations, and other local noise-generating land uses. Noise sources from the exercise will include the use of helicopters and small arms munitions.

4.4.7.4.2 Alternative 1 (Noise—Makua Military Reservation

Increased Tempo and Frequency of Training Operations and Major Exercises

Noise levels associated with increased tempo and frequency of training operations and major exercises would be similar to existing noise levels. The total number of training operations that affect noise would increase by approximately 9 percent above the No-action Alternative. Operations would take place at existing locations. While the number of operations would increase there would be no anticipated increase to the level of noise produced.

4.4.7.4.3 Alternative 2 (Noise—Makua Military Reservation)

Increased Tempo and Frequency of Training Operations

Noise levels associated with increased tempo and frequency of training operations would be similar to existing noise levels. The total number of training operations that affect noise would increase. While the number of operations would increase there would be no anticipated increase to the level of noise produced.

Additional Major Exercises—Multiple Carrier Strike Group Training

Up to three Strike Groups would be added to the major exercises occurring in the HRC. These ships would not be home ported in Hawaii, but would be in the area for up to 30 days per exercise. The operations proposed would be similar to those occurring during current Major Exercises, with impacts to noise levels similar to those described above.

4.4.8 KAHUKU TRAINING AREA

Table 4.4.8-1 lists ongoing operations for the No-action Alternative and proposed operations for Alternatives 1 and 2 at Kahuku Training Area. Alternative 2 is the preferred alternative.

Table 4.4.8-1. Operations Occurring at Kahuku Training Area

Training Operations (land)	
• Special Warfare Operations (SPECWAROPS) • Humanitarian Assistance/Non-combatant Evacuation Operations (HAO/NEO)	• Humanitarian Assistance/Disaster Relief Operations (HA/DR)

4.4.8.1 BIOLOGICAL RESOURCES (TERRESTRIAL)—KAHUKU TRAINING AREA

4.4.8.1.1 No-action Alternative (Biological Resources [Terrestrial]—Kahuku Training Area

HRC Training Operations and Major Exercises

Vegetation

The U.S. Army's KTA contains 10 species of endangered plants. SPECWAROPS operations at the range include a reconnaissance and survey mission, and a tactical aircrew recovery operation. Potential HA/DR and HAO/NEO operations use existing open areas and facilities. Some temporary structures, including tents, may be used. All participants in training operations are to adhere to the Navy's guidelines provided in Table 4.4.1.1.1.1-1, along with applicable Army procedures, to minimize potential impacts to the endangered vegetation, as well as limit the potential for introduction of invasive plant species.

Wildlife

SPECWAROPS activities generally include reconnaissance activities and a helicopter raid. Although noise levels can cause flushing of individual birds, such as the Oahu `elepaio or ‘Alauahio (Oahu creeper), the effects are temporary.

Environmentally Sensitive Habitat

Training operations would avoid critical habitat and other biologically significant areas in the region of influence.

4.4.8.1.2 Alternative 1 (Biological Resources [Terrestrial]—Kahuku Training Area)

Increased Tempo and frequency of Training Operations and Major Exercises

Alternative 1 would include up to six USWEX per year (an increase of two exercises), the RIMPAC biennial exercise, and two Strike Groups conducting training operations simultaneously in the HRC, as well as other continuing training operations (See Table 2.2.3.3-1). While training operations would increase in number, the likelihood of a similar increase in adverse impacts to biological resources is small as discussed below.

Vegetation

Operations would take place at existing locations; no expansion of the area would be involved. Compliance with relevant Navy guidelines (Table 4.4.1.1.1.1-1), and other applicable Army procedures, during training operations would minimize the potential for effects on vegetation, as well as limit the potential for introduction of invasive plant species.

Wildlife

Impacts to wildlife would be similar to those described previously for the No-action Alternative. The increased training operations would comply with relevant Army and Navy policies and procedures, which would further reduce the potential for effects on wildlife.

Environmentally Sensitive Habitat

Critical habitat and other biologically significant areas would continue to be avoided where possible.

4.4.8.1.3 Alternative 2 (Biological Resources [Terrestrial]—Kahuku Training Area

Increased Tempo and Frequency of Training Operations

Under Alternative 2, the tempo of training operations would be increased and the frequency of operations could also increase. Literature on the effects of noise on wildlife suggests that common responses to noise events include a startle or fright response, and ultimately, habituation. It has been reported that the intensity and duration of startle responses decrease with the number and frequency of exposures. (U.S. Department of the Navy, 2006).

Additional Major Exercises—Multiple Strike Group Training

Up to three Strike Groups would visit the area for up to 30 days per exercise. The exercises proposed would be similar to those occurring during RIMPAC and USWEX, with impacts to biological resources similar to those described above.

4.4.8.2 CULTURAL RESOURCES—KAHUKU TRAINING AREA

4.4.8.2.1 No-action Alternative (Cultural Resources—Kahuku Training Area

HRC Training Operations

Expeditionary Assault, HAO/NEO, and HA/DR

These three operations (Expeditionary Assault, HAO/NEO, and HA/DR) exhibit similar activities that involve personnel and equipment (e.g., AAVs, SDVs) crossing beach areas or following existing transit routes from the shoreline and dispersing into designated areas for from 1 to 18 days of realistic training. HA/DR *operations* also include the establishment of a safe haven camp or Civil-Military Operations Center, which can use either existing buildings or the erection of tents and portable latrines. At *Kahuku Training Area (*KTA*)*, the insertion point for operations is within a landing zone that is one of the more widely used military training areas in Hawaii; the area has been specifically designated for these types of *operations* (see Appendix *D*).

Surveys of KTA indicate that all archaeological and traditional Hawaiian sites are considered significant (U.S. Army Garrison, Hawaii, and U.S. Army Corps of Engineers, 1998); however, there will be no unmonitored ground-disturbing activities, land clearing, or use of vehicles off existing trails and roads. Operations use an existing training trail and access road that would be graded before the exercise (if required). However, in accordance with standard operating procedures, grading would not exceed the road width or alignment. Training overlays that identify the transit route, camp location, and any nearby restricted areas or sensitive biological and cultural resource areas will be used by all participants. All personnel entering the KTA will adhere to the training guidelines presented in the Ecosystem Management Plan Report (U.S. Army Garrison, Hawaii, and U.S. Army Corps of Engineers, 1998). Therefore, no impacts on cultural resources within the Kahuku Training Area are anticipated.

In the event cultural materials are unexpectedly encountered during the course of Expeditionary Assault, HAO/NEO, or HA/DR operations (particularly human remains), all operations will cease in the immediate vicinity of the find and the Schofield Barracks Cultural Resources Manager notified.

According to NOAA's shipwreck and fishpond location maps (see Figure 3.1.3-2 and 3.4.1.1.2-1), there are numerous shipwrecks, but no known Native Hawaiian fishponds in the vicinity of the HAO/NEO and HA/DR insertion point for Kahuku Training Area. Offshore HAO/NEO activities are performed in waters that are shallow and most shipwrecks are found in deeper waters.

Major Exercises

Elements of major exercises (RIMPAC) have been analyzed above. Exercises are well planned in advance, use existing trails and roads, and avoid sensitive cultural areas. In the event cultural materials are unexpectedly encountered during the course of Major Exercises, all operations will cease in the immediate vicinity of the find and the Schofield Barracks Cultural Resources Manager notified. Therefore, no impacts on cultural resources within the Kahuku Training Area are anticipated.

4.4.8.2.2 Alternative 1 (Cultural Resources—Kahuku Training Area)

Increased Tempo and Frequency of Training Operations

Training operations under Alternative 1 would increase the potential for impacts to occur to cultural resources in sensitive areas. Operations currently use designated training areas and mitigation measures are in place that would avoid adverse impacts (see above discussions)

4.4.8.2.3 Alternative 2 (Cultural Resources—Kahuku Training Area)

Increased Tempo and Frequency of Training Operations

The tempo and frequency of training operations under Alternative 2 would increase the potential for impacts to occur to cultural resources in sensitive areas; however, operations currently use designated training areas and mitigation measures are in place that would avoid adverse impacts.

Additional Major Exercises—Multiple Strike Group Training

Additional Major Exercises would be similar in nature to those described above and would employ the same mitigation measures. As a result no impacts are expected.

4.4.9 DILLINGHAM MILITARY RESERVATION

Table 4.4.9-1 lists ongoing operations for the No-action Alternative and proposed operations for Alternatives 1 and 2 at Dillingham Military Reservation. Alternative 2 is the preferred alternative.

Table 4.4.9-1. Operations Occurring at Dillingham Military Reservation

Training Operations (land & offshore)
• Special Warfare Operations (SPECWAROPS)

4.4.9.1 BIOLOGICAL RESOURCES (TERRESTRIAL AND OFFSHORE)—DILLINGHAM MILITARY RESERVATION

4.4.9.1.1 No-action Alternative (Biological Resources [Terrestrial and Offshore]—Dillingham Military Reservation

HRC Training Operations and Major Exercises

Vegetation

At the U.S. Army's DMR, four endangered plant species can be found within the cliff ecological zone. SPECWAROPS activities at the range include a reconnaissance and survey mission, and a tactical aircrew recovery operation. All participants in training operations are to adhere to the Navy's guidelines provided in Table 4.4.1.1.1.1-1, along with applicable Army procedures, to minimize potential impacts to the endangered vegetation, as well as limit the potential for introduction of invasive plant species.

Wildlife

SPECWAROPS activities generally include reconnaissance activities and a helicopter raid. Short helicopter hovering periods could result in noise levels at ground level of 88 dB. Although these noise levels can cause flushing, of individual birds, such as the endangered ‘alae ke'oke'o (Hawaiian coot), ‘alae'ula (Hawaiian moorhen), koloa maoli (Hawaiian duck), and nene (Hawaiian goose), the affects are temporary.

Because DMR is adjacent to a small segment of beachfront, a portion of the region of influence extends to the offshore waters. Humpback whales and several dolphin species are often present in the region of influence. Hawaiian monk seals and green sea turtles also have the potential to occur. All training participants are briefed on resource protection guidelines (Table 4.4.1.1.1.1-1) for operations on Oahu, which minimize the potential for harm to endangered species. The beach and offshore waters are monitored for the presence of marine mammals and sea turtles 1 hour before and during Major Exercises. If any are seen, the exercise is delayed until the animals leave the area. Underwater noise effects are discussed in Section 4.1.2.

Environmentally Sensitive Habitat

An Army Corps of Engineers jurisdictional wetland on the reservation is outside of the area used for maneuver training.

4.4.9.1.2 Alternative 1 (Biological Resources [Terrestrial and Offshore]—Dillingham Military Reservation

Increased Tempo Frequency of Training Operations and Major Exercises

Alternative 1 would include up to six USWEX per year (an increase of two exercises), the RIMPAC biennial exercise, and two Strike Groups conducting training operations simultaneously in the HRC, as well as other continuing training operations (See Table 2.2.3.3-1). While training operations would increase in number, the likelihood of a similar increase in adverse impacts to biological resources is small as described below.

Vegetation

Operations would take place at existing locations; no expansion of the area would be involved. Compliance with relevant Navy guidelines (Table 4.4.1.1.1.1.1-1), and other applicable Army procedures, during training operations would minimize the potential for effects on vegetation, as well as limit the potential for introduction of invasive plant species.

