PACIFIC MISSILE RANGE FACILITY LAND-BASED TRAINING AND TESTING

DRAFT ENVIRONMENTAL ASSESSMENT

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Draft
Environmental Assessment
Pacific Missile Range Facility
Land-Based Training and Testing

Lead Agency:	United States Department of the Navy
Action Proponent:	Commander, United States Pacific Fleet
Cooperating Agency:	Missile Defense Agency
Title of the Proposed Action:	Pacific Missile Range Facility Land-Based Training and Testing
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Abstract

The United States Department of the Navy (Navy) prepared this Environmental Assessment (EA) to comply with the National Environmental Policy Act. In this EA, the Navy evaluates the potential environmental impacts of conducting land-based training and testing activities at launch areas and other locations under the authority of Pacific Missile Range Facility (PMRF).

The Study Area consists of lands within PMRF at Barking Sands, beginning at the high tide line and extending inland to the installation boundary, and Kaula Island (an offshore islet where inert gunnery and bombing exercises occur). The lands at Barking Sands and Kaula Island where this training and testing would occur are owned by the United States with management by the Navy.

The Proposed Action, which is to continue previously analyzed land-based activities and conduct an increased number of land-based, multi-domain training and testing activities in the Study Area, is analyzed as the Preferred Alternative in this EA. The No Action Alternative, which is to continue ongoing levels of Navy-led training and testing activities at Barking Sands and Kaula Island, is also analyzed and would represent no change to ongoing training and testing activities within the Study Area.

The resources evaluated in this EA include air quality, climate change and greenhouse gases, noise, public health and safety, terrestrial biological resources, and cultural resources.

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EXECUTIVE SUMMARY

ES.1 Proposed Action

ES.1.1 Introduction

The United States (U.S.) Department of the Navy (Navy), the lead agency and the real estate manager of lands owned by the United States and leased lands from the State of Hawaii that comprise the Pacific Missile Range Facility (PMRF), has prepared this Environmental Assessment (EA) in accordance with the National Environmental Policy Act (Federal Interagency Working Group on Environmental Justice & NEPA Committee), as implemented by the Council on Environmental Quality (CEQ) regulations and Navy regulations for implementing Navy regulations for implementing NEPA. For this EA, the Action Proponent is the Commander, U.S. Pacific Fleet. The Missile Defense Agency (MDA) is a Cooperating Agency because of its launch activities at PMRF. The U.S. Army (Army), U.S. Air Force (Air Force), and U.S. Marine Corps (Marine Corps) are participating in the development of this EA as additional training units.

ES.1.2 Background

Strategically situated in the Hawaiian Islands, PMRF provides integrated range services in a modern, dynamic, multi-domain environment that ensures the safe conduct and evaluation of training and research, development, test, and evaluation missions. Accordingly, training and testing activities have been conducted at PMRF for decades. PMRF has supported various missile test and evaluation programs that include target launches and flight tests of missile interceptors. The mission of PMRF is to oversee and coordinate training events from unit-level to multi-national exercises (including foreign militaries) while simultaneously conducting or supporting research, development, test, and evaluation of Navy, Department of Defense (DoD), and other federal agency programs and platforms. Activities conducted at PMRF are monitored with real-time tracking and command/control capabilities located at or connected to land-based PMRF facilities. PMRF provides a realistic environment for training and testing in the use of surface, subsurface, air, and space weapons systems as well as land-based weapons systems located at Barking Sands, and air-to-surface gunnery and bombing exercises on Kaula Island (U.S. property). The ability to conduct training and testing at Barking Sands and Kaula Island is vital to military readiness.

ES.1.3 Purpose of and Need for the Proposed Action

The purpose of the Proposed Action is to provide U.S. military services and MDA with land-based, multi-domain training and testing at a level that supports military readiness into the reasonably foreseeable future. The need for the Proposed Action is to ensure U.S. military services and MDA are able to organize, train, and equip service members and personnel to meet their respective national defense missions in accordance with their congressionally mandated requirements, as set forth in 10 United States Code (U.S.C.) Section 7062 (Army), 10 U.S.C. Section 8062 (Navy), 10 U.S.C. Section 8063 (Marine Corps), 10 U.S.C. Section 9062 (Air Force), and 10 U.S.C. Section 205 (MDA).

ES.1.4 Proposed Action

As a Major Range and Test Facility Base, PMRF is part of the designated core set of DoD Test and Evaluation infrastructure and associated workforce components, which are national assets that must be preserved to support the DoD acquisition system. PMRF's unique location includes broad ocean areas to

the north, south, and west with a relatively isolated and encroachment-free environment that safely and effectively supports operations and Navy Fleet training.

Training and testing activities have been conducted at PMRF for decades. PMRF has supported various missile test and evaluation programs that include target launches and flight tests of missile interceptors. The tempo and types of training and testing activities at PMRF have fluctuated over the years because of the introduction of new technologies, the evolving nature of international events, advances in training and warfighting doctrine and procedures, evolving joint exercise cycles, and changes in force structure (e.g., organization of ships, weapons, and personnel). Such developments influence the frequency, duration, intensity, and location of required training and testing activities at PMRF.

The Proposed Action is to continue to conduct land-based, multi-domain training and testing activities to support military training readiness at launch areas and other locations within the existing PMRF Barking Sands and Kaula Island footprint. The Proposed Action also includes increases in training and testing activities conducted by the Army, Air Force, Marine Corps, and MDA. Training and testing activities may also include the participation of foreign militaries under U.S. sponsorship and oversight. No new types of training and testing activities are being proposed at Barking Sands or Kaula Island; all activities included in the Proposed Action have been previously conducted there at some point over the past 20 years and have been analyzed in relevant environmental documentation.

In developing the Proposed Action, the Navy engaged with the Army, Air Force, Marine Corps, and MDA to identify training and testing activities that were not being supported at other locations and for which PMRF was already supporting due to the availability of facilities and range assets. These activities were then assessed based on increased tempo requirements against factors of safety, range capability, and capacity given current operational and testing scheduling and deconfliction. Based on this assessment, the Navy determined the tempo of training and testing activities that PMRF could support into the reasonably foreseeable future. The proposed tempo under the Proposed Action is what is reasonably feasible at PMRF and is the minimum necessary for the services to fulfill their Title 10 responsibilities. It is for these reasons that no other action alternative was carried forward for analysis. This EA reflects the most up-to-date compilation of land-based training and testing activities deemed necessary to accomplish military readiness requirements.

ES.1.5 Summary of Alternatives Considered but Eliminated

Alternatives eliminated from further consideration included alternative training and testing locations and simulated training and testing. No other location matched the attributes necessary to support effective training and testing, which includes proximity to region of Hawaii homeport and service commands, shore-based facilities, and military families, as well as optimal environmental conditions. Simulation that replaces training and testing in the field does not meet the purpose of and need for the Proposed Action due to its significant limitations. As such, the Navy determined that these alternatives did not meet the purpose of and need for the Proposed Action.

ES.2 Summary of Environmental Resources Evaluated in the Environmental Assessment

CEQ regulations, NEPA, and Navy instructions for implementing NEPA, specify that an EA should address those resources potentially subject to adverse effects. In addition, the level of analysis should be commensurate with the anticipated level of environmental effects. The following resource areas have been addressed in this EA: air quality, climate change and greenhouse gases, noise, public health and safety, terrestrial biological resources, and cultural resources.

ES.3 Summary of Potential Environmental Consequences of the Alternatives and Major Mitigating Actions

Table ES-1 provides a summary of the potential impacts on resource areas from each of the alternatives analyzed.

ES.4 Public Involvement

CEQ regulations direct federal agencies to involve the public in the development of environmental impact analyses under NEPA. The Draft EA will be released for a 30-day public review on August 30, 2024. The Navy informed the public of the Proposed Action and the potential environmental impacts through a Notice of Availability published in *The Garden Island* and the *Honolulu Star-Advertiser*. The notices included information about the availability of the Draft EA for public review and comment; physical and electronic locations where the public can access the Draft EA; date, time, and location of the public meeting; and how to submit comments on the Draft EA.

Table ES-1: Summary of Potential Impacts on Resource Areas

Resource Area	No Action Alternative	Proposed Action	
		Barking Sands	Kaula Island
Air Quality	There would be no change from current levels of Navy-led training and testing activities, and these activities would continue to occur within the same designated areas as previously analyzed in relevant environmental documentation. Proposed increases in land-based training and testing activities would not occur, and there would be no change in designated training and testing areas. Therefore, no increases in air quality impacts from activities would occur.	Vehicle operations, aircraft, launch activities, generators, and personnel movement between training and testing areas associated with the Proposed Activity would generate emissions; however, the emissions would not result in a significant change from the environmental baseline and would have minor impacts on the ambient air quality of the region. Due to the relatively low criteria pollutant and HAP emissions, occurring infrequently and given the distance to downwind human sensitive receptors, these emissions are not expected to interfere with the attainment of AAQS or contribute to human health risks from HAP exposure in areas where public presence is expected. The state of Hawaii is designated as being in attainment for all criteria pollutants and, therefore, does not require a general conformity determination. Therefore, impacts on air quality would be less than significant.	GUNEX and BOMBEX activities associated with the Proposed Action would generate emissions. However, the emissions would not result in a significant change from the environmental baseline and would have minor impacts on the ambient air quality of the region. Due to the relatively low criteria pollutant and HAP emissions and infrequent occurrence, these emissions are not expected to interfere with the attainment of AAQS. Additionally, Kaula is uninhabited, and no human sensitive receptors are near the vicinity. Thus, emissions would not contribute to human health risks from HAP exposure. The state of Hawaii is designated as being in attainment for all criteria pollutants and, therefore, does not require a general conformity determination. Therefore, impacts on air quality would be less than significant.
Climate Change and Greenhouse Gases	There would be no change from current levels of Navy-led training and testing activities and these activities would continue to occur within the same designated areas as previously analyzed in relevant environmental documentation. Proposed increases in land-based training and testing activities would not occur, and there	The Proposed Action would increase GHG emissions by 7,602 MT of CO_2e per year as compared to the No Action Alternative. The increase in GHG emissions is conservatively estimated assuming all activities would occur within the same year at their highest average tempo and maximum number of personnel. The increase in GHG emissions is equivalent to approximately 0.00001 percent of the global GHG emissions, approximately 0.0001 percent of the reported U.S. emissions in 2021, and approximately 0.03 percent of the 2019 GHG	Due to the comprehensive nature of the analysis and region of influence, impacts from the Proposed Action on climate change and GHGs resulting from activities conducted at Kaula are not meaningfully different than those analyzed at Barking Sands. Therefore, climate change and greenhouse impacts would be less than significant.

Resource Area	No Action Alternative	Proposed Action	
		Barking Sands	Kaula Island
	would be no change in designated training and testing areas. Therefore, no additional impacts on climate change and greenhouse gases would occur.	emissions reported for Kauai County. Expected GHG emissions are relatively minor and make up a negligible percentage of the global GHG emissions. Therefore, climate change and greenhouse impacts would be less than significant as a result of implementation of the Proposed Action.	
Noise	There would be no change from current levels of Navy-led training and testing activities, and these activities would continue to occur within the same designated areas previously analyzed in relevant environmental documentation. Proposed increases in land-based training and testing activities would not occur, and there would be no change in designated training and testing areas. Noise levels would remain the same currently with no increase. Noise would continue to be sporadic, intermittent across all training and testing locations. Therefore, no significant impacts on noise would occur.	Under the Proposed Action, activities that could generate noise include those that would use military vehicles and equipment, such as missile launcher setup, aircraft operations conducted in association with FARP and LZ activities, C5ISRT setup activities, and large unit bivouacking. These activities could create temporary increases in noise levels that would quickly attenuate with increasing distance. The nearest human sensitive noise receptors are residences, located approximately 10,000 feet (about 2 miles) south of the western edge of PMRF Barking Sands. Due to this distance, noise from almost all land-based training and testing activities, even with an increase in training and testing, is anticipated to be inaudible and would not meaningfully change DNL levels near human sensitive noise receptors. Proposed increases in training and testing activities would not result in an appreciable increase in noise levels in the vicinity of human sensitive noise receptors or the general public. Therefore, noise impacts would be less than significant.	Under the Proposed Action, GUNEX and BOMBEX training utilizing ships and aircraft would increase at Kaula Island. Inert munitions impact, weapons firing, and aircraft noise would be the primary noise sources during these activities. However, there are no human sensitive noise receptors on the island, there would be no potential for degradation of the human noise environment. Therefore, noise impacts would be less than significant.
Public Health and Safety	There would be no change from current levels of Navy-led training and testing activities, and these activities	Potential public health and safety hazards on Barking Sands consists of EMR associated with radars and explosive safety associated with launch and firing activities. Under the Proposed Action,	Kaula Island is uninhabited, and the public is restricted from accessing the island. Under the Proposed Action, standard operating procedures

Resource Area	No Action Alternative	Proposed Action	
		Barking Sands	Kaula Island
	would continue to occur within the same designated areas previously analyzed in relevant environmental documentation. Proposed increases in land-based training and testing would not occur, and there would be no change in designated training and testing areas. Public health and safety risk would remain the same as currently. At present there is low risk to public health and safety. PMRF has not experienced a reportable major, work-related, ground incident in over 10 years. Given the historical data related to limited incidents creating low probability of elevated risk to public health and safety, no significant impacts on public health and safety would occur.	there would be no changes in the type of land-based training and testing activities that currently occur at Barking Sands, although the number of activities may increase. Each activity would still receive the same amount of attention and fall under the same SOPs as current activities—regardless of the service conducting the training or testing. Based on the adherence to established procedures, increasing activity would not increase risk to public health and safety. Proposed increases in activities would not pose any increased risks to military personnel or the general public. Therefore, public health and safety impacts would be less than significant.	would continue to be implemented. Public health and safety impacts would be less than significant.
Terrestrial Biological Resources	There would be no change from current levels of Navy-led training and testing activities, and these activities would continue to occur within the same designated areas previously analyzed in relevant environmental documentation. Impacts on	• Vegetation. Damage to vegetation from movement of personnel, vehicles, and equipment across the beach and into upland areas during Amphibious Warfare Training is not likely since the movement would be limited to existing routes that are regularly used for this activity. Damage to vegetation from other activities such as bivouacking and ground maneuvers is also unlikely since troops would	• Vegetation. Vegetation is very sparse; as such, brush fires occurring from gunnery and inert ordnance practice are unlikely to occur, and no documentation of fires from previous training activities is available. Therefore, because vegetation on the island is minimal, impacts on vegetation would be less than significant. • Wildlife. Surveys indicate that the seabird species composition of Kaula island has

Resource Area	No Action Alternative	Proposed Action	
		Barking Sands	Kaula Island
	terrestrial biological resources would remain as they do today, and activities would continue with the same SOPs and mitigation measures as presently conducted. Proposed land-based training and testing activities would not occur, and there would be no change in designated training areas. Therefore, no significant impacts on terrestrial biological resources would occur.	stay within previously disturbed areas. Ground disturbance during missile launch activities may occur during implementation of the stabilizing system, but this ground disturbance is minimal, localized, and would not significantly impact vegetation communities. Additionally, launch pads are kept clear of vegetation, and surrounding areas are maintained/landscaped in accordance with SOPs and established wildfire mitigation measures. Therefore, impacts on vegetation would be less than significant. • Wildlife. Impacts on wildlife could result from temporary increases in noise, increased potential of electromagnetic radiation exposure, the use of artificial lighting, personnel or vehicle movement, or airfield operations. However, all proposed increases activities would be short in duration and occur within regularly used training and testing sites. Any displacement of wildlife as a result of the Proposed Action would be temporary and short term. In addition, wildlife species have occurred at PMRF for decades during current training and testing activities, and no adverse effects have been observed. Wildlife species continue to use the habitats of PMRF before, during, and after training and testing activities. Established SOPs would continue to be implemented to minimize impacts from invasive species, noise, and physical disturbance to wildlife. As such, impacts on wildlife would be less than significant. • Special Status Species. Impacts on special status species at PMRF could result from temporary	remained very consistent over time despite ongoing GUNEX and BOMBEX activities(using inert bombs and missiles). All activities would occur on a small portion within the first 1,000 feet of the southeast tip of the island and would continue to adhere to established SOPs. As such, impacts on wildlife would be less than significant. • Special-Status Species. Increases in GUNEX and BOMBEX activities may impact Hawaiian monk seals hauled out at Kaula Island. However, the rate at which Hawaiian monk seal populations are increasing has not been affected by Navy training and testing activities in the Hawaiian Range Complex. In addition, monk seals are known to haul out on rocky ledges at sea level outside of the ROI. Per SOPs, if monk seals are observed hauled out on Kaula Island, any planned ordnance delivery is prohibited. Therefore, impacts under the Proposed Action to Hawaiian monk seals would be less than significant. • The impacts on MBTA-listed species from the proposed training and testing activities and associated noise at Kaula Island would be similar to those described above for wildlife. Therefore, impacts are expected to be minimal and short term and would not result in a significant adverse effect on populations of any bird species on Kaula Island protected under the MBTA. • Due to the limited information regarding *Portulaca villosa* presence on Kaula Island following the start of ordnance training in 1952, Portulaca villosa was not carried forward

Resource Area	No Action Alternative	Proposed Action	
		Barking Sands	Kaula Island
		increases in noise, increases in radar operations, increases in personnel and vehicle movements, and the use of artificial lighting at night. However, increases in noise would be short-term. Activities conducted on unpaved areas would occur on maintained landscaped or low-quality habitat within areas regularly used for training and testing activities. Artificial night lighting would be minimal and limited to short-term events. Impacts would be short term and no long-term impacts would occur under the Proposed Action. Established SOPs would continue to be implemented to minimize impacts from invasive species, noise, and physical disturbance to ESA-listed species. Therefore, impacts on terrestrial biological resources would be less than significant. To address potential impacts on ESA-listed terrestrial species, the Navy is informally consulting with the USFWS under Section 7 of the ESA. • Impacts on MBTA-listed species from the proposed training and testing activities and associated noise would be similar to those described above for wildlife. Therefore, impacts are expected to be minimal and short term and would not result in a significant adverse effect on populations of any bird species protected under the MBTA.	further for analysis and was considered unlikely to be present.
Cultural Resources	There would be no change from current levels of Navy-led training and testing activities and these activities would continue to occur	Impacts on cultural resources could occur from ground disturbance associated with training and testing activities. Historic properties have been recorded within the North Launch Area 1, Palai Olani, and Waiapuaa Bay Amphibious Staging	• GUNEX and BOMBEX activities at Kaula Island would only occur within the impact area. No cultural resources have been identified within the Kaula Island training and testing impact area, and these activities would continue to

Resource Area	No Action Alternative	Proposed Action	
		Barking Sands	Kaula Island
	within the same designated areas previously analyzed in relevant environmental documentation. Impacts on cultural resources would remain as they do today, and activities would continue with the same SOPs and minimization measures as presently conducted. Proposed increases in land-based training and testing activities would not occur, and there would be no change in designated training areas. Therefore, no significant impacts on cultural resources would occur.	training and testing areas. Identified historic properties would be avoided. All activities under the Proposed Action would be conducted on previously disturbed land, and personnel would not deviate from designated pathways. Any ground disturbing activities would require prior installation approval to establish appropriate avoidance and/or minimization measures. The Navy is planning on fulfilling Section 106 requirements in accordance with the 2012 Programmatic Agreement among the Commander Navy Region Hawaii, the Advisory Council on Historic Preservation and the Hawaii State Historic Preservation Officer Regarding Navy Undertakings in Hawaii. Avoidance and/or minimization measures in established SOPs and BMPs would continue to be implemented to ensure that there would be no adverse effect on historic properties. Per standard operation procedures, if unanticipated cultural resources are encountered during any activity, all activities will cease in the immediate vicinity of the find and Navy archaeologist shall be notified to complete SOPs. Therefore, impacts on cultural resources would be less than significant.	only occur in the heavily disturbed ordnance impact area. Therefore, impacts on historic properties would be less than significant.

Notes: AAQS = Ambient Air Quality Standards; BOMBEX = Bombing Exercise; C5ISRT = Command, Control, Computing, Communications, Cyber, Intelligence, Surveillance, Reconnaissance and Targeting; CO_2e = carbon dioxide equivalent; DNL = Average Day-Night Sound Level; EMR = Electromagnetic Radiation; ESA = Endangered Species Act; FARP = Forward Arming and Refueling Point; GHG = greenhouse gas; GUNEX = Gunnery Exercise; HAP = Hazardous Air Pollutant; LZ = Landing Zone; MT = Metric Tons; PMRF = Pacific Missile Range Facility; ROI = Region of Influence; SOP = Standard Operating Procedure; USFWS = U.S. Fish and Wildlife Service

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Acronyms and Abbreviations

Acronym	Definition
°F	degrees Fahrenheit
AAQS	Ambient Air Quality Standards
ACHP	Advisory Council on Historic Preservation
AICUZ	Air Installations Compatible Use Zone
ARDEL	Advanced Radar Detection Laboratory
ARPA	Archaeological Resources Protection Act
BASH	Bird Aircraft Strike Hazard
BMP	Best Management Practice
BOMBEX	Bombing Exercise
C5ISRT	Command, Control, Computing, Communications, Cyber, Intelligence, Surveillance, Reconnaissance and Targeting
CAA	Clean Air Act
CDZ	Circular Drop Zone
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CH_4	Methane
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent
CR	Cultural Resource
CRM	Cultural Resource Management
CZMA	Coastal Zone Management Act
dB	Decibel(s)
dBA	A-weighted decibel(s)
DLNR	Department of Land and Natural Resources
DNL	Day-Night Level
DoD	Department of Defense
EA	Environmental Assessment
EIS	Environmental Impact Statement
EMR	Electromagnetic Radiation
EO	Executive Order
ESA	Endangered Species Act
ESQD	Explosive Safety Quantity Distance

Acronym	Definition
FAA	Federal Aviation Administration
FACSFAC	Fleet Area Control and Surveillance Facility
FARP	Forward Arming and Refueling Point
FR	Federal Register
GHG	Greenhouse Gas
GUNEX	Gunnery Exercise
GWP	Global Warming Potential
HAP	Hazardous Air Pollutant
HAR	Hawaii Administrative Rules
HRC	Hawaii Range Complex
HRS	Hawaii Revised Statute
HSTT	Hawaii-Southern California Training and Testing
ICRMP	Integrated Cultural Resources Management Plan
JLTV	Joint Light Tactical Vehicle
KPGO	Kokee Park Geophysical Observatory
KTF	Kauai Test Facility
kW	Kilowatt
LZ	Landing Zone
MBTA	Migratory Bird Treaty Act
MDA	Missile Defense Agency
MEP	Mobile Electric Power
mi.	Mile(s)
mm	Millimeter(s)
MSAT	Mobile Source Air Toxic
MT	Metric Ton(s)
N_2O	Nitrous Oxide
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NASA	National Aeronautics and Space Administration
Navy	U.S. Department of the Navy
NEPA	National Environmental Policy Act
NHO	Native Hawaii Organization

Acronym	Definition
NHPA	National Historic Preservation Act
NM	Nautical Mile(s)
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
NRH	Navy Region Hawaii
NRHP	National Register of Historic Places
O_3	Ozone
OEIS	Overseas Environmental Impact Statement
OTB	Over-the-Beach
PA	Programmatic Agreement
Pb	Lead
$PM_{2.5}$	Particulate matter less than or equal to 2.5 microns
PM_{10}	Particulate matter less than or equal to 10 microns
PMRF	Pacific Missile Range Facility
POV	Privately Owned Vehicle

Acronym	Definition
RDT&E	Research, Development, Test, and Evaluation
ROI	Region of Influence
SHPD	State Historic Preservation Division
SIHP	State Inventory of Historic Places
SME	Subject Matter Expert
SO_2	Sulfur Dioxide
SOP	Standard Operating Procedure
SO_x	sulfur oxides
sUAS	Small Unmanned Aircraft Systems
T&E	Test and Evaluation
U.S.	United States
U.S.C.	United States Code
UAS	Unmanned Aircraft System
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VOC	Volatile Organic Compound

1 Purpose and Need for the Proposed Action

1.1 Introduction

The United States (U.S.) Department of the Navy (Navy), the lead agency and the real estate manager of lands owned by the United States and leased lands from the State of Hawaii that comprise the Pacific Missile Range Facility (PMRF), has prepared this Environmental Assessment (EA) in accordance with the National Environmental Policy Act, as implemented by the Council on Environmental Quality (CEQ) regulations and Navy regulations for implementing NEPA regulations. For this EA, the Action Proponent is the Commander U.S. Pacific Fleet. The Missile Defense Agency (MDA) is a Cooperating Agency because of its launch activities at PMRF. The U.S. Army (Army), U.S. Air Force (Air Force), and U.S. Marine Corps (Marine Corps) are participating in the development of this EA as additional training units.

Proposed land-based training and testing activities would be conducted at PMRF, specifically at Barking Sands (Main Base, hereinafter referred to as Barking Sands), and Kaula Island (Figure 1.3-1). Kaula Island is a crescent-shaped islet 23 miles (mi.) southwest of island of Niihau, owned by the United States and on the real estate inventory of PMRF. Gunnery training that occurs on it is coordinated through the Fleet Area Control and Surveillance Facility Pearl Harbor. The continued training at Kaula is part of this Proposed Action. The Proposed Action includes ongoing and proposed land-based training and testing activities at launch areas and other locations under the management of PMRF. Land-based training and testing activities contribute to fulfillment of the Action Proponent's mission to protect and defend the United States and its allies; however, these activities have the inherent potential to affect the environment. A description of the Proposed Action is provided in Chapter 2 (Description of Proposed Action and Alternatives).

The goal of this EA is to assess potential effects that the Proposed Action might have on the human environment (including the natural and biological environment) to assist in agency planning and determine whether there are significant impacts. If there are significant impacts which cannot be mitigated to less than significant, then an Environmental Impact Statement (EIS) must be prepared. The potential environmental impacts associated with land-based training and testing activities within the PMRF Study Area are evaluated under this EA.

1.2 Background

Strategically situated on the island of Kauai, PMRF provides integrated range services in a modern, dynamic, multi-domain environment that ensures the safe conduct and evaluation of training and research, development, test, and evaluation (RDT&E) missions. PMRF is a component of the Navy's Hawaii Range Complex (HRC). The mission of PMRF is to oversee and coordinate training events from unit-level to multi-national exercises (including foreign militaries) while simultaneously conducting or supporting RDT&E of Navy, Department of Defense (DoD), and other federal agency programs and platforms. Activities at PMRF are monitored with real-time tracking and command/control capabilities located at or connected to land-based PMRF facilities. PMRF provides a realistic environment for training and testing in the use of surface, subsurface, air, and space weapons systems as well as land-based weapons systems.

1.3 Location

The PMRF is located approximately 100 mi. northwest of Oahu on the northwest coast of the Hawaiian island of Kauai. The Study Area for this EA consists of Barking Sands and Kaula Island (Figure 1.3-1 and Table 1.3-1).

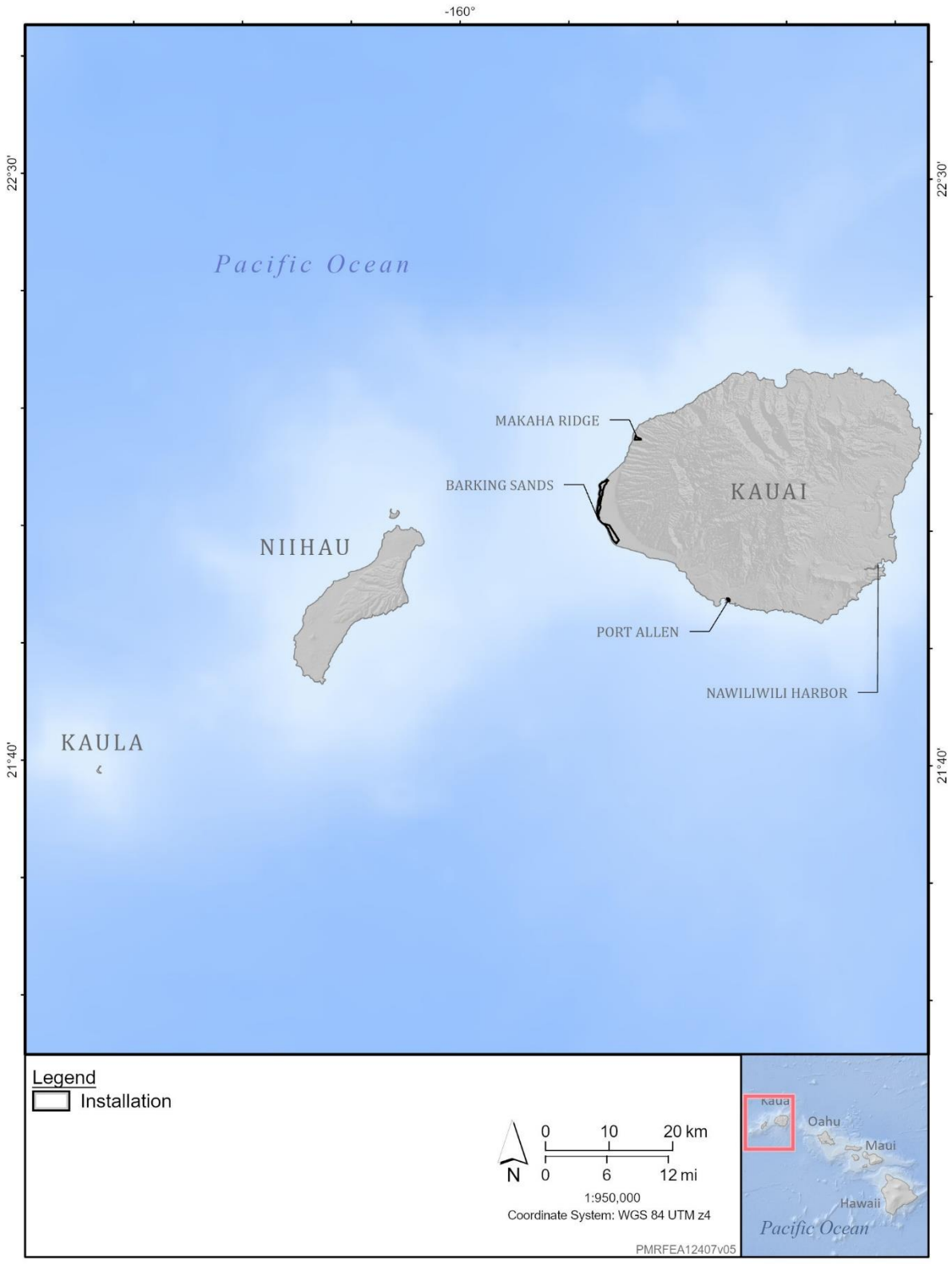

Figure 1.3-1: Regional Overview of PMRF Study Area

Table 1.3-1: Overview of PMRF Study Area

PMRF Land Areas	Uses	Total Acres
Barking Sands	Main Base and principal operations area for PMRF; supports surface, subsurface, air, and space training and testing activities	7,659
Kaula Island	Aircraft gunnery and inert ordnance target practice	113[1]

[1] The area of impact on Kaula Island is approximately 10 acres.