Wildlife

Impacts to wildlife would be similar to those described previously for the No-action Alternative. The increased training operations would comply with relevant Army and Navy policies and procedures, which would further reduce the potential for effects on wildlife. The beach and offshore waters would continue to be monitored for the presence of marine mammals and sea turtles 1 hour before and during an increase in Major Exercises. If any are seen, the exercise would be delayed until the animals leave the area.

Environmentally Sensitive Habitat

An Army Corps of Engineers jurisdictional wetland on the reservation is outside of the area used for maneuver training.

4.4.9.1.3 Alternative 2 (Biological Resources [Terrestrial and Offshore]—Dillingham Military Reservation)

Increased Tempo and Frequency of Training Operations

Under Alternative 2, the tempo of training operations would be increased and the frequency of operations could also increase. Literature on the effects of noise on wildlife suggests that common responses to noise events include a startle or fright response, and ultimately, habituation. It has been reported that the intensity and duration of startle responses decrease with the number and frequency of exposures. (U.S. Department of the Navy, 2006)

Additional Major Exercises—Multiple Strike Group Training

Up to three Strike Groups would visit the area for up to 30 days per exercise. The exercises proposed would be similar to those occurring during RIMPAC and USWEX, with impacts to biological resources similar to those described above.

4.4.9.2 CULTURAL RESOURCES—DILLINGHAM MILITARY RESERVATION

4.4.9.2.1 No-action Alternative (Cultural Resources—Dillingham Military Reservation

HRC Training Operations and Major Exercises

For SPECWAROPS under RIMPAC, Navy and Marine operations with the potential to affect cultural resources at DMR include helicopter insertions and raids and downed pilot training. Operations involve inserting personnel and equipment to conduct combat search and rescue, covert access to military assets, intelligence gathering, staged raids, and return to the host unit. Reconnaissance inserts and beach surveys are often conducted before large-scale amphibious landings and can involve several units gaining covert access using a boat, typically to locate and recover a downed aircrew. (U.S. Department of the Navy, Commander, Third Fleet, 2002) DMR is also used by the Army for small unit maneuvers of platoon- and squad-sized elements or combat support operations; airmobile operations and paradrop operations; and helicopter night-vision goggle training, which requires the absence of bright man-made sources of light (U.S. Army Garrison, Hawaii, 1996).

As described in Section 3.4.9.2, DMR has archaeological and traditional Hawaiian resources, including indications of pre-contact use of the coastal dunes for burials. However, all personnel entering the DMR will adhere to training guidelines regarding cultural resources. There will be no unmonitored ground-disturbing activities, land clearing, or use of vehicles off existing trails and roads; assembly of “hasty fortifications”; or litter accumulation, as discussed in the Ecosystem Management Plan Report (U.S. Army Garrison, Hawaii, and U.S. Army Corps of Engineers, 1998). As a result, no impacts on cultural resources are anticipated. In the event cultural materials are unexpectedly encountered during SPECWAROPS operations (particularly human remains), operations in the vicinity of the find will cease and follow the appropriate military branch protocols. If the find is made by Marine Corps or Navy personnel, the Hawaii SHPO will be immediately notified in accordance with the Programmatic Agreement (see Appendix I). If the find is unexpectedly encountered during Army operations, the Schofield Barracks Cultural Resources Manager will be immediately notified.

4.4.9.2.2 Alternative 1 (Cultural Resources—Dillingham Military Reservation)

Increased Tempo and Frequency of Training Operations

Training operations under Alternative 1 would increase the potential for impacts to occur to cultural resources in sensitive areas. Operations currently use designated training areas and mitigation measures are in place that would avoid adverse impacts.

4.4.9.2.3 Alternative 2 (Cultural Resources—Dillingham Military Reservation

Increased Tempo and Frequency of Training Operations

The tempo and frequency of training operations under Alternative 2 would increase the potential for impacts to occur to cultural resources in sensitive areas. However, operations currently use designated training areas and mitigation measures are in place that would avoid adverse impacts.

Additional Major Exercises—Multiple Strike Group Training

Elements of Major Exercises are analyzed in the No-action Alternative. Operations currently use designated training areas and mitigation measures are in place that would avoid adverse impacts.

4.4.10 EWA TRAINING MINEFIELD

Table 4.4.10-1 lists ongoing operations for the No-action Alternative and proposed operations for Alternatives 1 and 2 at Ewa Training Minefield. Alternative 2 is the preferred alternative.

Table 4.4.10-1. Operations Occurring at Ewa Training Minefield

Training Operations (offshore)	
• Underwater Demolition	• Special Warfare Operations (SPECWAROPS)

4.4.10.1 BIOLOGICAL RESOURCES (OFFSHORE)—EWA TRAINING MINEFIELD

4.4.10.1.1 No-action Alternative (Biological Resources [Offshore]—Ewa Training Minefield

HRC Training Operations and Major Exercises

No underwater demolition is planned for the Ewa Training Minefield. However, if performed, underwater demolition activities at Ewa Training Minefield would use no more than 20 lb net explosive weight of ordnance. Operations follow Navy procedures to minimize impacts to biological resources.

Prior to actual detonation, the area is determined to be clear of marine mammals and sea turtles using observations from above the surface and from underwater. Standard procedures require tethered mines to be suspended at least 10 ft below the surface of the water. Explosive charges on or near the shallow water bottom are placed in sandy areas away from exposed reefs and coral. Small cutting charges may be utilized during Salvage Operations training on existing underwater wrecks. There can be minor and localized loss of some fish and benthic populations from the explosions. After operations involving underwater detonations, the area is searched for injured animals.

Aquaculture farming would not be impacted by demolition activities at the range. Any effects from noise, shock, or residual chemicals from the detonation would be localized and temporary.

4.4.10.1.2 Alternative 1 (Biological Resources (Offshore)—Ewa Training Minefield)

Increased Tempo and Frequency of Training Operations and Major Exercises

Alternative 1 would include up to six USWEX per year (an increase of two exercises), the RIMPAC biennial exercise, and two Strike Groups conducting training operations simultaneously in the HRC, as well as other continuing training operations (See Table 2.2.3.3-1). While training operations would increase in number, the likelihood of a similar increase in the potential for impacts on biological resources is small, as described above for the No-action Alternative.

4.4.10.1.3 Alternative 2 (Biological Resources [Offshore]—Ewa Training Minefield)

Increased Tempo and Frequency of Training Operations

Under Alternative 2, the tempo of training operations would be increased and the frequency of operations could also increase. Literature on the effects of noise on wildlife suggests that common responses to noise events include a startle or fright response, and ultimately, habituation. It has been reported that the intensity and duration of startle responses decrease with the number and frequency of exposures. (U.S. Department of the Navy, 2006)

Additional Major Exercises—Multiple Strike Group Training

Up to three Strike Groups would visit the area for up to 30 days per exercise. The exercises proposed would be similar to those occurring during RIMPAC and USWEX, with impacts to biological resources similar to those described above for the No-action Alternative.

4.4.10.2 HAZARDOUS MATERIALS AND WASTE—EWA TRAINING MINEFIELD

4.4.10.2.1 No-action Alternative, Alternative 1, and Alternative 2 (Hazardous Materials and Waste—Ewa Training Minefield)

HRC Training Operations

Under the No-action Alternative, Alternative 1, or Alternative 2, underwater demolition training operations, if held, will use explosives charges of no more than 20 lb each, net explosive weight. The transport, handling, and use of such quantities of hazardous materials on an infrequent basis will have no effect on ongoing hazardous materials management activities. No hazardous wastes will be generated by these operations.

Major Exercises

Major Exercises under all Alternatives, such as RIMPAC and USWEX, include training operations and in some cases RDT&E operations. Under Alternative 2, Multiple Carrier Strike Groups will conduct no Demolition and SPECWAROPs at Ewa. Potential impacts from Major Exercises will be similar to those described above for training operations.

4.4.10.3 HEALTH AND SAFETY—EWA TRAINING MINEFIELD

4.4.10.3.1 No-action Alternative, Alternative 1, and Alternative 2 (Health and Safety—Ewa Training Minefield)

HRC Training Operations

Underwater demolition activities at Ewa Training Minefield are not anticipated under the No-action Alternative, Alternative 1, or Alternative 2. If held, however, they will use no more than 20 lb net explosive weight of ordnance. The public will not be exposed to the energetic effects of the detonations because the range will be cleared, and these effects will be completely contained within the range. Existing Navy safety protocols for the use of explosives will assure that non-participants would not be in the area during training operations.

Demolition activities will be conducted in accordance with COMNAVSURFPAC Instruction 3120.8F (U.S. Department of the Navy, 1993). COMNAVSURFPAC Instruction 3120.8F specifies detonation procedures for underwater ordnance to avoid endangering the public or impacting other non-military activities, such as shipping, recreational boaters, divers, and commercial or recreational fishermen.

Major Exercises

Major Exercises under all Alternatives, such as RIMPAC and USWEX, include training operations and in some cases RDT&E operations. Multiple Strike Groups will conduct no Demolition and SPECWAROPs at Ewa. Potential impacts from Major Exercises will be similar to those described above for training operations.

4.4.11 BARBERS POINT UNDERWATER RANGE

Table 4.4.11-1 lists ongoing operations for the No-action Alternative and proposed operations for Alternatives 1 and 2 at Barbers Point Underwater Range. Alternative 2 is the preferred alternative.

Table 4.4.11-1. Operations Occurring at Barbers Point Underwater Range

Training Operations (offshore)	
• Underwater Demolition	• Special Warfare Operations (SPECWAROPS)

4.4.11.1 BIOLOGICAL RESOURCES (OFFSHORE)—BARBERS POINT UNDERWATER RANGE

4.4.11.1.1 No-action Alternative (Biological Resources [Offshore]—Barbers Point Underwater Range)

HRC Training Operations and Major Exercises

If conducted, underwater Demolition would use no more than 20 lb net explosive weight of ordnance. Operations follow Navy procedures to minimize impacts to biological resources.

Demolition and SPECWAROPS activities in the offshore environment include destruction of inert mines by detonation of no more than 20 lb of explosive per inert mine. Prior to actual detonation, the area is determined to be clear of marine mammals and sea turtles. Explosive charges are placed in sandy bottom areas away from exposed reefs and coral. There can be minor and localized loss of some fish and benthic populations from the explosions. These shallow areas are not located in areas identified as EFH or HAPC, which occur at depths greater than 120 ft. After operations involving underwater detonations, the area is searched for injured animals.

4.4.11.1.2 Alternative 1 (Biological Resources [Offshore]—Barbers Point Underwater Range

Increased Tempo and Frequency of Training Operations

Alternative 1 would include up to six USWEX per year (an increase of two exercises), the RIMPAC biennial exercise, and two Strike Groups conducting training operations simultaneously in the HRC, as well as other continuing training operations (See Table 2.2.1-1). While training operations would slightly increase in number, impacts would be similar to those described above.

4.4.11.1.3 Alternative 2 (Biological Resources [Offshore]—Barbers Point Underwater Range)

Increased Tempo and Frequency of Training Operations

Under Alternative 2, the tempo of training operations would be increased and the frequency of operations could also increase. Literature on the effects of noise on wildlife suggests that common responses to noise events include a startle or fright response, and ultimately, habituation. It has been reported that the intensity and duration of startle responses decrease with the number and frequency of exposures. (U.S. Department of the Navy, 2006)

Additional Major Exercises—Multiple Strike Group Training

Up to three Strike Groups would visit the area for up to 30 days per exercise. The exercises proposed would be similar to those occurring during RIMPAC and USWEX, with impacts to biological resources similar to those described above.

4.4.11.2 HAZARDOUS MATERIALS AND WASTE—BARBERS POINT UNDERWATER RANGE

4.4.11.2.1 No-action Alternative, Alternative 1, and Alternative 2 (Hazardous Materials and Waste—Barbers Point Underwater Range)

HRC Training Operations

Under the No-action Alternative, Alternative 1, or Alternative 2, no training operations will occur at Barbers Point Underwater Range. The transport, handling, and use of hazardous materials will occur on an infrequent basis in accordance with existing hazardous materials management regulations and SOPs. No hazardous wastes will be generated.

Major Exercises

Major Exercises under all Alternatives, such as RIMPAC and USWEX, include training operations and, in some cases, RDT&E operations. Potential impacts from Major Exercises will be similar to those described above for training . Under Alternative 2, Multiple Strike Groups would conduct Demolition and SPECWAROPs at Barbers Point. This very limited, short-term use of the range would use minor amounts of hazardous materials and generate minor to no hazardous wastes.

4.4.11.3 HEALTH AND SAFETY—BARBERS POINT UNDERWATER RANGE

4.4.11.3.1 No-action Alternative, Alternative 1, and Alternative 2 (Health and Safety—Barbers Point Underwater Range)

HRC Training Operations

Underwater demolition activities would not occur at Barbers Point Underwater Range under No-action Alternative, Alternative 1, or Alternative 2. If held, however, they will use no more than 20 lb net explosive weight of ordnance. The public will not be exposed to the energetic effects of the detonations because the range will be cleared, and these effects will be completely contained within the range. Existing Navy safety protocols for the use of explosives will assure that non-participants will not be in the area during training operations. Accordingly, Navy training operations at Barbers Point Underwater Range under the No-action Alternative will have no effect on public safety.

Demolition activities will be conducted in accordance with COMNAVSURFPAC Instruction 3120.8F (U.S. Department of the Navy, 1993). COMNAVSURFPAC Instruction 3120.8F specifies detonation procedures for underwater ordnance to avoid endangering the public or impacting other non-military activities, such as shipping, recreational boaters, divers, and commercial or recreational fishermen.

Major Exercises

Major Exercises under all Alternatives, such as RIMPAC and USWEX, include training operations and, in some cases, RDT&E operations. Potential impacts from Major Exercises will be similar to those described above for training operations. Under Alternative 2, Multiple - Strike Groups would conduct Demolition and SPECWAROPs at Barbers Point. These operations would involve limited, short-term use of the range away from public use areas.

4.4.12 NAVAL UNDERSEA WARFARE CENTER RANGE

4.4.12.1 SHIPBOARD ELECTRONIC SYSTEMS EVALUATION FACILITY

Table 4.4.12.1-1 lists ongoing operations for the No-action Alternative and proposed operations for Alternatives 1 and 2 at Shipboard Electronic Systems Evaluation Facility (SESEF). Alternative 2 is the preferred alternative.

Table 4.4.12.1-1. Operations Occurring at SESEF

Training Operations (offshore)	
• Shipboard Electronic Systems Evaluation Facility (SESEF) Quick Look Tests	• SESEF System Performance Tests

4.4.12.1.1 Biological Resources (Offshore)—SESEF

4.4.12.1.1.1 No-action Alternative (Biological Resources (Offshore)—SESEF)

HRC RDT&E Operations

NUWC provides underwater target services and range pinger installation services. Under the No-action Alternative, the SESEF range would be in nearly continuous operation, with an average of about four to five tests per day, and an average duration of about 2 hours per test. During SESEF tests, Navy vessels would generate different levels of EMR emissions. The intensities of the EMR fields generated by these operations would decrease rapidly with increasing distance from the source. Impacts to biological resources would be similar to those discussed above.

4.4.12.1.1.2 Alternative 1 (Biological Resources [Offshore]—SESEF)

Increased RDT&E operations

Under Alternative 1, the SESEF range would be in continuous operation, with an average of about 10 to 15 tests per day and an average duration of about 2 hours per test. Impacts would be similar to those discussed above for the No-action Alternative.

4.4.12.1.1.3 Alternative 2 (Biological Resources [Offshore]—SESEF)

Increased RDT&E Operations

Under Alternative 2, the SESEF range would be in continuous operation, with an average of about 12 to 16 tests per day and an average duration of about 2 hours per test. Impacts would be similar to those discussed above for the No-action Alternative.

4.4.12.1.2 Health and Safety—SESEF

4.4.12.1.2.1 No-action Alternative (Health and Safety—SESEF)

HRC Training Operations

No training operations will occur on the SESEF range.

HRC RDT&E Operations

Under the No-action Alternative, the SESEF range will be in nearly continuous operation, with an average of about 10 to 15 tests per day, and an average duration of about 2 hours per test. During SESEF tests, Navy vessels will generate different kinds of electromagnetic radiation (EMR) emissions (e.g., radar). The intensities of the EMR fields generated by these operations will decrease rapidly with increasing distance from the source. However, Navy personnel aboard ship and the recreational or commercial public in the vicinity of the SESEF range potentially will be exposed to low intensity levels of EMR. Any exposures will be very brief because the position of the Navy vessel relative to the receptor will constantly be changing.

With regard to public safety, the Navy does not have exclusive use of the SESEF area, and collisions with commercial and recreational vessels are possible. However, both the personnel at the SESEF facility and the Navy personnel aboard ship constantly monitor the proximity of non-participants and adjust their activities accordingly, thus minimizing the potential for a vessel undergoing a SESEF test to be involved in a collision.

4.4.12.1.2.2 Alternative 1 and Alternative 2 (Health and Safety—SESEF)

Increased RDT&E Operations

Under Alternatives 1 and 2, the SESEF range would be in continuous operation, with an average of about 12 to 16 tests per day and an average duration of about 2 hours per test. During SESEF tests, Navy vessels would generate different kinds of EMR emissions. The intensities of the EMR fields generated by these operations would decrease rapidly with increasing distance from the source. However, neither Navy personnel aboard ship nor the recreational or commercial public in the vicinity of the SESEF range would be exposed to harmful levels of EMR. Any low-intensity exposures would be very brief because the position of the Navy vessel relative to the receptor would constantly be changing

With regard to public safety, the Navy does not have exclusive use of the SESEF area, and collisions with commercial and recreational vessels are possible. However, both the personnel at the SESEF facility and the Navy personnel aboard ship constantly monitor the proximity of non-participants and adjust their activities accordingly, thus minimizing the potential for a vessel undergoing a SESEF test to be involved in a collision.

4.4.12.2 FLEET OPERATIONAL READINESS ACCURACY CHECK SITE (FORACS)

Table 4.4.12.2-1 lists ongoing operations for the No-action Alternative and proposed operations for Alternatives 1 and 2 at Shipboard Electronic Systems Evaluation Facility (SESEF). Alternative 2 is the preferred alternative.

Table 4.4.12.2-1. Operations Occurring at FORACS

Training Operations (offshore)
• Fleet Operational Readiness Accuracy Check Site (FORACS) Tests

4.4.12.2.1 Biological Resources (Offshore)—FORACS

4.4.12.2.1.1 No-action Alternative (Biological Resources [Offshore]—FORACS)

HRC Training Operations

No training operations would occur on the FORACS range.

HRC RDT&E Operations

NUWC provides underwater target services and range pinger installation services. Inshore areas at depths of 40 to 70 ft have a modestly diverse coral community. Fish are generally rare, except where a coral colony or debris provides habitat. Green sea turtles are abundant in the area.

4.4.12.2.1.2 Alternative 1 (Biological Resources [Offshore]—FORACS)

Increased RDT&E Operations

FORACS tests proposed under Alternative 1 would have all the components of the No-action Alternative, but at an increased rate (i.e., from two to five FORACs tests/year). Impacts would be similar to those discussed above for the No-action Alternative.

4.4.12.2.1.3 Alternative 2 (Biological Resources [Offshore]—FORACS)

Increased RDT&E Operations

Impacts would be similar to those discussed above for the No-action Alternative.

Additional Major Exercises—Multiple Strike Group Training

Multiple strike groups would not conduct testing on the FORACS range.

4.4.12.2.2 Health and Safety—FORACS

4.4.12.2.2.1 No-action Alternative (Health and Safety—FORACS)

HRC Training Operations

No training operations will occur on the FORACS range.

HRC RDT&E Operations

NUWC ranges accommodate a variety of RDT&E operations. Most are benign operations that can be executed on a co-use basis with other users of the area. SESEF, located at Barber's Point on the island of Oahu, provides state-of-the-art T&E of combat systems which radiate or receive EM energy. SESEF provides for two-party testing, analysis, and troubleshooting of shipboard EM systems. The SESEF offers a variety of tests that fall into two basic categories: quick-look operability testing and system performance testing.

Communications and electronic devices such as radar, electronic jammers, and other radio transmitters produce EMR. Equipment that produces an electromagnetic field has the potential to generate hazardous levels of EMR. Although the sea space where SESEF and FORACS tests are conducted is unrestricted and is not controlled by NUWC or the Navy, the Navy notifies the public of hazardous activities through the use of NOTMARs. In addition, the NUWC Range Control Officer conducts a visual lookout and radar search of the FORACS range to identify any transient units. The NUWC Range Control Officer determines if range operations can continue. The general public is typically not exposed in areas that can contain EMF hazards from Navy equipment; therefore, the public will not be inadvertently exposed to EMF.

4.4.12.2.2.2 Alternative 1 (Health and Safety—FORACS)

Increased RDT&E Operations

FORACS tests proposed under Alternative 1 would have all the components of the No-action Alternative, and would occur at the same rate (i.e., five FORACs tests/year). The same safety procedures described under the No-action Alternative would be implemented. The use of safety procedures and access clearance would minimize potential safety issues during these operations.

4.4.12.2.2.3 Alternative 2 (Health and Safety—FORACS)

Increase RDT&E Operations

FORACS tests proposed under Alternative 2 would have all the components of Alternative 1, but at an increased rate (i.e., six FORACs tests/year). The same safety procedures described under the No-action Alternative would be implemented. The use of safety procedures and access clearance would minimize potential safety issues during these operations.

Additional Major Exercises—Multiple Strike Group Training

Multiple Strike Groups would not conduct testing on the FORACS range.