1.4 Purpose and Need

The purpose of the Proposed Action is to provide U.S. military services and MDA with land-based, multi-domain training and testing at a level that supports military readiness into the reasonably foreseeable future.

The need for the Proposed Action is to ensure U.S. military services and MDA are able to organize, train, and equip service members and personnel to meet their respective national defense missions in accordance with their congressionally mandated requirements, as set forth in 10 United States Code (U.S.C.) section 7062 (Army), 10 U.S.C. section 8062 (Navy), 10 U.S.C. section 8063 (Marine Corps), 10 U.S.C. section 9062 (Air Force), and 10 U.S.C. section 205 (Missile Defense Agency).

1.5 Scope of Environmental Analysis

This EA compares the potential environmental impacts associated with the Proposed Action to the No Action Alternative (status quo) sufficient to determine whether there would be significant impacts that warrant preparation of an EIS. The Navy considered other alternatives (as explained in Section 2.1.1, Land-Based Training and Testing), but there are no other reasonable alternatives that can achieve the level of readiness the military services need to fulfill their Title 10 responsibilities.

The scope of this analysis focuses on the effects on land associated with land-based training and testing activities, to include airfield operations (aircraft landings, taxi, parking at idle power, and take-offs), conducted at the PMRF airfield in connection with Forward Arming and Refueling Point (FARP) and landing zone activities as discussed in Section 2.1 (Proposed Action). The airfield has been in use by the U.S. Navy since the mid-1950s and routine operations of the airfield and future usage have been evaluated under prior NEPA analysis, such as the 1998 PMRF EIS (U.S. Department of the Navy, 1998), as well as within the PMRF Air Installation Compatibility Use Zone Study, as discussed in Section 3.3 (Noise) (Naval Facilities Engineering Command Southwest, 2020). In addition, any effects in or over the water associated with land-based training and testing activities (e.g., launching a land-based missile towards a target at sea, in-water impacts from land-based missile launch, and amphibious operations) have been previously analyzed in prior related NEPA documents as listed below under Section 1.6 (Key Documents) and will be carried forward in future environmental planning documentation. The scope of this EA does not include Port Allen, Kokee, Makaha Ridge, or Niihau because there are no proposed changes in use or training and testing activities conducted at these locations, which were analyzed in the 2008 HRC EIS (U.S. Department of the Navy, 2008a). After review of that document, further analysis was deemed not necessary.

The environmental resource areas analyzed in this EA include air quality, climate change and greenhouse gases, noise, public health and safety, terrestrial biological resources, and cultural resources. In accordance with NEPA and CEQ regulations, the description of the affected environment focuses on resources potentially subject to impacts from the Proposed Action.

1.6 Key Documents

Key documents are sources of information incorporated into this EA. Documents are considered key based on similar actions, analyses, or impacts that may apply to this Proposed Action. CEQ guidance encourages incorporating documents by reference (40 Code of Federal Regulations [CFR] part 1501.12). Documents listed in Table 1.6-1 are incorporated by reference.

Table 1.6-1: Documents Incorporated by Reference

Reference	Description
U.S. Army (1993)	Final Environmental Impact Assessment for the Restrictive Easement Kauai, Hawaii
U.S. Department of the Navy (1998, 1999b)	Pacific Missile Range Facility Enhanced Capability Final Environmental Impact Statement and Record of Decision for the Pacific Missile Range Facility Enhanced Capability Final Environmental Impact Statement
U.S. Department of the Navy (1999a)	Memorandum of Agreement Among the United States Department of the Navy, Pacific Missile Range Facility; The Hawaii State Historic Preservation Officer; and the Advisory Council on Historic Preservation Regarding Activities Proposed Within the Pacific Missile Range Facility Enhanced Capability Environmental Impact Statement, Barking Sands, Kauai, Hawaii
U.S. Department of the Navy (2001)	Integrated Natural Resources Management Plan: Pacific Missile Range Facility Hawaii
U.S. Department of the Navy (2003)	Programmatic Agreement Among the Commander Navy Region Hawaii, The Advisory Council on Historic Preservation and the Hawaii State Historic Preservation Officer Regarding Navy Undertakings in Hawaii
U.S. Department of the Navy (2008a, 2008b)	Hawaii Range Complex Final Environmental Impact Statement/Overseas Environmental Impact Statement and Record of Decision
U.S. Department of the Navy (2009)	Environmental Assessment of the Advanced Radar Detection Laboratory (ARDEL), Pacific Missile Range Facility, Kauai, Hawaii
U.S. Department of the Navy (2010b)	Pacific Missile Range Facility Intercept Test Support Environmental Assessment/Overseas Environmental Assessment
U.S. Department of the Navy (2010a)	Finding of No Significant Impact (FONSI) for Pacific Missile Range Facility Intercept Test Support Environmental Assessment/Overseas Environmental Assessment at the Pacific Missile Range Facility, Kauai, Hawaii
U.S. Department of the Navy (2011)	Native American Graves Protection and Repatriation Act Comprehensive Agreement between U.S. Department of the Navy at Pacific Missile Range Facility, Kauai, Hawaii, and Na Ohana Papa O Mana
U.S. Department of the Navy (2012c)	Programmatic Agreement Among the Commander Navy Region Hawaii, The Advisory Council on Historic Preservation and the Hawaii State Historic Preservation Officer Regarding Navy Undertakings in Hawaii
U.S. Department of the Navy (2012a, 2012b)	Final Report Integrated Cultural Resources Management Plan for the Pacific Missile Range Facility Kaua'i Island, State of Hawaii Fiscal Year 2012-2017

Reference	Description
U.S. Army (1993)	Final Environmental Impact Assessment for the Restrictive Easement Kauai, Hawaii
U.S. Department of the Navy (2012b)	Integrated Natural Resource Management Plan Niihau Addendum: Pacific Missile Range Facility Islands of Kauai, Oahu, and Kaula, State of Hawaii
U.S. Department of the Navy (2013a, 2013b)	Hawaii-Southern California Training and Testing Environmental Impact Statement/Overseas Environmental Impact Statement and Record of Decision
National Marine Fisheries Service (2014)	Biological Opinion and Conference Report on U.S. Navy Hawaii-Southern California Training and Testing
U.S. Fish and Wildlife Service (2014)	Formal Consultation for Pacific Missile Range Facility Base-wide Infrastructure, Operations, and Maintenance Kauai
U.S. Fish and Wildlife Service (2018)	Biological Opinion of the U.S. Fish and Wildlife Service for the Proposed Base-Wide infrastructure, Operations, and Maintenance Activities at the Pacific Missile Range Facility, Island of Kauai, Hawaii
U.S. Department of the Navy (2018a, 2018b)	Hawaii-Southern California Training and Testing Final Environmental Impact Statement/Overseas Environmental Impact Statement and Record of Decision
Naval Facilities Engineering Command Southwest (2020)	Air Installations Compatible Use Zones Study Update for Pacific Missile Range Facility, Barking Sands, Kauai, Hawaii
Commander United States Pacific Fleet (2021)	Hawaii Range Complex Re-Initiation Terrestrial Biological Evaluation
U.S. Fish and Wildlife Service (2021a)	Concurrence on the Request for Re-Initiation of Informal Consultation for Ongoing Military Readiness Activities at Pacific Missile Range Facility, Kauai, Hawaii
Naval Facilities Engineering Systems Command Hawaii (2023)	Integrated Natural Resources Management Plan Pacific Missile Range Facilities Islands of Kauai, Kaula, and Niihau, State of Hawaii

1.7 Relevant Laws and Regulations

The Navy has prepared this EA based upon applicable federal laws, statutes, regulations, and policies pertinent to the implementation of the Proposed Action, including the following:

- NEPA (42 U.S.C. sections 4321–4370h)
- CEQ Regulations for Implementing the Procedural Provisions of NEPA (40 CFR parts 1500–1508)
- Navy regulations for implementing NEPA (32 CFR part 775)
- Clean Air Act (42 U.S.C. section 7401 et seq.)
- Clean Water Act (33 U.S.C. section 1251 et seq.)
- Coastal Zone Management Act (16 U.S.C. section 1451 et seq.)
- National Historic Preservation Act (NHPA) (54 U.S.C. section 306101 et seq.)
- Native American Graves Protection and Repatriation Act (25 U.S.C. 3001 et seq.)
- Endangered Species Act (16 U.S.C. section 1531 et seq.)
- Migratory Bird Treaty Act (MBTA) (16 U.S.C. section 703 et seq.)
- Comprehensive Environmental Response, Compensation, and Liability Act (42 U.S.C. section 9601 et seq.)
- Resource Conservation and Recovery Act (42 U.S.C. section 6901 et seq.)
- Emergency Planning and Community Right-to-Know Act (42 U.S.C. sections 11001–11050)

- Executive Order (EO) 13175, Consultation and Coordination with Indian Tribal Governments
- EO 13990, Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis
- EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations
- EO 13045, Protection of Children from Environmental Health Risks and Safety Risks
- EO 14096, Revitalizing Our Nation's Commitment to Environmental Justice for All

1.8 Public and Agency Participation and Intergovernmental Coordination

CEQ regulations direct federal agencies to involve the public in the development of environmental impact analyses under NEPA. The Draft EA was released for a 30-day public review on August 30, 2024. The Navy informed the public of the Proposed Action and the potential environmental impacts through a Notice of Availability published in *The Garden Island* and the *Honolulu Star-Advertiser*. The notices included information about the availability of the Draft EA for public review and comment; physical and electronic locations where the public can access the Draft EA; date, time, and location of the public meeting; and how to submit comments on the Draft EA.

Informal consultation under Section 7 of the Endangered Species Act (ESA) is in progress with U.S. Fish and Wildlife Service (USFWS). The outcome of the informal consultation will be summarized in the Final EA.

The Navy is planning on fulfilling NHPA Section 106 requirements in accordance with the 2012 Programmatic Agreement among the Commander Navy Region Hawaii, the Advisory Council on Historic Preservation, and the Hawaii State Historic Preservation Officer Regarding Navy Undertakings in Hawaii (U.S. Department of the Navy, 2012c).

Hawaii has an approved Coastal Zone Management Program (Chapter 205A, Hawaii Revised Statutes), administered by the Hawaii Office of Planning and Sustainable Development. Based on an evaluation of the effects of the Proposed Action discussed in this EA and the enforceable policies of Hawaii's Coastal Zone Management Program, and pursuant to 15 CFR section 930.35, the Navy is submitting notification to the Hawaii Office of Planning and Sustainable Development of use of the list of Navy *de minimis* activities for these training and testing activities.

2 Description of Proposed Action and Alternatives

2.1 Proposed Action

2.1.1 Land-Based Training and Testing

As a Major Range and Test Facility Base, PMRF is part of the designated core set of DoD Test and Evaluation (T&E) infrastructure and associated workforce components, which are national assets that must be preserved to support the DoD acquisition system. PMRF's unique location includes broad ocean areas to the north, south, and west with a relatively isolated and encroachment-free environment that safely and effectively supports operations and Navy Fleet training.

Training and testing activities have been conducted at PMRF for decades. PMRF has supported various missile test and evaluation programs that include target launches and flight tests of missile interceptors. The tempo and types of training and testing activities at PMRF have fluctuated over the years because of the introduction of new technologies, the evolving nature of international events, advances in training and warfighting doctrine and procedures, evolving joint exercise cycles, and changes in force structure (e.g., organization of ships, weapons, and personnel). Such developments influence the frequency, duration, intensity, and location of required training and testing activities at PMRF.

The Proposed Action is to continue to conduct land-based, multi-domain training and testing activities to support military training readiness at launch areas and other locations within the existing PMRF Barking Sands and Kaula Island footprint (Figure 2.1-1). The Proposed Action also includes increases in training and testing activities conducted by the Army, Air Force, Marine Corps, and MDA. Training and testing activities may also include the participation of foreign militaries under U.S. sponsorship and oversight. No new types of training and testing activities are being proposed at PMRF Barking Sands or Kaula Island; all activities included in the Proposed Action have been previously conducted at these locations at some point over the past 20 years and have been analyzed in relevant environmental documentation listed in Table 1.6-1.

In developing the Proposed Action, the Navy engaged with the Army, Air Force, Marine Corps, and MDA to identify training and testing activities/capabilities that could not be supported at other locations and for which PMRF was already supporting due to the availability of facilities and range assets. These activities were then assessed based on increased tempo requirements against factors of safety, range capability, and capacity given current operational and testing scheduling and deconfliction. Based on this assessment, the Navy determined the tempo of training and testing activities that PMRF could support into the reasonably foreseeable future. The proposed tempo under the Proposed Action is what is reasonably feasible at PMRF and is the minimum necessary for the services to fulfill their Title 10 responsibilities. It is for these reasons that no other alternative was carried forward for analysis. This EA reflects the most up-to-date compilation of land-based training and testing activities deemed necessary to accomplish military readiness requirements.

2.1.2 Training and Testing Study Area

The overall Study Area (Figure 2.1-1) consists of the land portion of PMRF Barking Sands, a roughly 0.5 mi. wide and 7.5 mi. long area, beginning at the high tide line, and extending inland to the boundary of the PMRF installation. The Study Area also includes Kaula Island (an offshore islet where inert gunnery and bombing occurs). Collectively, the Study Area encompasses typical training and testing sites. The following provides a description of the training and testing sites within the PMRF Study Area.

Table 2.1-1 provides a list of unit-level and coordinated training and testing activities (including those included in major training exercises), activity descriptions, locations where activities would be conducted, annual tempo of ongoing activities, and proposed annual activities. The number of annual activities reflects the current activity (status quo). A more detailed description of proposed training and testing activities is provided in Appendix A (Military Readiness Activity Descriptions).