4.4.13 KEEHI LAGOON

As detailed in Section 3.4.13, a review of the 14 environmental resources against program operations determined there will be no impacts from site operations under the No-action Alternative, Alternative 1, or Alternative 2 at Keehi Lagoon. Alternative 2 is the preferred alternative. Salvage Operations take place in Keehi Lagoon. Use of Keehi Lagoon does not require control of the airspace above this area. There are no reports of emission from Navy operations affecting the air quality for Keehi Lagoon. Because no ground disturbance or building modifications would occur, there would be no impact to biological resources, cultural resources, or geology and soils. Additionally, there are no known significant archaeological sites at Keehi Lagoon. Geology and soils impacts would be limited to short-term minor disturbance of the lagoon bottom. Water resources effects would include minor, temporary increase in turbidity as the Salvage Operations are implemented. There are no air emission issues from HRC operations associated with Keehi Lagoon. Every effort would be made to limit actions that would decrease visibility in order to have effective training for the divers. Operations associated with this site adhere to policies and regulations governing hazardous materials and waste, health and safety, and noise, as discussed in Appendix C. There is no impact on native or naturalized vegetation or wildlife within Keehi Lagoon. The proposed operations associated with Alternative 1 or Alternative 2 would not affect socioeconomic characteristics, modes of transportation, or utilities demand on Oahu. There are no prehistoric, historic, or archaeological sites associated with Keehi Lagoon. Additionally, there is no planned construction or alteration associated with the Navy that would affect the scenic and visual quality of the site or, land use.

4.4.14 KAENA POINT

As detailed in Section 3.4.14, a review of the 14 environmental resources against program operations determined there will be no impacts from site operations under the No-action Alternative, Alternative 1, or Alternative 2 at Kaena Point. Alternative 2 is the preferred alternative. No building modifications would occur. No air emissions would be generated from site operations unless use of diesel generators would be required for backup power. The site does not affect the existing airspace structure in the region. Because no ground disturbance or building modifications would occur, there would be no impact to biological resources (including the Laysan albatross eggs being accepted from PMRF), cultural resources, or geology and soils. Operation of the radar does require the use of small amounts of hazardous materials for facility maintenance such as paint repair and oil for the radar unit and generates small amounts of hazardous waste. All hazardous materials used and hazardous waste generated would continue to be managed in accordance with Air Force, Federal, and State regulations. There is an established safety zone around the radar unit to prevent electromagnetic radiation hazards exposures, which eliminates health and safety issues. The site is compatible with existing surrounding land uses, and operations are consistent to the maximum extent practicable with the Hawaii Coastal Zone Management Program. No noise is generated by site operations. The site, which employs up to 15 personnel, would not affect local transportation levels of service or utilities. There is no socioeconomic impact from site operations, and the site does not block any prominent public vistas. Existing or proposed operations would not generate any waste streams that could impact local water quality.

4.4.15 MT. KAALA

As detailed in Section 3.4.15, a review of the 14 environmental resources against program operations determined there will be no impacts from site operations under the No-action Alternative, Alternative 1 or Alternative 2 at Mt. Kaala. Alternative 2 is the preferred alternative. No building modifications would occur. No air emissions would be generated from operations unless use of diesel generators would be required for backup power. The site does not affect the existing airspace structure in the region. Because no ground disturbance or building modifications would occur, there would be no impact to biological resources, cultural resources, or geology and soils. HRC operations at this location would continue to use small amounts of hazardous materials and generate hazardous waste associated with facility maintenance to prevent building corrosion. All hazardous materials used and hazardous waste generated would continue to be handled in accordance with Federal and State regulations. The site does not represent any public health and safety issues. The site is compatible with existing surrounding land uses and operations are consistent to the maximum extent practicable with the Hawaii Coastal Zone Management Program. No noise is generated by site operations. The site, which is only operated by a few personnel, would not affect local transportation levels of service or utilities. There is no socioeconomic impact from operations, and the site does not block any prominent public vistas. HRC operations would not generate any waste streams that could impact local water quality.

4.4.16 WHEELER NETWORK SEGMENT CONTROL/PMRF COMMUNICATION SITES

As detailed in Section 3.4.16, a review of the 14 environmental resources against program operations determined there will be no impacts from site operations under the No-action Alternative, Alternative 1 or Alternative 2 at Wheeler Network Communications Control. Alternative 2 is the preferred alternative. No building modifications would occur. No air emissions would be generated from operations at the sites unless use of diesel generators would be required for backup power. The site does not affect the existing airspace structure in the region. Because no ground disturbance or building modifications would occur, there would be no impact to biological resources, cultural resources, or geology and soils. Operation of this site does require small amounts of hazardous materials for facility maintenance and generates small amounts of hazardous waste. All hazardous materials used and hazardous waste generated would continue to be managed in accordance with applicable regulations. There is no electromagnetic radiation generated at the site; therefore, there are no public health and safety issues. The site is compatible with existing surrounding land uses, and operations are consistent to the maximum extent practicable with the Hawaii Coastal Zone Management Program. No noise is generated by operations at the site. The site, which is only manned during operations, employs two to four persons. Such a small work force would not affect local transportation levels of service or utilities. There is no socioeconomic impact from operation of the site, and the site does not block any prominent public vistas. HRC operations at the site would not generate any waste streams that could impact local water quality.

4.4.17 MAUNA KAPU COMMUNICATION SITE

As detailed in Section 3.4.17, a review of the 14 environmental resources against program operations determined there will be no impacts from site operations under the No-action Alternative, Alternative 1, or Alternative 2 at the Mauna Kapu Communication Site. Alternative 2 is the preferred alternative. No building modifications would occur. No air emissions would be generated from operations at the sites unless use of diesel generators would be required for backup power. The site does not affect the existing airspace structure in the region. Because no ground disturbance or building modifications would occur, there would be no impact to biological resources, cultural resources, or geology and soils. Operation of this site does require small amounts of hazardous materials for facility maintenance and generates small amounts of hazardous waste. All hazardous materials used and hazardous waste generated would continue to be managed in accordance with applicable regulations. There is no electromagnetic radiation generated at the site; therefore, there are no public health and safety issues. The site is compatible with existing surrounding land uses, and operations are consistent to the maximum extent practicable with the Hawaii Coastal Zone Management Program. No noise is generated by operations at the site. The site, which is only manned during operations, employs two to four persons. Such a small work force would not affect local transportation levels of service or utilities. There is no socioeconomic impact from operation of the site, and the site does not block any prominent public vistas. HRC operations at the site would not generate any waste streams that could impact local water quality.

4.4.18 MAKUA RADIO/REPEATER/CABLE HEAD

As detailed in Section 3.4.18, a review of the 14 environmental resources against program operations determined there will be no impacts from site operations under the No-action Alternative, Alternative 1 or Alternative 2 at Makua Radio/Repeater/Cable Head. Alternative 2 is the preferred alternative. No building modifications would occur. No air emissions would be generated from operations at the sites unless use of diesel generators would be required for backup power. The site does not affect the existing airspace structure in the region. Because no ground disturbance or building modifications would occur, there would be no impact to biological resources, cultural resources, or geology and soils. Operation of this site does require small amounts of hazardous materials for facility maintenance and generates small amounts of hazardous waste. All hazardous materials used and hazardous waste generated would continue to be managed in accordance with applicable regulations. There is no electromagnetic radiation generated at the site; therefore, there are no public health and safety issues. The site is compatible with existing surrounding land uses, and operations are consistent to the maximum extent practicable with the Hawaii Coastal Zone Management Program. No noise is generated by operations at the site. The site, which is only manned during operations, employs two to four persons. Such a small work force would not affect local transportation levels of service or utilities. There is no socioeconomic impact from operation of the site, and the site does not block any prominent public vistas. HRC operations at the site would not generate any waste streams that could impact local water quality.

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4.5 MAUI

4.5.1 MAUI OFFSHORE

Maui Offshore is used for submarine training. Table 4.5-1 lists ongoing operations for the No-action Alternative and proposed operations for Alternatives 1 and 2 in Maui Offshore. Alternative 2 is the preferred alternative.

Table 4.5-1. Operations Occurring in the Maui Offshore

Research, Development, Testing, and Evaluation (RDT&E) Operations	
• Mine Countermeasures Exercise	• Enhanced Electronic Warfare Training (Alternative 1)
• Portable Undersea Tracking Range (Alternative 1)	• Expanded Training Capability for Transient Air Wings (Alternative 1)
• Large Area Tracking Range Upgrade (Alternative 1)	

4.5.1.1 BIOLOGICAL RESOURCES (OFFSHORE)—MAUI OFFSHORE

4.5.1.1.1 No-action Alternative (Biological Resources [Offshore]—Maui Offshore)

HRC Training Operations and Major Exercises

Submarine operations occur throughout much of the Hawaii Range Complex (HRC). Weapon firing mainly occurs in the Pacific Missile Range Facility Shallow Water Training Range and the training areas within the 100-fathom isobath contour between the islands of Kahoolawe, Maui, Lanai, and Molokai. Most submarine operations occur between approximately 15 fathoms below the water surface and the ocean floor.

Personnel are aware that they are not to harm or harass whales, monk seals, or sea turtles. The Navy has conducted these submarine operations in the Hawaiian Islands for decades, and no harmful effects on these species have been observed to date. Aircrews are trained to visually scan the surface of the water for anomalies. Due in part to this additional emphasis on visual scanning and the availability of extra crew members to conduct such searches, it is unlikely that whales, monk seals, or sea turtles would be undetected when the aircraft are flying at lower altitudes. If animals are detected, the submarine's path can be adjusted. Submarine operations as part of Rim of the Pacific (RIMPAC) exercises are conducted during summer months in part to minimize the potential for impacts to humpback whales in the area. Submarine operations, including existing underwater training areas between the islands of Kahoolawe, Maui, Lanai, and Molokai, follow clearance procedures to ensure the activity will not adversely impact marine mammals and sea turtles. The potential to harm whales, monk seals, or sea turtles from the firing and tracking of non-explosive torpedoes in these training areas, as part of the various Major Exercises, is remote. Personnel are aware that they are not to harm or harass whales, monk seals, or sea turtles. As part of the required clearance before an exercise, the target area will be inspected visually and determined to be clear.

4.5.1.1.2 Alternative 1 (Biological Resources [Offshore]—Maui Offshore)

Increased Tempo and Frequency of Training Operations

Alternative 1 would include up to six Undersea Warfare Exercises per year (an increase of two exercises), the RIMPAC biennial exercise, and two Strike Groups conducting training operations simultaneously in the HRC, as well as other continuing training operations (See Table 2.2.3.1-1). The number of training operations would increase, however, the likelihood of a similar increase in adverse impacts to biological resources would be small because personnel are aware that they are not to harm or harass whales, monk seals, or sea turtles, and because the Navy would monitor its operations for potential impacts.

HRC Enhancements

The Portable Undersea Tracking Range would be developed to provide submarine training in areas where the ocean depth is between 300 and 2,000 feet (ft) and at least 3 nautical miles from land (Figure 2.2.3.5.3-1). The underwater range instrumentation hardware could be deployed, and a temporary range created anywhere within the region shown in Figure 2.2.3.5.3-1. The Portable Undersea Tracking Range would also be used in areas around Maui with water depths less than 300 ft. When training is complete, the Range equipment could be recovered and moved to another location. All of these areas have been used for submarine training since World War II. Other than the temporary disturbance to marine species during instrumentation installation and recovery, no impacts would be expected to occur.

4.5.1.1.3 Alternative 2 (Biological Resources (Offshore)—Maui Offshore)

Increased Tempo and Frequency of Training Operations

Under Alternative 2, the tempo of training operations would be increased and the frequency of operations could also increase. However, effects to marine mammals and sea turtles would be minor and similar to those occurring during current training operations, as described above.

4.5.2 MAUI SPACE SURVEILLANCE SYSTEM

As detailed in Section 3.5.2, a review of the 14 environmental resources against program operations determined there would be no impacts from site operations under the No-action Alternative, Alternative 1, or Alternative 2 at the Maui Space Surveillance Site. Alternative 2 is the preferred alternative. No building modifications would occur. No air emissions would be generated from site operations unless use of diesel generators would be required for backup power. The site does not affect the existing airspace structure in the region. Because no ground disturbance or building modifications would occur as a result of proposed operations, there would be no impact to biological resources, cultural resources, or geology and soils. The use of hazardous materials and generation of hazardous waste at this site would be in accordance with applicable regulations. There are established safety zones around electromagnetic radiation hazards, which eliminate health and safety issues. The site is compatible with existing surrounding land uses. No noise is generated by site operations, and the site is operated by up to 60 persons. This small staff would not affect local transportation levels of service or utilities. There is no socioeconomic impact from site operations, and the site does not block any prominent public vistas. Operations would not generate any waste streams that could impact local water quality.

4.5.3 SHALLOW-WATER MINEFIELD SONAR TRAINING AREA

As detailed in Section 3.5.3, a review of the 14 environmental resources against program operations determined there would be no impacts from site operations under the No-action Alternative, Alternative 1, or Alternative 2 at the Shallow-water Minefield Sonar Training Area. Alternative 2 is the preferred alternative. Use of this site does not require control of the airspace above this area. There are no reports of emissions from Navy operations affecting the air quality in the training area. Operations associated with this site adhere to policies and regulations governing hazardous materials and waste, health and safety, and noise, as discussed in Appendix C. During the preparation of a 1997 Environmental Assessment, exploration of the site indicated no archeological or historic submerged sites or coral reefs in the area. The training area is located within the Hawaiian Island Humpback Whale National Marine Sanctuary; however, the inert shapes and mine detection equipment used in operations at the shallow water training area would be clean and free from residual materials and invasive species from prior use, and no environmental effects on biological resources are anticipated. Since the shapes will rest on the ocean bottom, they would pose no entanglement hazard to marine mammals and sea turtles. A minimum of one inspection per year of the training area and mooring cables/anchor chain is performed. The site is compatible with existing surrounding land uses. There are no earth resources (land forms, geology and soils) that are adversely affected by operations associated with the site. HRC operations would not affect local transportation levels of service or utilities. There is no planned construction or alteration associated with the Navy that would affect the scenic and visual quality of the site. The socioeconomic characteristics of Maui are not affected by operations associated with this training area. Additionally, water resources would not be affected by the movement of submarines during the operations.

4.5.4 MAUI HIGH PERFORMANCE COMPUTING CENTER

As detailed in Section 3.5.4, a review of the 14 environmental resources against program activities determined there would be no impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2 at the Maui High Performance Computing Center. Alternative 2 is the preferred alternative. No building modifications would occur. No air emissions would be generated from operations at the sites unless use of diesel generators would be required for backup power. The site does not affect the existing airspace structure in the region. Because no ground disturbance or building modifications would occur, there would be no impact to biological resources, cultural resources, or geology and soils. Operation of this site does require small amounts of hazardous materials for facility maintenance and generates small amounts of hazardous waste. All hazardous materials used and hazardous waste generated would continue to be managed in accordance with applicable regulations. There is no electromagnetic radiation generated at the site; therefore, there are no public health and safety issues. The site is compatible with existing surrounding land uses. No noise is generated by operations at the site. HRC operations would not affect local transportation levels of service or utilities. There is no socioeconomic impact from operation of the site, and the site does not block any prominent public vistas. HRC operations at the site would not generate any waste streams that could impact local water quality.

4.5.5 SANDIA MAUI HALEAKALA FACILITY

As detailed in Section 3.5.5, a review of the 14 environmental resources against program activities determined there would be no impacts from site activities under the No-action Alternative, Alternative 1, or Alternative 2 at the Sandia Maui Haleakala Facility. Alternative 2 is the preferred alternative. No building modifications would occur. No air emissions would be generated from operations at the sites unless use of diesel generators would be required for backup power. The site does not affect the existing airspace structure in the region. Because no ground disturbance or building modifications would occur, there would be no impact to biological resources, cultural resources, or geology and soils. Operation of this site does require small amounts of hazardous materials for facility maintenance and generates small amounts of hazardous waste. All hazardous materials used and hazardous waste generated would continue to be managed in accordance with applicable regulations. There is no electromagnetic radiation generated at the site; therefore, there are no public health and safety issues. The site is compatible with existing surrounding land uses. No noise is generated by operations at the site. HRC operations would not affect local transportation levels of service or utilities. There is no socioeconomic impact from operation of the site, and the site does not block any prominent public vistas. HRC operations at the site would not generate any waste streams that could impact local water quality.

4.6 HAWAII

4.6.1 POHAKULOA TRAINING AREA

4.6.1.1 POHAKULOA TRAINING AREA

Table 4.6.1.1-1 lists ongoing operations for the No-action Alternative and proposed operations for Alternatives 1 and 2 at Pohakuloa Training Area (PTA). Alternative 2 is the preferred alternative.

Table 4.6.1.1-1. Operations Occurring at Pohakuloa Training Area

Training Operations (Land)	Research, Development, Testing, and Evaluation (RDT&E) Operations (Land)
• Electronic Combat Operations	• Large Area Tracking Range Upgrade (Alternative 1)
• Bombing Exercises	• Enhanced Electronic Warfare Training (Alternative 1)
• Special Warfare Operations (SPECWAROPS)	• Expanded Training Capability for Transient Air Wings (Alternative 1)
• Live Fire Exercise (LFX)	
• Strike Warfare Exercise	
• Humanitarian Assistance/Non-combatant Evacuation Operations	

4.6.1.1.1 Airspace—Pohakuloa Training Area

4.6.1.1.1.1 No-action Alternative (Airspace—Pohakuloa Training Area)

HRC Training Operations

HRC training operations can include live fire exercises (LFXs) at PTA. These types of operations are confined to the special use airspace R-3103 located above the range associated with PTA. Air activity is controlled and coordinated by PTA Range Control. For operations including 10 or more aircraft, the Bradshaw Army Airfield manager submits a Notice to Airmen (NOTAM) to Honolulu Flight Service Station to be published as a Honolulu Local NOTAM and as a Class D NOTAM. The Bradshaw Army Airfield manager provides this information to the airfield Air Traffic Information Service (U.S. Army Garrison, Hawaii, 1996).

Major Exercises

Major Exercises such as Rim of the Pacific (RIMPAC) and Undersea Warfare Center (USWEX) include combinations of ongoing training operations. For PTA this includes LFX and Special Warfare Operations (SPECWAROPS). These types of operations are confined to the special use airspace R-3103 located above the range associated with PTA. Air activity is controlled and coordinated by PTA Range Control. For operations including 10 or more aircraft, the Bradshaw Army Airfield manager submits a NOTAM to Honolulu Flight Service Station to be published as a Honolulu Local NOTAM and as a Class D NOTAM. The Bradshaw Army Airfield manager provides this information to the airfield Air Traffic Information Service (U.S. Army Garrison, Hawaii, 1996).

RIMPAC planning conferences, which include coordination with the Federal Aviation Administration (FAA), are conducted beginning in March of the year prior to each RIMPAC.

Each of the USWEX training operations, up to four per year, will include coordination with the FAA well in advance of the 3- or 4-day exercise.

4.6.1.1.1.2 Alternative 1 (Airspace—Pohakuloa Training Area)

Increased Tempo and Frequency of Training Operations

Increased training operations could include additional LFXs at PTA. Potential effects would be as described above for the HRC Training Operations.

HRC Enhancements

HRC enhancements would not include any operations at PTA.

4.6.1.1.1.3 Alternative 2 (Airspace—Pohakuloa Training Area

Increased Tempo and Frequency of Training Operations

Increased tempo and frequency of training operations could result in additional LFXs at PTA. Potential effects would be as described above for the HRC Training Operations.

Additional Major Exercises—Multiple Strike Group Training

Multiple Strike Group training could include additional LFXs at PTA. Potential effects would be as described above for the HRC Training Operations.

4.6.1.1.2 Biological Resources (Terrestrial)—Pohakuloa Training Area

4.6.1.1.2.1 No-action Alternative (Biological Resources (Terrestrial)—Pohakuloa Training Area)

HRC Training Operations and Major Exercises

Vegetation

LFXs, which are confined to the Impact Area, are conducted at PTA as part of ongoing training. RIMPAC and USWEX strike warfare, and close air support operations are also confined to the Impact Area. SPECWAROPS primarily use existing trails and roads. Personnel review training overlays that identify the insertion points and any nearby restricted areas. Although the Impact Area has not been surveyed for biological resources—due to the risks posed by unexploded ordnance—impacts from ordnance and other munitions landing over a long period of use have most likely already degraded the habitat. In addition, numerous ordnance-related fires over the years have tended to favor non-native invasive species over Native Hawaiian species, which generally are not fire-adapted and recover slowly after a fire.

Military activities, other than fire, seem to have had little impact on rare plants. Approximately 25 percent of the installation is covered by lava, with little vegetative development. Dust from operations can also negatively impact a threatened or endangered species, as listed in Table 3.6.1.1.2-1, if it is growing close to a road. However, many of the threatened and endangered plants inhabit remote areas of PTA with little or no chance of being impacted by military activity. (Shaw, 1997)

An Integrated Natural Resources Management Plan (INRMP) has been prepared to address protection and management of resources for PTA. Compliance with this plan and the Ecosystem Management Plan during operations and exercises further reduces the potential for effects of training operations on biological resources and limits the potential for introduction of invasive weed plant species. The risk of impacting threatened or endangered plants can be further minimized by locating training operations away from areas with these species whenever possible. The effects of continued training operations on biological resources within the Impact Area will be minor in the context of the overall quantity of ordnance deliveries to this area from various training operations.

Air-to-surface missile training as part of strike warfare at PTA is confined to the special use airspace R-3103 associated with Bradshaw Army Airfield and the impact area associated with PTA. Air activity is coordinated by PTA Range Control. The following restrictions from the PTA External Standard Operating Procedures (SOPs) are applicable to all training areas on the installation:

- All off-road driving is prohibited
- All fenced areas are off-limits
- All lava tubes and sinkholes are off-limits
- Digging is only permitted in previously disturbed areas

Wildlife

The U.S. National Park Service, through an interagency agreement, fenced approximately 6,500 acres to keep feral goats, sheep, and pigs from disturbing native habitat and listed species. The U.S. Department of Agriculture, Wildlife Services staff removes the feral animals. Explosive ordnance disposal specialists assist in these efforts due to safety considerations. (U.S. Army Corps of Engineers, 2001)

For missile and weapons systems, PTA Safety establishes criteria for the safe execution of the test operation in the form of Range Safety Approval and Range Safety Operational Plan documents. These plans are required for all weapon and target systems using PTA. The plans include the allowable launch and flight conditions, and flight control methods necessary to contain the missile flight and impacts within the predetermined impact hazard areas. PTA safety criteria also provide for protection of biological and cultural resources. The impact area is in a barren and isolated area with restricted access.