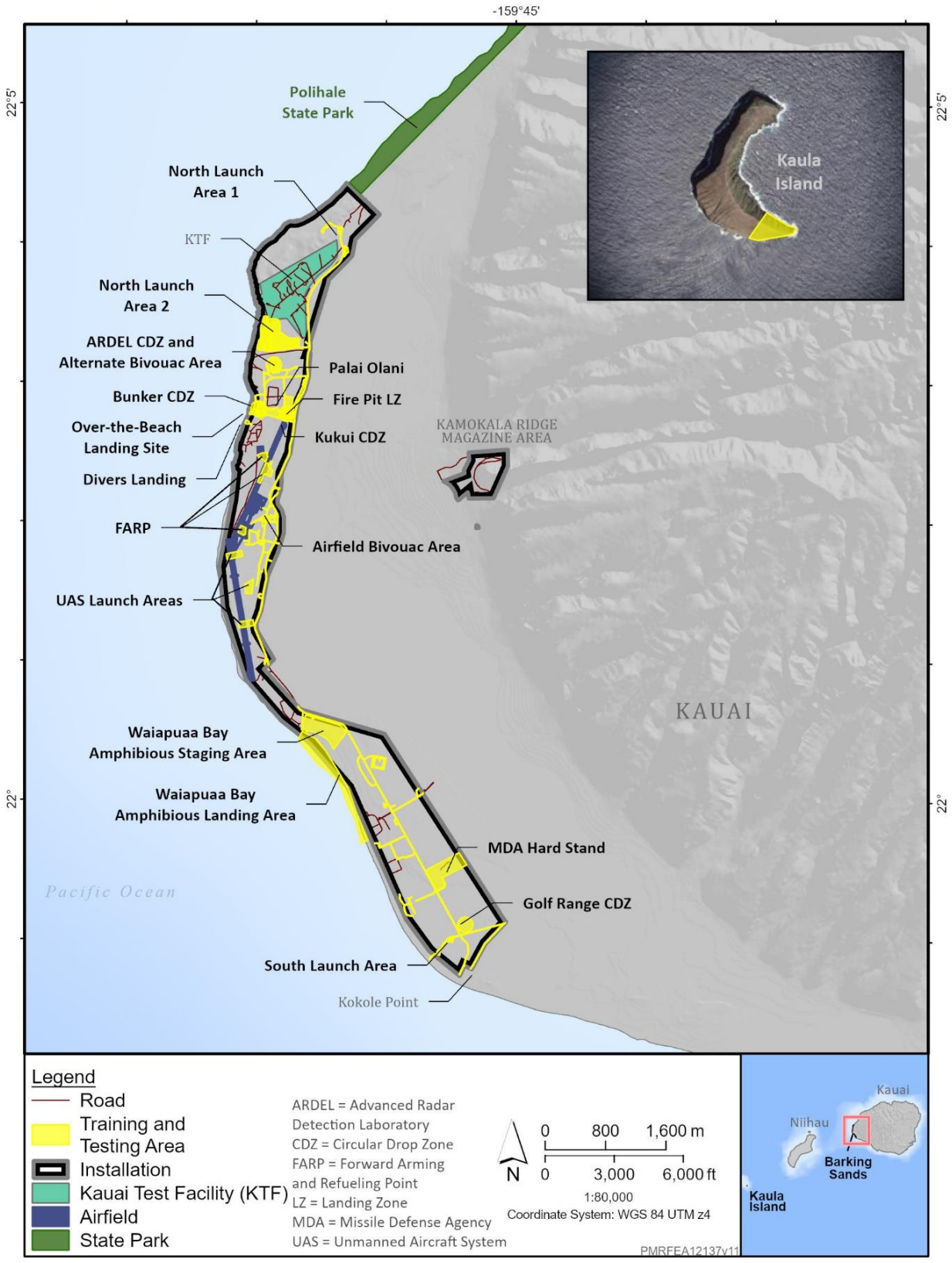

Figure 2.1-1: Training and Testing Sites in the Study Area

Table 2.1-1: Proposed Training and Testing Activity Descriptions

Activity Name	Activity Description	Training & Testing Area	Ongoing # of Annual Activities*	Proposed # of Annual Activities
Missile, Rocket, and Aerial Target Drone Launch	Terrestrial portion of launching missiles, rockets, and aerial target drones from established launch areas ashore. Aerial or surface target intercepts to occur offshore, on or above water.	North Launch Area 1	16	15
		North Launch Area 2	9	20
Missile, Rocket, and Aerial Drone Target Set-up (No Launch)	Conduct non-live-fire missile or rocket system launch preparation by deploying, making ready for launch, and redeploying a transportable tactical missile or rocket system.	North Launch Area 1, North Launch Area 2, and South Launch Area	1	6
Artillery	Terrestrial portion of land-based forces live firing of artillery guns at surface (waterborne) or air targets.	North Launch Area 2	1	3
Amphibious Operations (Raid, Small Boat Operations, Swimmer Insertion/Extraction)	Raid. Company (unit-sized) forces move from amphibious ships at sea, conduct amphibious landing via various vessels/watercraft/vehicles, and conduct follow-on activities ashore. Return to amphibious ships at sea.	Waiapuaa Bay Amphibious Landing Area	1	2
	Small Boat Operations. A Unit using small boats move from offshore location to a beach landing site, carry boat to an inland site, conduct reconnaissance, and then return to the sea via small boat.	Waiapuaa Bay Amphibious Landing Area, and Divers Landing	2	19
	Swimmer Insertion/Extraction. Personnel conduct Over-the-Beach water entry swimmer insertion and extraction training in PMRF amphibious landing areas.	Waiapuaa Bay Amphibious Landing Area, Divers Landing, and Over-the-Beach Landing	1	2

Activity Name	Activity Description	Training & Testing Area	Ongoing # of Annual Activities*	Proposed # of Annual Activities
Forward Arming and Refueling Point (FARP) Operations	Establish, operate, and re-deploy a FARP site using the Tactical Airfield Fuel Dispensing Systems, Helicopter Expedient Refueling System, or similar type expeditionary aircraft refueling system. Aircraft examples: MV-22, KC-130, CH-47, AH-64, FA-18, F-35, P-8.	FARP Areas	1	20
Small Unmanned Aircraft Systems (sUAS) and Counter-Unmanned Aircraft Systems (UAS) Operations	Conduct sUAS operations. Launch and control sUAS. Conduct counter-UAS operations. Launch and control a counter-UAS system from a land location.	UAS Launch Area	2	45
Parachute Operations	Conduct parachute operations (land).	ARDEL Circular Drop Zone (CDZ), Bunker CDZ, Golf Range CDZ, and Kukui CDZ	1	16
Command, Control, Computing, Communications, Cyber, Intelligence, Surveillance, Reconnaissance and Targeting Exercise to include Command Post Exercise, Communication Relay Exercise	Establish and operate a tactical field command post, communication systems, radar tracking and surveillance systems, optical tracking systems, and electronic warfare equipment operated on concrete areas or by mobile vehicles.	North Launch Area 1	1	30
		North Launch Area 2	5	12
		South Launch Area	1	18
		MDA Hard Stand	2	10
Bivouac (unit, medium, large)	Establish and operate expeditionary field lodging for personnel conducting training.	Airfield Bivouac Area	5	26
		MDA Hard Stand	1	4
		Palai Olani	1	6
		North Launch Area 2	1	9
		Alternate Bivouac Area (ARDEL)	1	2

Activity Name	Activity Description	Training & Testing Area	Ongoing # of Annual Activities*	Proposed # of Annual Activities
Air-to-Ground Gunnery Exercise (GUNEX)	GUNEX involves strike fighter aircraft and helicopter crews employing guns and inert rockets to attack ground targets, day or night, with the goal of destroying or disabling enemy vehicles, structures, or personnel. Inert ordnance only. GUNEX may include the use of targeting laser.	Kaula Island	14	24
Air-to-Ground Bombing Exercise (BOMBEX)	BOMBEX involves training of strike fighter aircraft delivery of inert ordnance only against land targets in day or night conditions and may include the use of targeting laser.	Kaula Island	12	31
Helicopter/Tilt-Rotor Landing Zone (LZ) Operations (off airport surface)	Helicopter/Tilt-Rotor aircraft conduct LZ Operations (off airport surface). Deliver/recover personnel or equipment from/to unimproved landing zone locations.	Fire Pit LZ	1	12
Ground Maneuver	Units conduct land movement to other land locations.	Improved roads and pathways	1	22

*Quantity represents the highest single-year activity occurrences, over the period 2018–2023.

2.1.2.1 North Launch Area 1

North Launch Area 1, located in the north end of PMRF Barking Sands (Figure 2.1-2), is bounded by Polihale State Park to the north, agricultural lands to the east, Kauai Test Facility (KTF) to the south, and dunes of the Pacific Ocean to the west. The site is approximately 4 acres and contains launch pads, a launcher, and communication facilities.

2.1.2.2 North Launch Area 2

North Launch Area 2, located in the northern portion of PMRF (Figure 2.1-3), is bounded by KTF to the north, vegetated areas to the east, Nohili Ditch to the south, and dunes of the Pacific Ocean to the west. The site is approximately 38 acres and contains launch pads, launchers, and command and communication facilities.

2.1.2.3 South Launch Area

The South Launch Area (Kokole Point), located at the southern end of PMRF (Figure 2.1-4), is bounded by PMRF communication equipment areas to the north and east, and dunes of the Pacific Ocean to the south and west. The site is approximately 2 acres and contains a single launch pad area. Located northeast of the launch area, the Golf Range Circular Drop Zone (CDZ) is a 100-meter radius circular area used for personnel parachute landing training.

2.1.2.4 Palai Olani

The Palai Olani area (Figure 2.1-5) is approximately 20 acres and is bounded by fuel storage to the north; Nohili Road to the east; airfield parking and ordnance repair support facilities to the south; and with water entry/exit exceptions, dunes of the Pacific Ocean to the west. Areas co-located within or adjacent to Palai Olani include the following:

- Divers Landing: personnel using small boats move from an offshore location to a beach landing site, carry boats to an inland site, conduct reconnaissance, and return to the sea via small boat.
- Over-the-Beach (OTB) Landing Site: personnel train for water entry swimmer insertion and extraction.
- Fire Pit Landing Zone: Helicopter/Tilt-Rotor aircraft conduct landing zone operations (off the airfield's paved surface) to deliver or recover personnel or equipment.
- Bunker and Kukui CDZs: two 100-meter radius circular areas used for personnel parachute landing training.

2.1.2.5 Waiapuaa Bay

Waiapuaa Bay is located in the southern portion of PMRF (Figure 2.1-6), south of the airfield and north of PMRF housing. The bay is approximately 0.75 mi. long and includes the immediate beach area used to support amphibious training. The components of Waiapuaa Bay include the following:

- Waiapuaa Bay Amphibious Landing Area: amphibious vehicles and vessels come ashore to offload equipment and personnel for follow-on training. The area covers approximately 45 acres.
- Waiapuaa Bay Amphibious Staging Area: a temporary location for logistical supply cache, brought ashore from ships at sea. The area covers approximately 31 acres.

2.1.2.6 Missile Defense Agency Hard Stand

The MDA Hard Stand area is located in the southern portion of PMRF (Figure 2.1-7), with solar farms (photovoltaic collector panels) to the north and south, Kaumualii Highway and non-DoD lands to the east, and vegetated areas to the west. This site is 27 acres and supports radar testing.