Native birds common to PTA, such as honeycreepers (‘apapane and Hawaiian ‘amakihi), can be startled or flushed by intermittent noise associated with training operations. The ‘io (Hawaiian hawk) and nene, which are the only endangered forest birds seen on PTA, can also be startled or flushed. These effects, however, are temporary and the birds continue to return to the area following completion of operations. Compliance with the PTA INRMP and Ecosystem Management Plan during operations can further reduce the potential for effects on wildlife. The continuance of current training operations is not likely to adversely affect the long-term well-being, reproduction rates, or survival of these native or listed species.

Environmentally Sensitive Habitat

The U.S. Fish and Wildlife Service (USFWS) determined that critical habitat for the listed plant species was not necessary since the PTA INRMP and Ecosystem Management Plan encompass management actions that will benefit the listed species for which critical habitat was originally proposed (Federal Register, 2003).

The critical habitat established for the endangered palila, a finch-billed honeycreeper, is located outside the areas likely to be affected by the current training operations.

4.6.1.1.2.2 Alternative 1 (Biological Resources (Terrestrial)—Pohakuloa Training Area)

Increased Tempo and Frequency of Training Operations and Major Exercises

While training operations would increase in number (See Table 2.2.3.1-1), the likelihood of a similar increase in adverse impacts to biological resources is small since different areas of PTA would be used for each independent activity, and the actual area used for LFX would be affected at different times.

Vegetation

Operations would take place at existing locations; no expansion of the area would be involved. Compliance with the PTA INRMP and Ecosystem Management Plan during increased training operations would minimize the potential for effects on vegetation, as well as limit the potential for introduction of invasive plant species. The risk of impacting threatened or endangered plants could be further minimized by continuing to locate training operations away from areas with native, threatened, or endangered plant species, whenever possible.

Wildlife

Impacts to wildlife would be similar to those described previously for the No-action Alternative. The increased training operations would comply with the PTA INRMP and Ecosystem Management Plan, which could further reduce the potential for effects on wildlife.

Environmentally Sensitive Habitat

The critical habitat established for the endangered palila is located outside the areas likely to be affected by the increased training and Major Exercises.

HRC Enhancements

No new construction is expected and modifications to existing facilities for the LATR upgrade would not impact biological resources.

4.6.1.1.2.3 Alternative 2 (Biological Resources (Terrestrial)—Pohakuloa Training Area

Increased Tempo and Frequency of Training Operations

Under this portion of Alternative 2, the tempo of training operations would be increased and frequency of operations could also be increased. Wildlife exhibits a wide variety of responses to noise. Some species are more sensitive to noise disturbances than others. Literature on the effects on wildlife from noise suggests that common responses to noise events include a startle or fright response, and ultimately, habituation. It has been reported that intensity and duration of the startle response decreases with the number and frequency of exposure. (Department of the Navy, 2006)

Additional Major Exercises—Multiple Strike Group Training

Up to three Strike Groups would visit the area for up to 30 days per exercise. The exercises proposed would be similar to those occurring during RIMPAC and USWEX, with impacts to biological resources similar to those described above.

4.6.1.1.3 Cultural Resources—Pohakuloa Training Area

4.6.1.1.3.1 No-action Alternative (Cultural Resources—Pohakuloa Training Area)

HRC Training Operations and Major Exercises

Live Fire Exercises

LFXs involve operations within the PTA impact area and along designated, heavily disturbed roads and trails.

Approximately 30 percent of PTA has been surveyed for cultural resources, and approximately 300 archaeological and traditional Hawaiian sites have been identified; some of the sites are eligible for inclusion in the National Register. Some of the identified sites are located in proximity to existing trails and roads; however, none are located within the impact training area (U.S. Army Garrison, Hawaii, and U.S. Army Corps of Engineers, 1998; U.S. Department of the Navy, Commander, Third Fleet, 2002). Personnel review training overlays that identify insertion points and nearby restricted areas and sensitive biological and cultural resource areas are avoided (U.S. Department of the Navy, Commander, Third Fleet, 2002). In the event unexpected cultural materials are encountered (particularly human remains) during LFX, operations in the immediate vicinity of the find will cease and the Schofield Barracks Cultural Resources Manager will be contacted. In addition, if the alignment of trails requires alteration or grading, or other ground disturbing operations are required, coordination with the Schofield Barracks Cultural Resources Manager would be required. Because of the required preplanning of LFX operations and the implementation of the described mitigation measures, no impacts are expected to cultural resources at PTA.

The Army will continue to provide Native Hawaiians with access to traditional religious and cultural properties, in accordance with the American Indian Religious Freedom Act and Executive Order 13007, on a case-by-case basis.

4.6.1.1.3.2 Alternative 1 (Cultural Resources—Pohakuloa Training Area)

Increased Tempo and Frequency of Training Operations and Major Exercises

Training operations and major exercises under Alternative 1 could increase the potential for impacts to occur to cultural resources in sensitive areas. For PTA, this would be most apparent along the roads and trails used for LFX, where there are identified archaeological sites. With continued implementation of mitigations specified for the No-action Alternative, no impacts would be anticipated for the increase in tempo and number of training operations that make up Alternative 1. If no grading, widening, or other alteration of the roads and trails widths or alignments is required, the increased potential for adverse effects is minimal. However, if alteration to the roads and trails is necessary, coordination with the Schofield Barracks Cultural

Resources Manager would be completed prior to the changes (see above analysis under the No-action Alternative for LFX).

HRC Enhancements

Large Area Tracking Range Upgrade

To support Large Area Tracking Range, a new ground relay station would be added to PTA. The relay station would not require new construction, but would be added to an existing building. There are only a few scattered military buildings within the PTA, none of which have been recommended as eligible for inclusion in the National Register and none of which are located within the region of influence for LFX. Most of the PTA buildings are located within the cantonment/Bradshaw Army Airfield, 138 of which have been determined eligible for the National Register for their association with World War II. Potential impacts if the relay station is added to one of the historic buildings within the cantonment/Bradshaw Army Airfield are analyzed in Section 4.6.1.2.3.

4.6.1.1.3.3 Alternative 2 (Cultural Resources—Pohakuloa Training Area)

Increased Tempo and Frequency of Training Operations

The tempo and frequency of training operations over and above Alternative 1 could increase the potential for impacts to cultural resources in sensitive areas. See discussion under Alternative 1. As with Alternative 1, the continued use of mitigations mentioned earlier would minimize potential impacts to cultural resources.

Additional Major Exercises—Multiple Strike Group Training

Elements of Major Exercises with the potential to affect cultural resources have been analyzed above for the No-action Alternative and Alternative 1.

4.6.1.1.4 Health and Safety—Pohakuloa Training Area

4.6.1.1.4.1 No-action Alternative (Health and Safety—Pohakuloa Training Area)

Under the No-action Alternative, existing operations at PTA will continue and there will be no adverse impacts to health and safety. PTA takes every reasonable precaution during planning and execution of operations and training operations to prevent injury to human life or property.

HRC Training Operations

Under the No-action Alternative, LFXs, which are confined to the Impact Area, are conducted at PTA as part of ongoing HRC training operations. Every reasonable precaution is taken during the planning and execution of the operation of training operations to prevent injury to human life or damage to property. Specific safety plans have been developed to ensure that each operation is in compliance with applicable policy and regulations, and to ensure that the general public and range personnel and assets are provided an acceptable level of safety. The impact area is in an isolated area with restricted access located away from the civilian population. Safety and health precautions are covered in external SOPs and are briefed by the PTA Operations Center.

Major Exercises

Strike Warfare exercises, LFX, and SPECWAROPS exercises routinely occur at PTA. Every reasonable precaution is taken during the planning and execution of training operations to prevent injury to human life or damage to property. Specific safety plans have been developed to ensure that each operation is in compliance with applicable policy and regulations and to ensure that the general public and range personnel and assets are provided an acceptable level of safety.

For missile and weapons systems, the PTA Safety Office establishes criteria for the safe execution of training operations in the form of Range Safety Approval and Range Safety Operational Plan documents, which are required for all weapon and target systems using PTA. These include the allowable launch and flight conditions and flight control methods to contain the missile flight and impacts within the predetermined impact hazard areas that have been determined to be clear of nonessential personnel and aircraft.

The impact area is in an isolated area with restricted access located away from the civilian population. Safety and health precautions are covered in external SOPs and are briefed by the PTA Operations Center. Impacts from the continuing Major Exercises at PTA on safety and health are not anticipated.

4.6.1.1.4.2 Alternative 1 (Health and Safety—Pohakuloa Training Area)

Increased Tempo and Frequency of Training Operations and Major Exercises

Alternative 1 would include up to six USWEX per year (an increase of two exercises), the RIMPAC biennial exercise, and two Strike Groups conducting training operations simultaneously in the HRC, as well as other continuing training operations, an increase of approximately 9 percent. While training operations would increase in number, it is anticipated that existing SOPs and specific safety plans that have been developed would ensure that the general public and range personnel and assets are provided an acceptable level of safety.

HRC Enhancements

Under Alternative 1 an upgrade to the existing Large Area Tracking Range would include modifications to existing facilities at the PTA. No construction would be required, and the proposed minor modifications would be to expand training operation capability. Existing SOPs and specific safety plans have been developed and would ensure that the general public and range personnel and assets are provided an acceptable level of safety.

4.6.1.1.4.3 Alternative 2 (Health and Safety—Pohakuloa Training Area)

Increased Tempo and Frequency of Training Operations

Under Alternative 2, the tempo of training operations would be increased and the frequency of operations could also increase. Although the number of operations would increase, the types of operations would remain the same.

Additional Major Exercises—Multiple Strike Group Training

Up to three Strike Groups would be added to the Major Exercises occurring in the HRC. These ships would not be home ported in Hawaii, but would be in the area for up to 30 days per exercise. The exercises proposed would be similar to those occurring during Major Exercises, with potential impacts to health and safety at PTA similar to those described in Section 4.6.1.1.4.1. Existing SOPs and specific safety plans that have been developed would ensure that the general public and range personnel and assets are provided an acceptable level of safety.

4.6.1.1.5 Noise—Pohakuloa Training Area

Impacts of noise on human receptors are evaluated based on whether or not a noise event would exceed Department of Defense (DoD) or Occupational Safety and Health Administration (OSHA) guidelines. Potential noise effects on wildlife are discussed in Section 4.6.1.1.2, Biological Resources (Terrestrial).

4.6.1.1.5.1 No-action Alternative (Noise—Pohakuloa Training Area

HRC Training Operations

Under the No-action Alternative, LFXs, which are confined to the Impact Area, are conducted at PTA as part of ongoing HRC training operations. PTA maintains a hearing protection program that includes monitoring the hearing of personnel exposed to high noise levels and identifying and posting notification of noise hazard areas. Personnel required to work in noise hazard areas are required to use appropriate hearing protection and to bring noise levels within established safety levels. The impact area is in an isolated area with restricted access located away from the civilian population.