Figure 2.1-2: North Launch Area 1

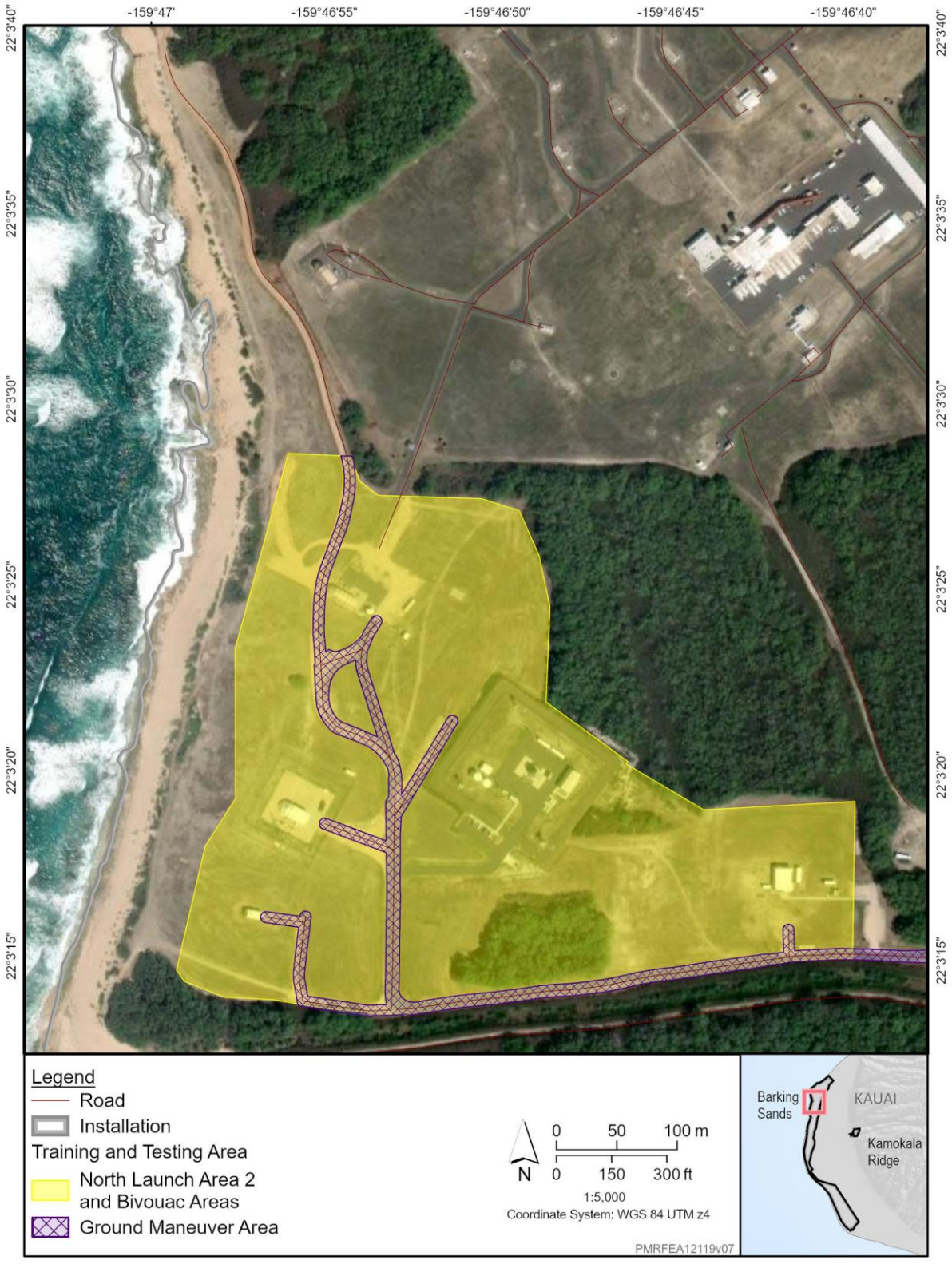

Figure 2.1-3: North Launch Area 2

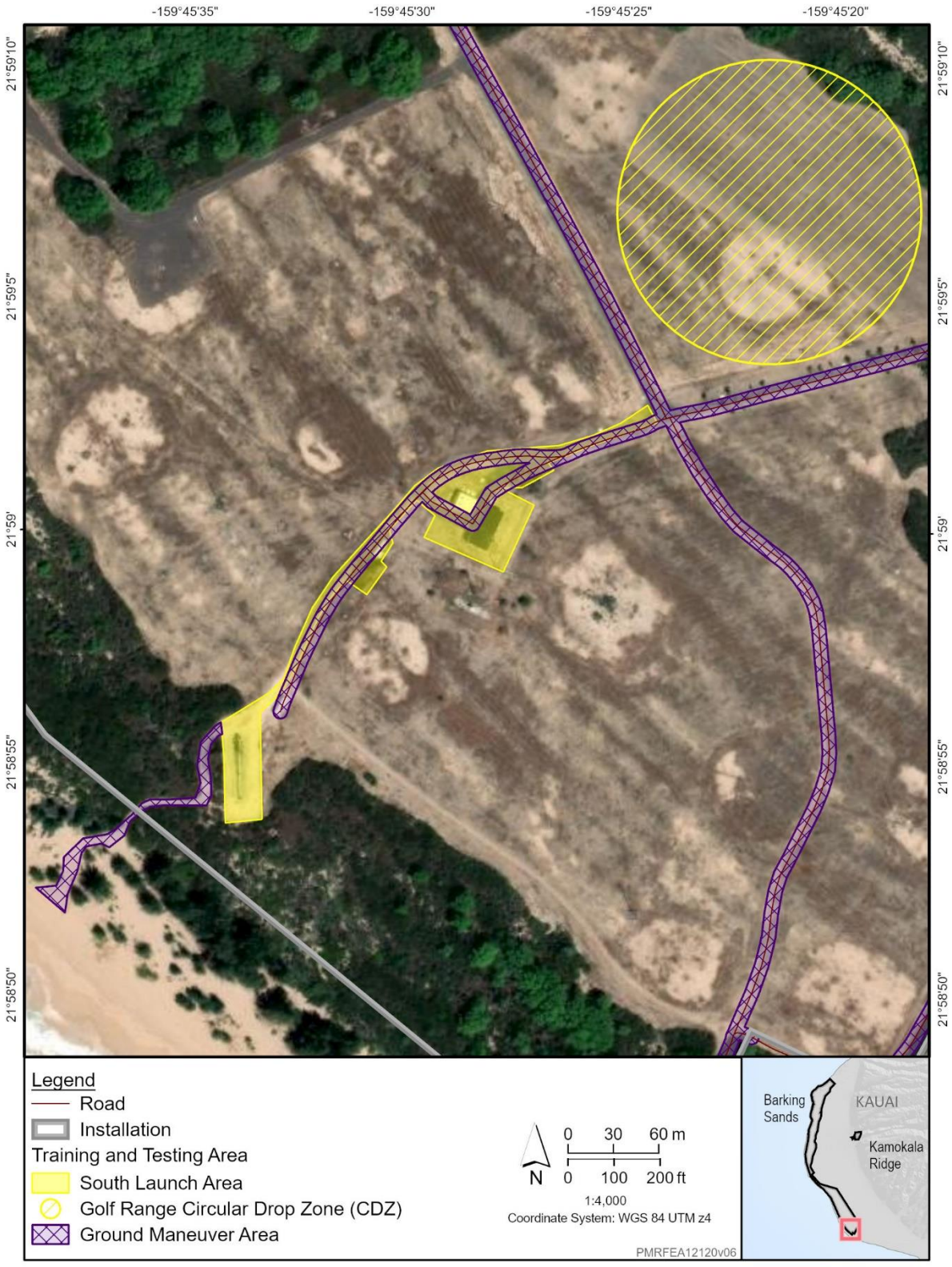

Figure 2.1-4: South Launch Area and Golf Range CDZ

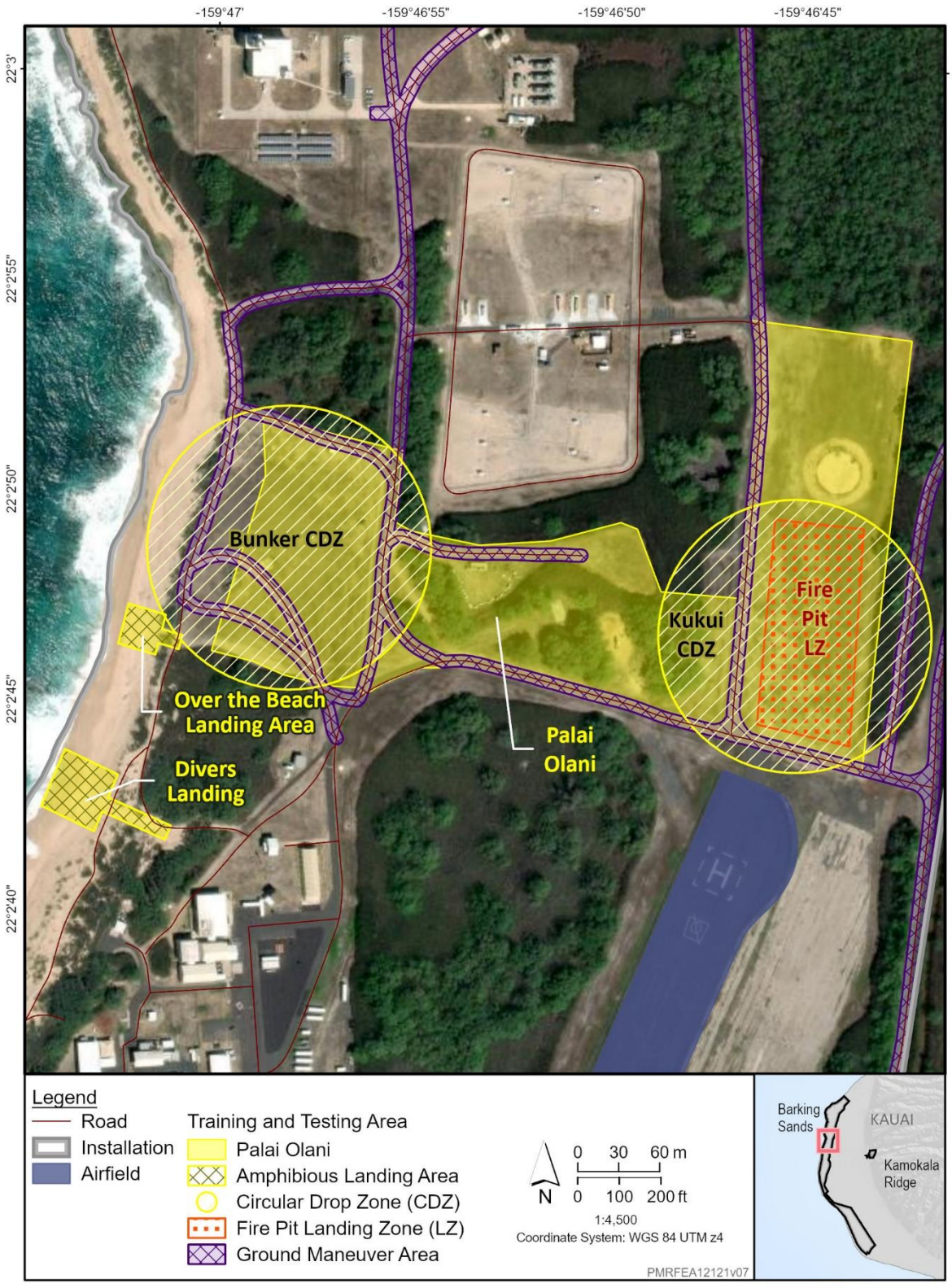

Figure 2.1-5: Palai Olani

Figure 2.1-6: Waiapuaa Bay

Figure 2.1-7: Missile Defense Agency Hard Stand

2.1.2.7 Airfield Bivouac Area

The Airfield Bivouac Area is located adjacent to the airfield site (Figure 2.1-8), straddling the main north-south road (Nohili Road). This area is 2 acres and has several logistical support buildings.

2.1.2.8 Alternate Bivouac Area

The Alternate Bivouac Area is located within the Advanced Radar Detection Laboratory (ARDEL) site (Figure 2.1-9), immediately south of Nohili Ditch. The area is approximately 5 acres. The ARDEL CDZ, a 100-meter radius circular area used for personnel parachute landing training, is co-located in this area.

2.1.2.9 Forward Arming and Refueling Point Areas

Forward Arming and Refueling Point areas (Figure 2.1-10) cover approximately 10 acres and are located on or abutting the airfield's paved aircraft parking ramps.

2.1.2.10 Unmanned Aircraft System Launch Area

The Unmanned Aircraft System (UAS) Launch Area (Figure 2.1-11) covers 4 acres and is adjacent to the runway for the launching catapult systems and on the PMRF runway for the UAS recovery system.

2.1.2.11 Ground Maneuver Area

PMRF Ground Maneuver Area (Figure 2.1-12) is approximately 65 acres and includes most of the hard surfaced roads within Barking Sands.

2.1.2.12 Kaula Island

Kaula Island (Figure 2.1-13) is located 20 nautical miles (NM) from Niihau. The southern 1,000 feet of the island, covering approximately 11 acres, is used for inert bombing and gunnery training. Delivery of ordnance at Kaula Island is inert only. Use of live ordnance is restricted; however, previous surveys have noted unexploded ordnance exists on the island. It is assumed that live ordnance had been used in the past before records were maintained (greater than 50 years ago).

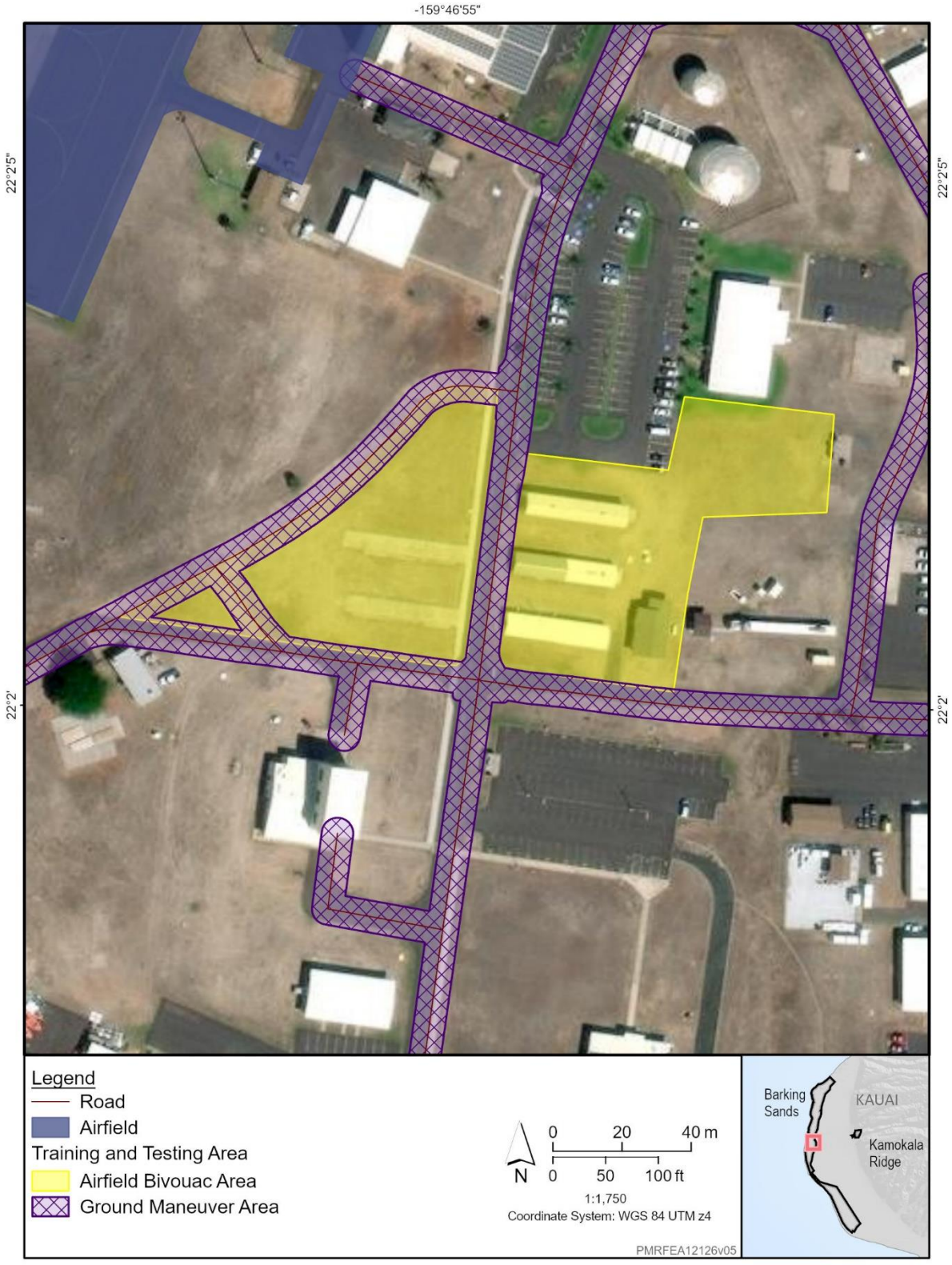

Figure 2.1-8: Airfield Bivouac Area

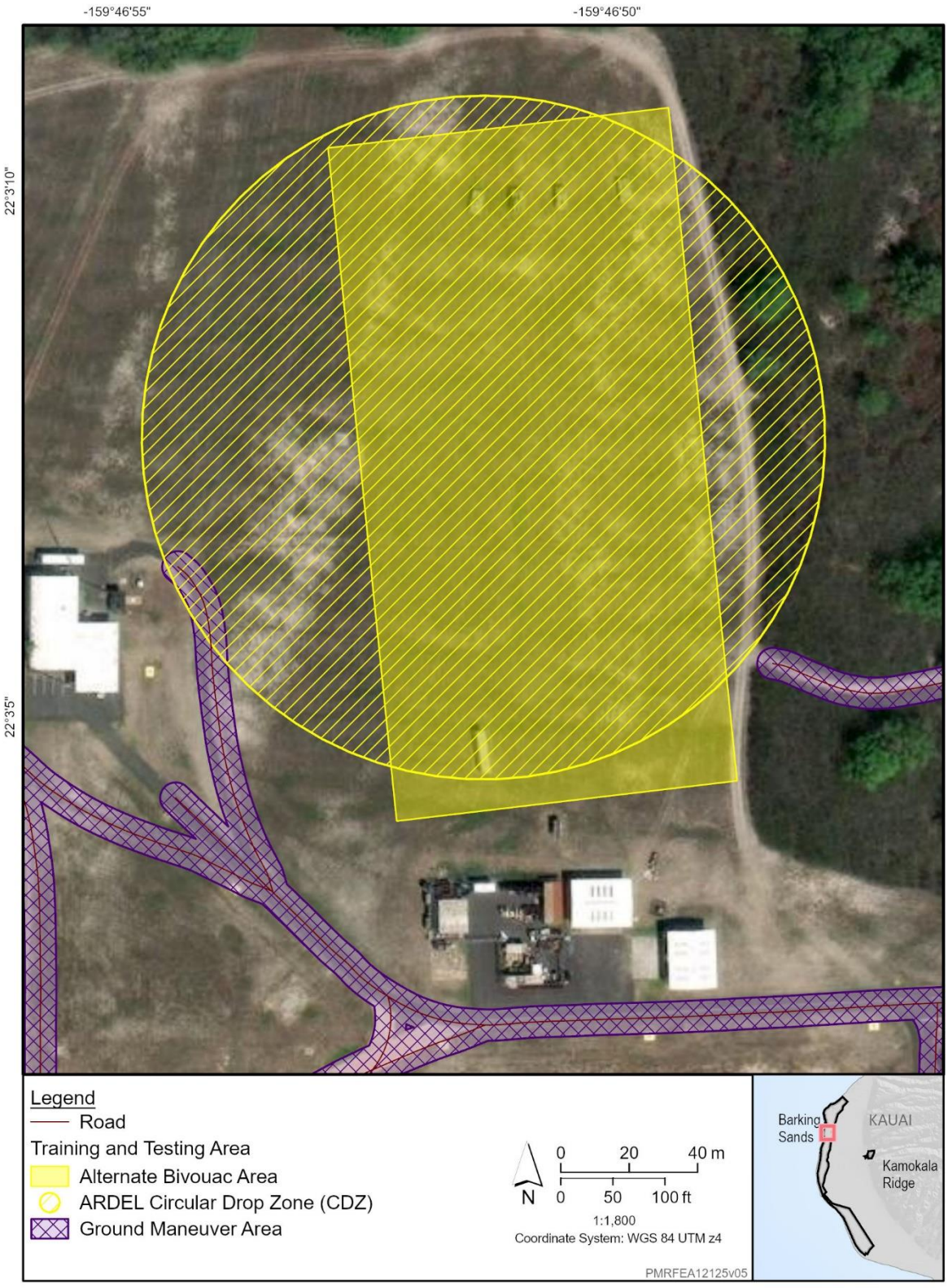

Figure 2.1-9: Alternate Bivouac Area and ARDEL CDZ

Figure 2.1-10: Forward Arming and Refueling Point Areas

Figure 2.1-11: Unmanned Aircraft System Launch Area

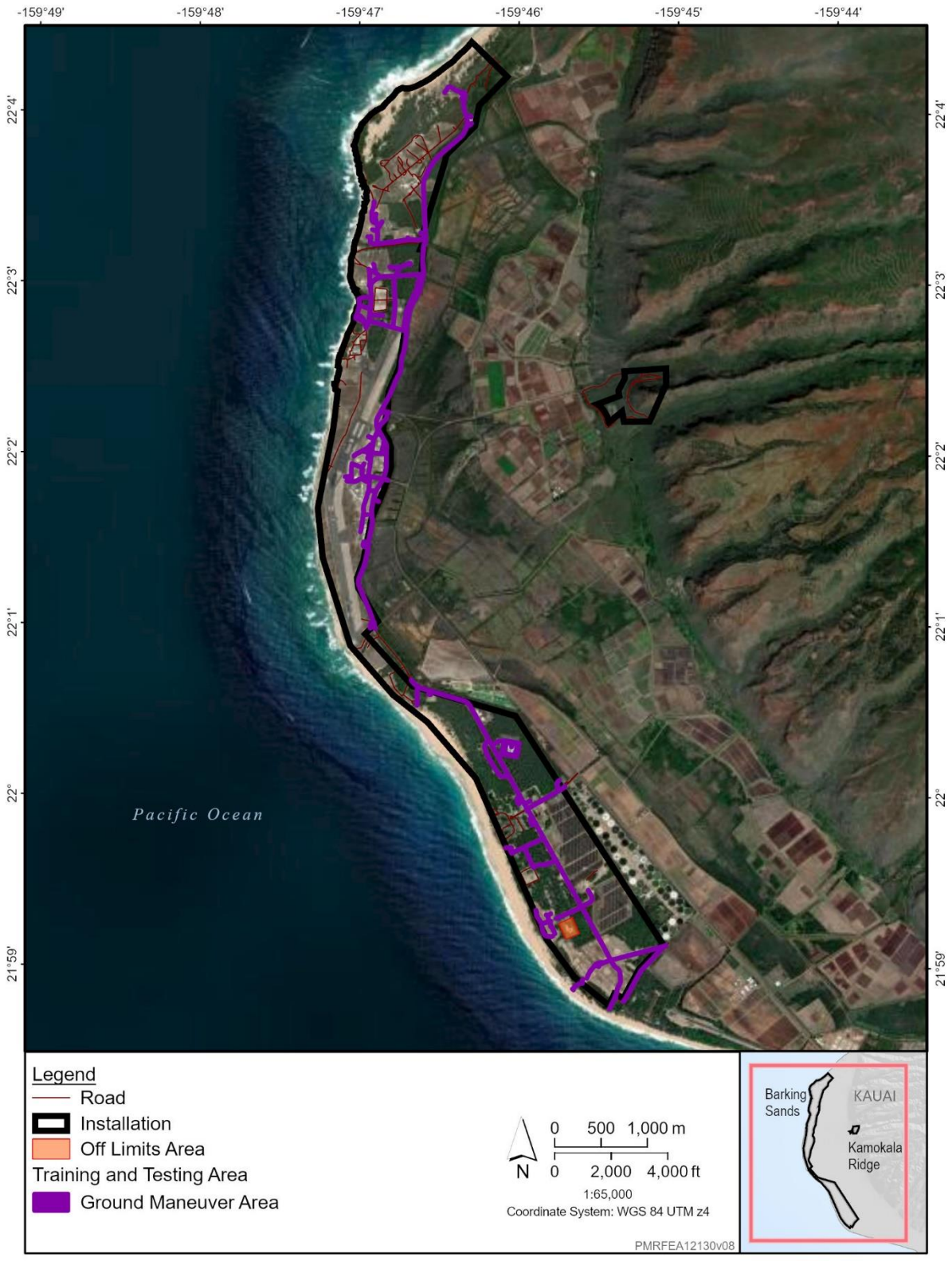

Figure 2.1-12: Ground Maneuver Area

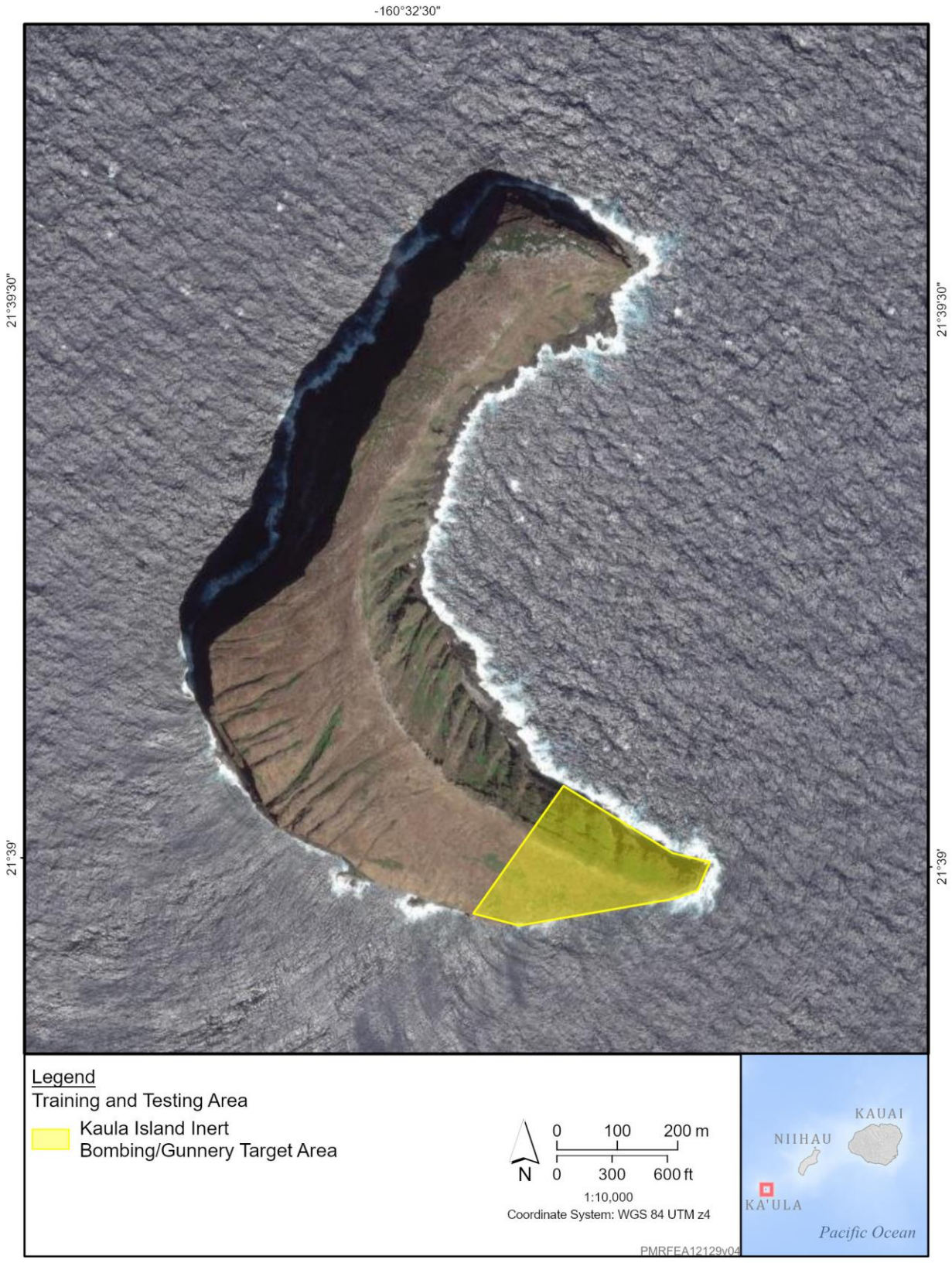

Figure 2.1-13: Kaula Island

2.1.3 Training and Testing Aerial Vehicles/Weapons Systems

Table 2.1-2 lists the typical types of equipment that may be used during proposed training and testing activities within the Study Area. Each activity would require a specific mix of personnel, equipment, and supporting systems. Further, the particular goal of a single training evolution may require a specific set of equipment.

Table 2.1-2: Typical Equipment for PMRF Land-Based Training and Testing

Equipment Type	Description
Command, Control, Computing, Communications, Cyber, Intelligence, Surveillance, Reconnaissance and Targeting (C5ISRT)	
Communication Equipment, Satellite Receivers/Transmitters	Radios for receiving and transmitting voice and data information
Radar	Surveillance, acquisition, and targeting during interceptor flight tests
Electronic Warfare Equipment (vehicle-mounted)	Radio frequency detection equipment and mobile emitters, such as On-the-Move Networking systems
Ground Support Vehicles[1]	
Joint Light Tactical Vehicle (JLTV), High Mobility Multipurpose Wheeled Vehicle (HMWWV), Infantry Support Vehicle	Four-wheeled vehicles for transporting personnel and equipment
7-ton truck	Multi-wheeled vehicle for transporting personnel and heavy equipment
Heavy Expanded Mobility Tactical Truck (HEMTT)	Multi-wheeled vehicle for missile, rocket, and refueling support
Live-Fire Munitions	
Missile	Missile launcher, missile, train in employment of tactical missile launching, such as a land-launched Naval Strike Missile (NSM)
Rocket	Rocket launcher, rocket, train in employment of tactical rocket launching, such as the High Mobility Artillery Rocket System (HIMARS)
Aerial target drone	Aerial target drone launcher, drone, that support anti-air warfare training, such as the BQM-177 target drone
Artillery	Artillery, to include large mortars, for firing 105 millimeter (mm), 120mm, or 155mm artillery rounds
Aircraft	
Small Unmanned Aircraft System (sUAS)	sUAS, hand launched or catapult launched, with ground control system and flight vehicle, which may be fixed wing or rotary wing
Tilt-rotor aircraft	MV-22, both vertical and short take-off capabilities, for transport, personnel, and equipment
Rotary-wing aircraft	CH-53, heavy-lift helicopter, used for transporting personnel, equipment, or supplies; AH-64, UH-60, attack and utility helicopters, providing air-delivered munitions and logistics support

[1] Smaller vehicles may be used; however, the largest types of vehicles are listed for purpose of analysis.

2.2 Screening Criteria

Regulations for implementing NEPA provide guidance to federal agencies on the consideration of alternatives in an EA (40 CFR section 1502.14). These regulations require the decision maker to consider the environmental effects of the Proposed Action and a reasonable range of alternatives to the Proposed Action. Alternatives were determined based on the criteria that an alternative should meet

the purpose and need, and be feasible, reasonable, and in accordance with Office of the Chief of Naval Operations Manual 5090.1E and CEQ regulations for implementing NEPA (40 CFR parts 1500–1508). Reasonable alternatives are those that are technically and economically practical or feasible and meet the purpose and need for the proposed action. The following screening criteria were developed to determine if a potential alternative is reasonable and meets the purpose and need if it supports:

- realistic military readiness activities for the Navy, Marine Corps, Army, and Air Force
- requisite air, surface, and sub-surface range tracking, instrumentation, and communications capabilities
- variable training and testing schedules through allowance of year-round training and testing
- training and testing in proximity to home ports and bases where crews are located in Hawaii
- maximum access to and utilization of existing and future offshore and land-based range infrastructure resources and facilities
- provision of training and testing access to diverse and variable marine environments that replicate real-world conditions where military personnel would be expected to operate

2.2.1 No Action Alternative

The purpose of including the No Action Alternative in environmental impact analyses is to allow agencies to compare the potential impacts of a proposed action with the known impacts of maintaining the status quo. The No Action Alternative is included in this EA as the existing, or baseline (current), level of activity at existing training and testing locations at PMRF required to support ongoing Navy-led training and testing activities. In other words, the No Action Alternative represents no change from current levels of Navy-led training and testing activities, and does not include additional proposed training or testing by the Army, Marine Corps, Air Force, and MDA not previously analyzed in prior documents listed in Table 1.6-1.

2.2.2 Alternatives Considered but Eliminated

Alternatives eliminated from further consideration are described below. The Navy determined that these alternatives did not meet the purpose of and need for the Proposed Action.

2.2.2.1 Alternative Training and Testing Locations

Decades of evolving improvements to the PMRF training range now allows for a full spectrum of multi-domain training and testing to occur in a single range complex. While some unit-level training and testing activities may require only one training element (e.g., airspace, sea surface space, undersea space), more advanced training and testing events require a combination of air, surface, and undersea space as well as access to land ranges. No other location matches these attributes, which are as follows:

- Proximity to the homeport region of Hawaii, and the Navy, Marine Corps, Army, and Air Force commands, ships, submarines, schools, and aircraft units stationed there. Training within Hawaii decreases transit time to equivalent overseas capabilities and ranges, shortens maintenance delays for equipment post-deployment, and reduces biosecurity concerns following overseas use of equipment.
- Proximity to shore-based facilities and infrastructure, joint headquarters, and the logistical support provided for training and testing activities.
- Possesses air, surface, and sub-surface range tracking, instrumentation, and communications capabilities.

- Proximity to military families, minimizing the length of time military personnel spend deployed away from home and benefitting overall readiness.
- Environmental conditions (e.g., bathymetry, topography, and weather) found in the Study Area that maximize the training realism and testing effectiveness.
- Operational conditions (e.g., a unit can come ashore and fire a live rocket or missile at a target ship for training purposes) within the Study Area that allows long range command and control operations with joint partners aligned under U.S. Indo-Pacific Command.