Major Exercises

Major Exercises such as RIMPAC and USWEX include combinations of ongoing training operations. For PTA this includes LFX and SPECWAROPS. LFX and SPECWAROPS typically occur at PTA as part of Major Exercises. There will be no increase to existing noise levels during the continuing exercises listed above. The total perceived noise will be the combination of ambient noise and noise from the exercises. Noise sources from the exercise will include the use of helicopters and small arms munitions.

4.6.1.1.5.2 Alternative 1 (Noise—Pohakuloa Training Area)

Increased Tempo and Frequency of Training Operations and Major Exercises

Alternative 1 would include up to six USWEX per year (an increase of two exercises), the RIMPAC biennial exercise, and two Strike Groups conducting training operations simultaneously in the HRC, as well as other continuing training operations, an increase of approximately 9 percent. While training operations would increase in number, the types of operations would be the same and there would be no anticipated increase to the level of noise produced.

HRC Enhancements

Under Alternative 1 an upgrade to the existing Large Area Tracking Range would include modifications to existing facilities at the PTA. No construction would be required, and the proposed minor modifications would be to expand training operation capability. The Large Area Tracking Range upgrade would not produce additional noise levels as the proposed expansion would be contained within existing facilities at PTA.

4.6.1.1.5.3 Alternative 2 (Noise—Pohakuloa Training Area)

Increased Tempo and Frequency of Training Operations

Under Alternative 2, the tempo of training operations would be increased and the frequency of operations could also increase. Although the number of operations would increase, the types of operations would remain the same and there would be no anticipated increase in the level of noise produced.

Additional Major Exercises—Multiple Strike Group Training

Up to three Strike Groups would be added to the major exercises occurring in the HRC. These ships would not be home ported in Hawaii, but would be in the area for up to 30 days per exercise. The exercises proposed would be similar to those occurring during RIMPAC and USWEX.

4.6.1.2 BRADSHAW ARMY AIRFIELD

Table 4.6.1.2-1 lists ongoing operations for the No-action Alternative and proposed operations for Alternatives 1 and 2 at Bradshaw Army Airfield. Alternative 2 is the preferred alternative.

Table 4.6.1.2-1. Operations Occurring at Bradshaw Army Airfield

Training Operations	
• Special Warfare Operations (SPECWAROPS)	• Command and Control (Land)
• Air Operations	• Aircraft Support Operations

4.6.1.2.1 Airspace—Bradshaw Army Airfield

4.6.1.2.1.1 No-action Alternative (Airspace—Bradshaw Army Airfield)

HRC Training Operations

HRC training operations can include localized use of rotary wing aircraft within predefined areas for reconnaissance and survey inserts. Helicopter raids will involve approximately six helicopters over a 2- to 6-hour period. Airspace use within the Bradshaw Army Airfield Class D airspace will be coordinated with the PTA Range Control.

Major Exercises

Major Exercises such as RIMPAC include training operations as described above. Helicopter raids will involve approximately six helicopters over a 2- to 6-hour period. Airspace use within the Bradshaw Army Airfield Class D airspace will be coordinated with the PTA Range Control.

RIMPAC planning conferences, which include coordination with the FAA, are conducted beginning in March of the year prior to each RIMPAC.

4.6.1.2.1.2 Alternative 1 (Airspace—Bradshaw Army Airfield)

Increased Tempo and Frequency of Training Operations

Increased training operations could result in minor additional use of rotary wing aircraft within predefined areas for reconnaissance and survey inserts as described above under HRC Training Operations.

4.6.1.2.1.3 Alternative 2 (Airspace—Bradshaw Army Airfield)

Increased Tempo and Frequency of Training Operations

Increased tempo and frequency of training operations could result in additional LFXs at PTA. Potential effects would be as described above for the HRC Training Operations.

Additional Major Exercises—Multiple Strike Group Training

Multiple Strike Group training could include additional LFXs at PTA. Potential effects would be as described above for the HRC Training Operations.

4.6.1.2.2 Biological Resources (Terrestrial)—Bradshaw Army Airfield

4.6.1.2.2.1 No-action Alternative (Biological Resources (Terrestrial)—Bradshaw Army Airfield)

HRC Training Operations and Major Exercises

Vegetation

Current use of the Bradshaw Army Airfield includes Command and Control (C2), Aircraft Support Operations, and SPECWAROPS (generally helicopter raids and survey and reconnaissance insertions). These operations are limited in scope and are not anticipated to impact the areas beyond the airfield itself. All personnel entering Bradshaw Army Airfield will be briefed on the guidelines set forth in the PTA Ecosystem Management Plan. Adherence to these guidelines will limit the potential for introduction of invasive plant species and reduce any risk of fire or damage due to training operations.

Wildlife

Since the area has been cleared for the runway, only small mammals and birds are likely to be in the region of influence. Current operations are limited in scope and are not anticipated to impact the areas beyond the airfield itself.

Although the potential exists for transient threatened or endangered birds to be in the area, such occurrences are considered rare, especially at the airfield. Compliance with the PTA INRMP and Ecosystem Management Plan during operations and exercises reduces the potential for adverse effects to wildlife.

Environmentally Sensitive Habitat

Critical habitat for the endangered palila established both north and southeast of Bradshaw Army Airfield will not be affected by operations.

4.6.1.2.2.2 Alternative 1 (Biological Resources (Terrestrial)—Bradshaw Army Airfield)

Increased Tempo and Frequency of Training Operations

Alternative 1 (See Table 2.2.3.1-1) would include an increase in operations. Although training operations would increase in number, the likelihood of a similar increase in adverse impacts to biological resources is small since the area has been cleared for the runway and only small mammals and birds are likely to be in the affected areas.

Vegetation

Operations would take place in current existing locations; no expansion of the area would be involved. Compliance with the PTA INRMP and Ecosystem Management Plan during these increased training operations should minimize the effects on vegetation, as well as limit the potential for introduction of weed plant species. The risk of impacting threatened or endangered plants could be minimized by continuing to locate training operations away from areas with native, threatened, or endangered plant species whenever possible.

Wildlife

There is additional suitable habitat nearby for birds such as the endangered ʻio and nene to use if they temporarily leave the area affected by an increase in training operations. It is not likely that a bird or any other species of wildlife on Bradshaw Army Airfield would be injured or killed since compliance with the PTA INRMP and Ecosystem Management Plan help to reduce the potential for effects on wildlife. An increase in training operations is unlikely to adversely affect the long-term well-being, reproduction rates, or survival of these native or listed birds or other forms of wildlife in the area.

Environmentally Sensitive Habitat

The critical habitat established for the endangered palila is located outside the areas likely to be affected by the increased training operations.

4.6.1.2.2.3 Alternative 2 (Biological Resources (Terrestrial)—Bradshaw Army Airfield

Increased Tempo and Frequency of Training Operations

Under Alternative 2, the tempo of training operations would be increased and the frequency of operations could also increase. Literature on the effects of noise on wildlife suggests that common responses to noise events include a startle or fright response, and ultimately, habituation. The intensity and duration of startle responses decrease with the number and frequency of exposures. (U.S. Department of the Navy, 2006)

Additional Major Exercises—Multiple Strike Group Training

Up to three Strike Groups would visit the area for up to 30 days per exercise. The exercises proposed would be similar to those occurring during RIMPAC and USWEX, with impacts to biological resource similar to those described above.

4.6.1.2.3 Cultural Resources—Bradshaw Army Airfield

4.6.1.2.3.1 No-action Alternative (Cultural Resources—Bradshaw Army Airfield)

HRC Training Operations and Major Exercises

There are no training operations or Major Exercises actions with the potential to affect cultural resources at Bradshaw Army Airfield.

4.6.1.2.3.2 Alternative 1 (Cultural Resources—Bradshaw Army Airfield)

Increased Tempo and Frequency of Training Operations

For actions associated with Alternative 1, there are no training operations with the potential to affect cultural resources at Bradshaw Army Airfield.

HRC Enhancements

Large Area Tracking Range Upgrade

To support the Large Area Tracking Range, the proposed new ground relay station would likely be added to one of the buildings within the PTA cantonment/Bradshaw Army Airfield. There are 138 identified historic buildings within this area. If the decision is made to add the relay station to one of the non-historic buildings, then no adverse effects are expected. To avoid adverse effects, the final placement and design of the relay station would be coordinated with the Schofield Barracks Cultural Resources Manager.

4.6.1.2.3.3 Alternative 2 (Cultural Resources—Bradshaw Army Airfield)

Increased Tempo and Frequency of Training Operations

There are no training operations with the potential to affect cultural resources at Bradshaw Army Airfield.

Additional Major Exercises—Multiple Strike Group Training

For actions associated with Alternative 2, there are no major exercises involving multiple Strike Group training with the potential to affect cultural resources at Bradshaw Army Airfield.

4.6.1.3 KAWAIHAE PIER

Table 4.6.1.3-1 lists ongoing operations for the No-action Alternative and proposed operations for Alternatives 1 and 2 at Kawaihae Pier. Alternative 2 is the preferred alternative.

Table 4.6.1.3-1. Operations Occurring at Kawaihae Pier

Training Operations (Offshore)	
• Expeditionary Assault	• Special Warfare Operations (SPECWAROPS)

4.6.1.3.1 Biological Resources (Terrestrial and Offshore)—Kawaihae Pier

4.6.1.3.1.1 No-action Alternative (Biological Resources (Terrestrial and Offshore)—Kawaihae Pier)

HRC Training Operations and Major Exercises

Vegetation

Amphibious landings are restricted to specific areas of designated beaches. The small beach area located immediately adjacent to the pier contains no vegetation. No threatened or endangered vegetation has been identified in the Kawaihae Harbor area (U.S. Department of the Navy, 2002). Vehicles are restricted to existing roads, trails, and other disturbed areas and do not use undisturbed, off-road areas where they might harm vegetation. Expeditionary Assault landing personnel are briefed on existing procedures for entering the harbor and unloading equipment and supplies at the boat ramp. These procedures include inspections by appropriate Federal and/or State agencies of vehicles and equipment from foreign countries to prevent the introduction of invasive or alien species. A recycling wash rack is used to clean foreign country vehicles and equipment prior to back-loading to control the spread of alien species.

Wildlife

No threatened or endangered species have been identified in the Kawaihae Harbor area (U.S. Department of the Navy, 2002). The potential for adverse effects on biological resources related to offloading and loading vehicles and equipment is minimal. These operations use existing ramps and a small open beach adjacent to the ramps. Reef or coral areas will be avoided. Expeditionary Assault landing personnel are briefed on existing procedures for entering the harbor and unloading equipment and supplies at the boat ramp. These procedures include inspections by appropriate Federal and/or State agencies of vehicles and equipment from foreign countries to prevent the introduction of alien species. A recycling wash rack is used to clean foreign country vehicles and equipment prior to back-loading to control the spread of alien species.