No other alternatives were identified that could fulfill the need for the Proposed Action. PMRF is the most practical and only feasible location within Hawaii to conduct the multi-service land-based training and testing activities listed in this Proposed Action, as it is an existing range that offers diverse and multi-dimensional capabilities and allows range users to develop and maintain high levels of military readiness. Existing Army ranges and training lands within Hawaii are significantly constrained due to space (geography and size) and demand from Army units in addition to supporting other DoD service components, to include the Marine Corps, Navy, and Air Force. Region-specific commands, such as the Multi-Domain Task Force, 8th Theater Sustainment Command, and the 94th Air and Missile Defense Command have several water-based training requirements that cannot be met on Army lands. PMRF consists of instrumented, multi-environmental ranges that support long-range live fire, and non-live-fire training capabilities absent on Marine Corps and Army ranges. This is due to the extensive at-sea range, expansive controlled airspace, and unique coastal geography that is not available on Marine Corps and Army training areas in Hawaii or the Continental U.S.

As such, the unique and interrelated nature of the features of PMRF (land ranges, undersea terrain, at-sea ranges, and controlled airspace) provides the training and testing venue needed to support complex military activities. There is no other integrated range in Hawaii that affords the required level of operational support and comprehensive integration of training and testing activities. Therefore, for the purposes of this EA, only the Proposed Action and No Action Alternative have been evaluated.

2.2.2.2 Simulated Training and Testing Only

The Services currently use simulators for training and testing whenever possible (e.g., command and control exercises conducted without operational forces); however, simulation has significant limitations, and its use cannot replace live training or testing. Live training remains essential for its realism and its ability to help trainees develop physical skills, improve teamwork, increase adaptability, manage risk, and account for human factors (e.g., physical fatigue, fear) as part of training. It complements and enhances the overall training experience, ensuring comprehensive readiness for real-world operations. Furthermore, operational training and testing cannot be based exclusively on computer modeling or simulation (see 10 U.S.C. sections 2366 and 2399). Therefore, simulation as an alternative that replaces training and testing in the field does not meet the purpose of and need for the Proposed Action and has been eliminated from detailed study.

2.3 Standard Operating Procedures Included in the Proposed Action

To avoid and minimize potential environmental effects from the Proposed Action, Standard Operating Procedures (SOPs) and minimization measures would continue to be followed for training and testing activities. These measures are listed for each applicable resource section of this EA (Sections 3.1–3.6). The impact assessment provided in this EA accounts for the implementation of these measures. SOPs are existing policies, practices, and measures that the Navy uses to reduce the environmental impacts of proposed activities, functions, or processes, and are inherently part of the Proposed Action.

3 Affected Environment and Environmental Consequences

3.0 Introduction

This section presents a description of the environmental resources and existing conditions that may be adversely affected as a result of implementation of the Proposed Action, and an analysis of potential direct or indirect effects. All potentially relevant environmental resource areas were considered for analysis in this EA. In compliance with NEPA, CEQ, and Navy guidelines, the discussion of the affected environment (i.e., existing conditions) focuses on only those resource areas potentially subject to adverse effects. Additionally, the level of detail used in describing a resource is commensurate with the anticipated level of potential environmental impact.

The analysis presented in this section focuses on air quality, climate change and greenhouse gases, noise, public health and safety, terrestrial biological resources, and cultural resources, and potential impacts on these resources as a result of implementation of the Proposed Action and No Action Alternative. Potential impacts on the resource areas listed in Table 3.0-1 are considered to be negligible or non-existent and therefore were not analyzed further in this EA. The Proposed Action does not include construction and would not result in an increase or decrease in the local workforce.

Table 3.0-1: Resource Areas Not Carried Forward for Further Analysis

Resource Area	Justification
Water Resources	The Proposed Action is not expected to impound, divert, drain, control, or otherwise modify the waters of any stream or other body of water. Proposed training and testing activities do not involve changes to drainage patterns and therefore are not expected to introduce pollutants to surface waters or groundwater in the Study Area. Spill response and prevention procedures would comply with PMRF's Spill Prevention, Control, and Countermeasure Plan and Spill Contingency Plan to prevent and respond to any potential spills associated with proposed activities. Therefore, water quality is not expected to be measurably impacted.
Geological Resources	The Proposed Action does not include construction. Any ground-disturbing activities (i.e., placement of grounding rods) would not occur in undisturbed areas without prior approval and if approved would be minimized through implementation of SOPs and protective measures. Therefore, geological resources in the Study Area are not expected to be measurably impacted.
Visual Resources	The Proposed Action does not include the construction of permanent new structures over any undisturbed areas and therefore is not expected to permanently alter views or scenic quality associated with publicly recognized vistas, viewsheds, overlooks, or features within the Study Area or surrounding area.
Airspace Management	The Proposed Action does not include changes to airspace designation or restriction in the existing airspace within the Study Area or surrounding area.
Infrastructure	The Proposed Action does not include changes to infrastructure within the Study Area. Therefore, any disruption or change to existing wastewater, water, telecommunication, or other utility services with implementation of the Proposed Action is not expected. Proposed increases in training and testing and associated personnel would not impact the existing capacity of PMRF utility systems (i.e., water, sewer, electricity, etc.).
Transportation	The Proposed Action is not expected to alter transportation facilities or traffic patterns of a public roadway. Any changes to traffic associated with the increases in training and testing activities would be limited to the installation boundaries and are not expected to impact the general public.

Resource Area	Justification
Socioeconomics	Proposed activities are consistent with the type of training and testing activities that have historically occurred at PMRF. Although the continuation of these activities would occur at an increased tempo depending on activity, there would not be an increase in stationed personnel associated with the Proposed Action. Therefore, there would be no short-term or long-term impacts on the population or demographics within the Study Area and surrounding area. As a result, proposed activities are not expected to cause a measurable change in the following socioeconomic characteristics: population; availability of affordable housing; accessibility to public services; social conditions linked to population shifts; and economic factors, including employment, income, and spending.
Environmental Justice and Protection of Children	Activities associated with the Proposed Action may result in changes in the natural and physical environment (e.g., air quality, climate change and greenhouse gases, noise, public health and safety, terrestrial biological resources, and cultural resources); however, these changes are not expected to result in any adverse environmental or health effects. Therefore, there would be no disproportionate or adverse impacts on minority or low-income populations, or children within the Study Area and surrounding area.

Notes: PMRF = Pacific Missile Range Facility, SOP = Standard Operating Procedure

3.1 Air Quality

3.1.1 Definition of Resource

This section describes the air quality in the Study Area and discusses potential adverse effects on air quality that could result from the Proposed Action. Air pollution can damage the health of people, plants, animals, and water bodies as well as the exteriors of buildings, monuments, and statues. It also creates haze or smog that reduces visibility and interferes with aviation. A region's air quality is influenced by many factors, including the type and amount of pollutants emitted into the atmosphere, the size and topography of the air basin, and the local meteorological conditions. Ambient air quality is reported as the atmospheric concentrations of specific air pollutants at a particular time and location. The units of measure are expressed as a mass per unit volume (e.g., micrograms per cubic meter of air) or as a volume fraction (e.g., parts per million by volume).

3.1.2 Regulatory Setting

3.1.2.1 Clean Air Act

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

3.1.2.1.1 Criteria Pollutants and Ambient Air Quality Standards

Under the CAA, the U.S. Environmental Protection Agency (USEPA) establishes National Ambient Air Quality Standards (NAAQS) to protect public health and welfare. NAAQS have been established for six major pollutants of concern, called "criteria pollutants": carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3), sulfur dioxide (SO_2), and coarse and fine particulate matter (with an aerodynamic size less than or equal to 10 microns [PM_{10}] and with an aerodynamic size less than or equal to 2.5 microns [$PM_{2.5}$]). Primary standards provide public health protection, including protecting the health of "sensitive" populations such as asthmatics, children, and the elderly. Secondary standards provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings.

Criteria air pollutants are classified as either primary or secondary pollutants. Primary air pollutants are emitted directly into the atmosphere from the source of the pollutant, such as volatile organic compounds (VOCs) emitted by industrial solvents. Secondary air pollutants are those formed through atmospheric chemical reactions. For example, ozone is a secondary pollutant that is formed in the atmosphere by photochemical reactions of previously emitted pollutants, or precursors (VOC, nitrogen oxides [NO_x], and suspended PM_{10}).

Areas that meet the NAAQS are designated as attainment. Areas with one or more criteria pollutants that exceed the NAAQS are designated as nonattainment. An area may be nonattainment for some pollutants and attainment for others. Nonattainment areas for some criteria pollutants are further classified as marginal, moderate, serious, severe, and extreme, depending on the severity of the air quality problem. An area that was formerly designated as nonattainment but has attained the standard is designated as maintenance. Maintenance areas are subject to a USEPA-approved maintenance plan to ensure continued attainment of the area over two consecutive 10-year periods.

The CAA sections 111 and 112 allow USEPA to transfer primary implementation and enforcement authority for most of the federal standards to state, territory, local, or tribal regulatory agencies. These agencies' authority to implement the CAA requirements is through USEPA-approved State Implementation Plans, or by delegation.

States may establish ambient air quality standards (AAQS) that are more stringent than the NAAQS.

Table 3.1-1 presents the current NAAQS and Hawaii AAQS for criteria pollutants.

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

Air Pollutant	Averaging Time	Hawaii Standard	Federal Primary Standard	Federal Secondary Standard
Carbon monoxide (CO)	1-hour	9 ppm	35 ppm	–
	8-hour	4.4 ppm	9 ppm	–
Lead (Pb)	3-month	1.5 µg/m^3 (Calendar quarter)	0.15 µg/m^3	Same as primary
Nitrogen dioxide (NO_2)	1-hour	None	100 ppb	None
	Annual	0.04 ppm	53 ppb	Same as primary
Particulate matter less than or equal to 10 microns in diameter (PM_{10})	24-hour	150 µg/m^3	150 µg/m^3	Same as primary
	Annual	50 µg/m^3	–	–
Particulate matter less than or equal to 2.5 microns in diameter ($PM_{2.5}$)	24-hour	None	35 µg/m^3	Same as primary
	Annual	None	9 µg/m^3	15 µg/m^3
Ozone (O_3)	8-hour	0.08 ppm	0.070 ppm	Same as primary
Sulfur dioxide (SO_2)	1-hour	None	75 ppb	–
	3-hour	0.5 ppm	–	0.5 ppm
	24-hour	0.14 ppm	–	–
	Annual	0.03 ppm	–	–
Hydrogen sulfide (H_2S)	1-hour	25 ppb	–	–

Sources: (U.S. Environmental Protection Agency, 2024b), (Hawaii Department of Health, 2015).
Notes: ppb = parts per billion, ppm = parts per million, µg/m^3 = micrograms per cubic meter.

3.1.2.1.2 Hazardous Air Pollutants

In addition to the six criteria pollutants, the USEPA currently designates 188 substances as hazardous air pollutants (HAPs) under the federal CAA. HAPs are air pollutants known or suspected to cause cancer or other serious health effects, or adverse environmental and ecological effects (U.S. Environmental Protection Agency, 2016). HAP emissions are typically one or more orders of magnitude smaller than concurrent emissions of criteria air pollutants. NAAQS are not established for these pollutants; however, the USEPA has developed rules and control standards to limit emissions of HAPs from specific stationary and mobile sources. The stationary source HAP regulations are called National Emissions Standards for Hazardous Air Pollutants, codified in 40 CFR parts 61 and 63. These emissions control standards are intended to achieve the maximum degree of reduction in emissions of the HAPs, taking into consideration the cost of emissions control, non-air-quality health and environmental impacts, and energy requirements.

The Mobile Source Air Toxics (MSAT) rules reduce HAPs emitted by mobile sources, such as highway vehicles and non-road equipment, with 21 compounds identified and six compounds specifically identified as having the greatest influence on health: benzene, 1,3 butadiene, formaldehyde, acrolein, acetaldehyde, and diesel particulate matter (U.S. Environmental Protection Agency, 2015). To assess risk from exposure to toxics, the USEPA has tabulated long-term (chronic) and short-term (acute) dose-response assessments that could be used for risk assessments of HAPs (U.S. Environmental Protection Agency, 2024a).

3.1.2.2 Hawaii Air Pollution Control Standards and Regulations

The State of Hawaii Department of Health Clean Air Branch is responsible for air pollution control in the state. Air pollution requirements are implemented through Hawaii Administrative Rules (HAR), Title 11, Chapters 59, Ambient Air Quality Standards, and 60.1, Air Pollution Control. The State of Hawaii has established AAQS for the six criteria pollutants and a state standard for hydrogen sulfide (Table 3.1-1). Hydrogen sulfide was not analyzed in this EA because it is not emitted by any emission source from the Proposed Action. Permits are required for Covered and Noncovered stationary emission sources. Internal combustion engines propelling mobile sources such as automobiles, trucks, construction vehicles and aircraft are exempt from permit requirements.

3.1.3 Approach to Analysis

The generated air emissions are evaluated based on the geographical and spatial locations where emissions occur, as well as pollutants emitted, type of emission source, and levels of emissions. All the air emissions associated with the Proposed Action are expected to occur on land and within 3 NM from shore.

The General Conformity Analysis is not applicable to the Proposed Action because the state of Hawaii is not designated as nonattainment or maintenance for any criteria pollutants.

3.1.3.1 National Environmental Policy Act

Analysis of health-based air quality impacts under NEPA includes estimates of total direct and indirect criteria air pollutants and HAPs emissions from all activities, including aircraft, missiles, or targets released at or below 3,000 feet above mean sea level, or that involve vessels in U.S. territorial seas (within 12 NM). NEPA impacts include those that occur over U.S. land mass and within 3 NM from coastline. Total direct and indirect emissions consider all emission increases and decreases that are reasonably foreseeable and are possibly controllable. The analysis considers the future emissions in the

area with the action versus the future emissions without the action (i.e., the Baseline Condition/Affected Environment).

The air quality impact analysis summarizes the emissions estimated for each alternative and provides a qualitative discussion of short-term and long-term impacts of the emissions to air quality. The location and initial dispersion of emissions, duration of exposure, meteorological conditions, wind patterns, buoyancy of pollutants, and other relevant factors are considered and discussed as part of the analysis.

3.1.4 Region of Influence

The region of influence (ROI) for air quality depends on the type of pollutant, emission rates of the pollutant source, proximity to other emission sources, and local and regional meteorology. For example, ground-level ozone, a component of smog, is formed in the lower troposphere when its precursor emissions, VOCs, and NO_x, react in the presence of sunlight. Because of the reaction time involved, the highest ozone concentrations often occur far downwind of the precursor emissions.

The ROI for the Proposed Action includes the areas within and downwind of the PMRF training and testing sites and Kaula Island over land or within 3 NM from the coastline.