The Expeditionary Assault exercises will continue to be conducted in compliance with Executive Order (EO) 13089, *Coral Reef Protection*. Before each major landing exercise is conducted, a hydrographic survey is performed to map out the precise transit routes through sandy bottom areas. Within 1 hour of initiation of the Expeditionary Assault landing operations, the landing routes and beach areas are determined to be clear of marine mammals and sea turtles. If any are seen, the exercise will be delayed until the animals leave the area. During the landing the crews follow established procedures, such as having a designated lookout watching for other vessels, obstructions to navigation, marine mammals (whales or monk seals), or sea turtles. The water on this leeward side of the island provides habitat for humpback mother and calf pods and for resting dolphin pods. No threatened or endangered species have been identified within the harbor (U.S. Department of the Navy, 2002).

During SPECWAROPS exercises, crews for amphibious inserts follow established procedures, such as having a designated lookout watching for other vessels, obstructions to navigation, marine mammals (whales or monk seals), or sea turtles. Personnel review training overlays that identify the insertion points and any nearby restricted areas; sensitive biological resource areas are avoided.

Environmentally Sensitive Habitat

The Kawaihae Harbor and Small Boat Basin are not included in the Hawaiian Islands Humpback Whale National Marine Sanctuary boundaries, and no critical habitat has been designated.

4.6.1.3.1.2 Alternative 1 (Biological Resources (Terrestrial and Offshore)—Kawaihae Pier)

Increased Tempo and Frequency of Training Operations and Major Exercises

No increases in training operations and major exercises at Kawaihae Pier are expected. Impacts would be the same as those discussed above for the No-action Alternative.

4.6.1.3.1.3 Alternative 2 (Biological Resources (Terrestrial and Offshore)—Kawaihae Pier)

Increased Tempo and Frequency of Training Operations

Under Alternative 2, the tempo of training operations would be increased and the frequency of operations could also increase. Literature on the effects of noise on wildlife suggests that common responses to noise events include a startle or fright response, and ultimately, habituation. It has been reported that the intensity and duration of startle responses decrease with the number and frequency of exposures. (U.S. Department of the Navy, 2006)

Additional Major Exercises—Multiple Strike Group Training

Up to three Strike Groups would visit the area for up to 30 days per exercise. The exercises would be similar to those occurring during RIMPAC and USWEX, with impacts to biological resource similar to those described above for the No-action Alternative.

4.7 MAJOR EXERCISES CONCLUSIONS

The conclusions of Major Exercises are being developed.

4.8 ADVERSE ENVIRONMENTAL EFFECTS THAT CANNOT BE AVOIDED

4.9 CONFLICTS WITH FEDERAL, STATE, AND LOCAL LAND USE PLANS, POLICIES, AND CONTROLS FOR THE AREA CONCERNED

Based on an evaluation of consistency with statutory obligations, the Navy's proposed operations for the HRC does not conflict with the objectives or requirements of Federal, State, regional, or local plans, policies, or legal requirements. The proposed operations would not alter the use of the sites that currently support missile and rocket testing. Enhancement of the HRC would be in accordance with applicable Federal, State, and local planning plans and policies. The DoD maintains Federal jurisdiction for on-installation land use. Table 4.9-1 provides a summary of environmental compliance requirements that may apply to the proposed operations.

Table 4.9-1. Summary of Environmental Compliance Requirements -

Plans, Policies, and Statutory Requirements	Responsible Agency	Compliance Status
National Environmental Policy Act (NEPA) (42 U.S.C. § 4321, et seq.) Department of the Navy Procedures for Implementing NEPA (OPNAVINST 5090.1B, February 1998)	U.S. Navy	This Environmental Impact Statement and Overseas Environmental Impact Statement (EIS/OEIS) has been prepared in accordance with Council on Environmental Quality regulations (40 CFR § 1500-1508) and Navy NEPA procedures. Public participation and review is being conducted in compliance with the NEPA statute.
Endangered Species Act (16 U.S.C. § 1531) Marine Mammal Protection Act (16 CFR § 1431 et seq.)	U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS)	Effects on listed species are the subject of consultations with USFWS and NMFS.
Clean Water Act Section 401/402 (§§ 4101-402, 33 U.S.C. § 1251 et seq.) Section 404 (§ 404, 33 U.S.C. § 1251 et seq.)	U.S. Environmental Protection Agency (USEPA) and U.S. Army Corps of Engineers (USACE)	The proposed operations would not discharge dredged or fill material. Discharges into the water will not result in contaminant concentrations above regulatory standards.
Rivers and Harbors Act (33 U.S.C. § 401 et seq.)	USACE	A Section 10 permit in accordance with the Rivers and Harbors Act is not required.
Clean Air Act (CAA) (42 U.S.C. § 7401 et seq.)	USEPA	The proposed operations would not compromise the air quality in Hawaii.

Table 4.9-2. Summary of Environmental Compliance Requirements (Continued)

Plans, Policies, and Statutory Requirements	Responsible Agency	Compliance Status
National Marine Sanctuaries Act	National Oceanic and Atmospheric Administration (NOAA)	
National Historic Preservation Act (NHPA) (16 U.S.C. 470 et seq.)	Advisory Council on Historic Preservation, California State Historic Preservation Office	The proposed operations would not have a significant impact on cultural resources.
Coastal Zone Management Act (CZMA) (16 CFR § 1451, et seq.)	Hawaii Coastal Zone Management Program	The Navy has prepared a Coastal Consistency Determination (CCD) in accordance with the CZMA.
Executive Order (EO) 12114 Environmental Effects Abroad of Major Federal Actions	U.S. Navy	EO 12114 requires environmental consideration for actions that may affect the environment outside of U.S. Territorial Waters. This EIS/OEIS satisfies the requirement of EO 12114.
EO 13112 Invasive Species	U.S. Navy	EO 13112 requires Agencies to identify actions that may affect the status of invasive species and take measures to avoid introduction and spread of these species. This EIS/OEIS satisfies the requirement of EO 13112 with regard to the proposed operations.
EO 11990 Protection of Wetlands	U.S. Navy	The proposed operations would not have a significant impact on wetlands.
EO 12962 Recreational Fisheries	U.S. Navy	EO 12962 requires Agencies to fulfill certain duties with regard to promoting the health and access of the public to recreational fishing areas. The proposed operations do not have a significant impact on Navy actions in support of this EO.
EO 12898, Federal Action to Address Environmental Justice in Minority Populations and Low-Income Populations	U.S. Navy	The proposed operations would not disproportionately affect minority or low-income populations.
EO 13045, Protection of Children from Environmental Health and Safety Risks	U.S. Navy	The proposed operations would not disproportionately affect children.

4.10 ENERGY REQUIREMENTS AND CONSERVATION POTENTIAL

The proposed operations include increased training and testing operations in the HRC. In order to implement the proposed operations, increased amounts of fossil fuels would be required to power the increased use by ships and aircraft. These fuels are currently in adequate supply from either Navy owned sources or from commercial distributors. The required electricity demands would be met by the existing electrical generation infrastructure on the Hawaiian Islands.

Anticipated energy requirements of the continued use and enhancement of the HRC would be well within the energy supply capacity of all facilities. Energy requirements would be subject to any established energy conservation practices at each facility. No additional power generation capacity other than the potential use of generators would be required for any of the operations. The use of energy sources has been minimized wherever possible without compromising safety, training, or testing operations. No additional conservation measures related to direct energy consumption by the proposed operations are identified.

4.11 IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF RESOURCES

Resources that are irreversibly or irretrievably committed to a project are those that are used on a long-term or permanent basis. This includes the use of nonrenewable resources such as fuels. Human labor is also considered a nonrenewable resource. Use of these resources is considered irreversible or irretrievable since they would be committed to the proposed operations and would not be available for other purposes. Furthermore, unavoidable destruction of natural resources as a result of the proposed operations is considered an irreversible or irretrievable commitment of resources if the potential uses of these resources become limited.

The proposed operations would have an irreversible or irretrievable effect due to the use of nonrenewable energy sources: fuels for aircraft, vessels, and vehicles. Implementation of the proposed operations would not result in the destruction of environmental resources so as to cause the potential uses of the environment of the HRC to be limited. The proposed operations would not adversely affect the biodiversity or cultural integrity within the HRC including the marine, terrestrial, or human environment.

4.12 RELATIONSHIP BETWEEN SHORT-TERM USE OF THE HUMAN ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The National Environmental Policy Act (NEPA) requires an analysis of the relationship between a project's short-term impacts on the environment and the effects that these impacts may have on the maintenance and enhancement of the long-term productivity of the affected environment. Impacts that narrow the range of beneficial uses of the environment are of particular concern. This means that choosing one option may reduce future flexibility in pursuing other options, or that committing a resource to a certain use may often eliminate the possibility for other uses of that resource.

The proposed operations would result in both short- and long-term environmental effects. The Navy is committed to sustainable range management, including co-use of the HRC with the general public and commercial interests. This commitment to co-use will enhance the long-term productivity of the range areas and surrounding areas.

4.13 FEDERAL ACTIONS TO ADDRESS ENVIRONMENTAL JUSTICE IN MINORITY POPULATIONS AND LOW-INCOME POPULATIONS (EXECUTIVE ORDER 12898)

EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, was issued on 11 February 1994. Its objectives include development of federal agency implementation strategies, identification of minority and low-income populations where proposed Federal actions have disproportionately high and adverse human health and environmental effects, and participation of minority and low-income populations. Although an Environmental Justice analysis is not mandated by NEPA, DoD has directed that NEPA will be used as the primary approach to implement the provision of the Executive Order.

An Environmental Justice impact would be a long-term environmental, cultural, health, or economic effect that has a disproportionately high and adverse effect on a nearby minority or low-income population. Environmental Justice concerns could be triggered where the percentage of persons in low-income or minority populations in the census area meaningfully exceeds the percentage in the regions of comparison. The percentage of minority or low-income population in the census area exceeds 50 percent; and the proposed operations could result in substantial adverse effects to low income and/or minority populations (see Table 4.13-1). No long-term, adverse environmental, cultural, health, or economic effects have been identified in this EIS/OEIS, and therefore there are no Environmental Justice impacts.

Table 4.13-1. Population and Ethnicity for the State of Hawaii

Geographic Area	Total Population	Race								
		Total	White	Black or African American	American Indian	Asian	Native Hawaiian	Some other race	Two or more races	Hispanic or Latino (of any race)
Hawaii	1,211,537	952,194	294,102	22,003	3,535	503,868	113,539	15,147	59,343	87,699
County										
Hawaii	148,677	106,389	46,904	698	666	39,702	16,724	1,695	42,288	14,111
Honolulu	876,156	710,532	186,484	20,619	2,178	403,371	77,680	11,200	74,624	58,729
Kalawao	147	138	38	0	0	25	71	4	9	6
Kauai	58,463	44,525	17,255	177	212	21,042	5,334	505	13,938	4,803
Maui	128,094	99,610	43,421	509	479	39,728	13,730	1,743	28,484	10,050

Source: 2000 Census

4.14 FEDERAL ACTIONS TO ADDRESS PROTECTION OF CHILDREN FROM ENVIRONMENTAL HEALTH RISKS AND SAFETY RISKS (EXECUTIVE ORDER 13045, AS AMENDED BY EXECUTIVE ORDER 13229)

Since the majority of operations as part of continued use and enhancement of the HRC would be conducted on DoD property and out in the open ocean, this EIS/OEIS has not identified any environmental health and safety risks that may disproportionately affect children.