3.1.5 Affected Environment

3.1.5.1 Meteorological Conditions and Topography of the Study Area

Pollution dispersion in the air is influenced by meteorological conditions, such as wind speed and wind direction, temperature, and atmospheric stability. Wind direction determines the dispersion path pollutants take; higher wind speeds disperse pollutants over a larger area. Lower wind speeds tend to favor a coherent plume. When warmer air traps cooler air near the surface, stable conditions result in slower dispersion, whereas unstable atmospheric conditions can facilitate dispersion. Topography is another factor that influences pollutant dispersion. Urban areas with tall buildings can disrupt wind patterns and downwash plumes to trap pollutants. Mountains and valleys in the absence of an atmospheric inversion can channel air and promote dispersion.

PMRF is located just south of the Tropic of Cancer and has a mild and semi-tropical climate. Typical temperatures for the area are 80–84 degrees Fahrenheit (°F) during the day and 65–68°F during the night. Trade winds are from the northeast and are typically light. Precipitation in the area averages 20 inches annually. Most of the rain falls during the October through April wet season. Figure 3.1-1 depicts wind rose data, for the December 31, 2018, to December 30, 2023, period, collected by the Kekaha weather station at the PMRF airfield, and the location of the weather station relative to the activity areas.

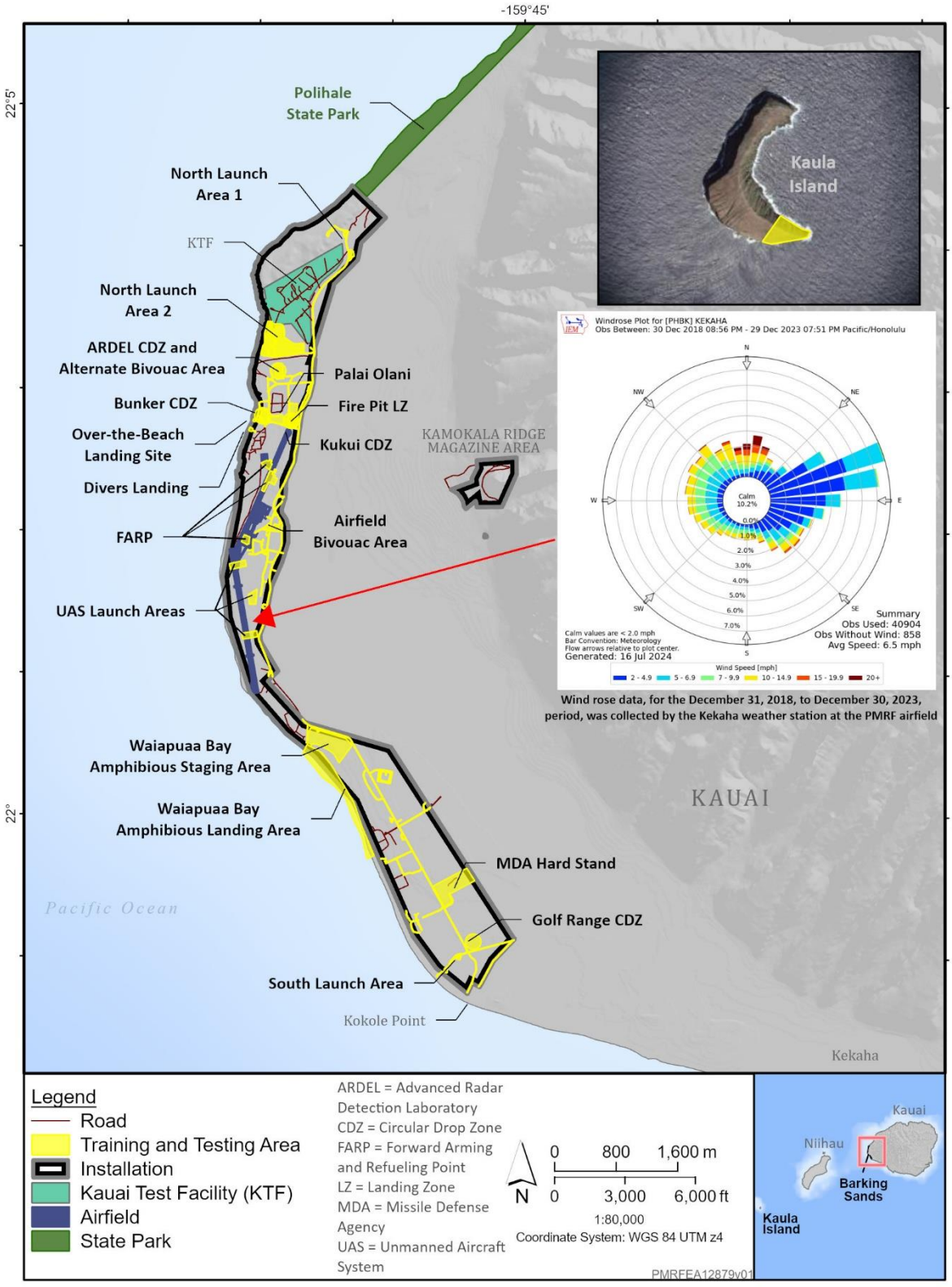

Figure 3.1-1: Kauai Wind Rose and Location Relative to Activity Areas

3.1.5.2 Existing Conditions

Air quality in Hawaii is generally good because of the small number of major stationary sources and strong ventilation provided by frequent trade winds. The State of Hawaii Department of Health, Clean Air Branch plans, operates, and maintains the statewide ambient air quality monitoring network. A Special Purpose Monitoring station on Kauai was established to measure SO_2 from cruise ship emissions. Monitoring for NO_2 and $PM_{2.5}$ on Kauai was discontinued at the site on March 31, 2022 (State of Hawaii Department of Health, 2023). Monitored air pollutant concentrations support the classification of the entire State of Hawaii as attainment for all NAAQS and State AAQS.

The main stationary and portable sources of emissions operated by PMRF include diesel-fueled engines that are used to power generators during training and testing events to provide electricity when demand is high. These engine/generator sets operate under Noncovered Source Permits. Mobile source emissions are generated from aircraft operations, diesel- and gasoline-fueled vehicles, and rocket launches, which are exempt from permitting.

3.1.5.2.1 Receptors

Identification of receptors, including sensitive receptors, is part of describing the existing air quality environment. Sensitive receptors are individuals who are more susceptible to adverse effects of exposure to air pollutants and they are often at hospitals, schools, daycare facilities, elderly housing and convalescent facilities, or other sites. Some of the sites, such as North Launch Areas 1 and 2 are close to public receptors including Polihale State Park and Kokole Point. Other sites, such as Waiapuaa Bay and Unmanned Aircraft System Launch Area are close to an on-base public receptor, Barking Sand Beach Cottages. Kekaha Elementary School is the closest sensitive receptor to the sites. Appendix B (Table B-23) presents the location and distance of closest public receptor and closest sensitive receptor relative to each site.

3.1.5.3 Sources of Emissions

This analysis considers he increase in direct and indirect criteria pollutants and HAP emissions associated with the Proposed Action. Direct emissions are those emissions caused by the Proposed Action and that occur at the same time and place as the action. This includes emissions from all mobile, area and stationary sources. Indirect emissions are those emissions that are a result of the Proposed Action, but that may occur later in time or may be farther removed in distance from the action itself but that are still reasonably foreseeable. No construction activities are planned as part of the Proposed Action.

For ongoing activities, emissions were estimated for the increase in the tempo or number of events. No new activities are proposed at any of the sites. Conservative operating scenarios (e.g., longest average durations, heaviest vehicles) were used to estimate the emissions. Even though not all locations within the training and testing study areas may be utilized over a given year period, emission estimates assumed that all planned activities would occur each year.

Emission sources vary by activity and by training and testing sites within the Study Area. The following activities would generate criteria pollutants and HAP emissions, primarily generated by the combustion of fuel:

- Military vehicles operations in support of training and testing activities. Depending on the exercise, Joint Light Tactical Vehicles (JLTVs), seven-ton trucks, or Amphibious Combat Vehicles may be used. Estimated emissions include dust generated from vehicle travel on unpaved roads.

- Generators utilized to provide power in support of certain activities. Mobile Electric Power (MEP)-531A 2-kilowatt Military Diesel Generators are expected to be the only generators used, except for missile launch, missiles set up/no launch, and Command, Control, Computing, Communications, Cyber, Intelligence, Surveillance, Reconnaissance and Targeting (C5ISRT), which would use 60-kilowatt (kW) generators. It is assumed that all generators are diesel-fueled; the MEP-531A generators meet the USEPA Tier 2 emission standards for Nonroad Compression-Ignition Engines; and the 60-kW generators meet the USEPA Tier 3 emission standards for Nonroad Compression-Ignition Engines.
- Aircraft utilized in support of FARP and Helicopter/Tilt-Rotor Landing Zone operations, Air-to-Ground Gunnery Exercises (GUNEX), and Air-to-Ground Bombing Exercise (BOMBEX). Criteria pollutant and HAP emissions were estimated up to 3,000 feet above ground level, which is the default mixing height above which emissions would not affect the ambient air quality.
- Launches or firing of missiles and rockets, and inert munitions. This includes "Smokey Sam" rockets launched from North Launch Area 2 supporting the Electronic Warfare training exercises.
- Emissions from additional personnel travel to training and testing areas.

Table 3.1-2 presents the sources of emissions by area and activity.

Table 3.1-2: Sources of Emissions by Area and Activity

Activity Name	Training & Testing Area	Emission Sources
Missile, Rocket, and Aerial Target Drone Launch	North Launch Area 1 North Launch Area 2	Military Vehicles, combustion emissions and fugitive dust Privately-Owned Vehicles (POV), combustion emissions and fugitive dust Generators Missiles and rockets
Missile, Rocket, and Aerial Drone Target Set-up (No Launch)	North Launch Area 1, North Launch Area 2, and South Launch Area	Military Vehicles, combustion emissions and fugitive dust POV, combustion emissions and fugitive dust Generators
Artillery	North Launch Area 2	Military Vehicles, combustion emissions and fugitive dust POV, combustion emissions and fugitive dust Munitions
Amphibious Operations - Raid	Waiapuaa Bay	Landing Craft Air-Cushioned (LCAC) Amphibious Combat Vehicle (combustion emissions and fugitive dust)
Amphibious Operations - Small Boat Operations	Waiapuaa Bay and the Divers Landing Area	Combat Rubber Raiding Craft (CRRC)
Amphibious Operations - Swimmer Insertion/Extraction)	Waiapuaa Bay, Divers Landing area, and the Over-the-Beach Landing area	POV, combustion emissions and fugitive dust

Activity Name	Training & Testing Area	Emission Sources
Forward Arming and Refueling Point Operations	Airport Aircraft Parking Area - Forward Arming and Refueling Point Areas	Aircraft (takeoffs and landings and operation during refueling) Military Vehicles, combustion emissions and fugitive dust POV, combustion emissions and fugitive dust Generators Negligible fugitive VOC emissions from JP-8 refueling
Small Unmanned Aircraft Systems (sUAS) and Counter-Unmanned Aircraft Systems Operations	Airfield – sUAS Launch and Recovery Areas	Military Vehicles, combustion emissions and fugitive dust POV, combustion emissions and fugitive dust Generators
Parachute Operations	Palai Olani (ARDEL CDZ, Bunker CDZ, Golf Range CDZ, and Kukui CDZ)	POV, combustion emissions and fugitive dust
Command, Control, Computing, Communications, Cyber, Intelligence, Surveillance, Reconnaissance and Targeting	North Launch Area 1	Military Vehicles, combustion emissions and fugitive dust POV, combustion emissions and fugitive dust Generators
	North Launch Area 2	
	South Launch Area	
	MDA Hard Stand	
Bivouac (unit, medium, large)	Bivouac Area 1	Military Vehicles, combustion emissions and fugitive dust POV, combustion emissions and fugitive dust Generators
	MDA Hard Stand	
	Palai Olani	
	North Launch Area 1	
	Alternate Bivouac Area (ARDEL)	
Air-to-Ground Gunnery Exercise	Kaula Island	Inert Munitions Rotary wing aircraft (takeoffs and landings and hover)
Air-to-Ground Bombing Exercise	Kaula Island	Inert Munitions
Helicopter/Tilt-Rotor Landing Zone Operations	Fire Pit LZ	Aircraft (takeoffs and landings and operation with Engines on, on deck or above LZ Fire Pit) Military Vehicles, combustion emissions and fugitive dust POV, combustion emissions and fugitive dust
Ground maneuver	Improved roads and pathways	None. Involves personnel on foot only.

3.1.6 Environmental Consequences

Effects on air quality are based on estimated increases in direct and indirect emissions associated with implementation of the Proposed Action. The expected areas of impact from air pollutants released by the Proposed Action are downwind of the activities over land or within 3 NM from the Kauai coastline.

The impact analysis includes direct effects from the proposed change in training or testing activities (such as increase in generator operations or movement of a launch system or troops to launch location) and indirect effects (such as personnel travel to the sites) as well as cumulative effects. It does not include airfield operations conducted at the PMRF airfield, except for takeoff and landing in support of FARP, Helicopter/Tilt-Rotor Landing Zone Operations, and Air-to-Ground GUNEX and BOMBEX on Kaula Island. In addition, effects associated with land-based training and testing activities in the water (e.g., land-based missile launch towards a target at sea) have been previously analyzed in prior relevant NEPA documentation (see Table 1.6-1 for a list of documents incorporated by reference).

3.1.6.1 No Action Alternative

Under the No Action Alternative, there would be no change from current levels of Navy-led training and testing activities, described in Table 2.1-1, and these activities would continue to occur within the same designated areas as previously analyzed in relevant environmental documentation listed in Table 1.6-1. Proposed increases in land-based training and testing activities would not occur, and there would be no change in designated training and testing areas. Therefore, no increases in air quality impacts from activities would occur as a result of the No Action Alternative.

3.1.6.2 Proposed Action

This section discusses the potential short-term and long-term effects to air quality under NEPA that could result from implementation of the Proposed Action. The criteria pollutant and HAP emissions all occur within 3 NM from shore.

Table 3.1-3 presents a summary of pollutant emissions for PMRF Barking Sands and Kaula Island. Detailed emissions, by site, are presented in Appendix B. The calculations conservatively assume that the proposed activities all occur within the same year at their highest average tempo and maximum number of personnel. For example, the typical duration of C5ISRT events is between 3 and 10 days. The analysis assumes all but one annual event occurs over a 10-day period, and one annual event is 60 days in duration. Similarly, the Missile, Rocket, Aerial Target Drone Launch activities are modeled as three-day events except for one annual event with a 40-day duration. Most of the emissions are due to generator operations and dust generated by military vehicles and personnel travel to the sites where C5ISRT events, Missile, Rocket, Aerial Target Drone Launch, and Bivouac activities are planned.

Table 3.1-3: Increase in Criteria Pollutant Emissions

Site/Emissions	Total Emissions, ton/year					
	NO_x	SO_x	CO	VOCs	PM_{10}	$PM_{2.5}$
PMRF Barking Sands	31.24	8.05	70.05	10.18	164.54	21.56
Kaula Island	0.31	0.01	2.68	0.81	0.20	0.20
Total	**31.55**	**8.06**	**72.73**	**10.99**	**164.74**	**21.76**

For the Proposed Action, HAPs are primarily generated, in addition to criteria air pollutants, by combustion of fuels. Table 3.1-4, Table 3.1-5, and Table 3.1-6 present the estimated increase in total HAPs of concern, grouped based on their potential cancer, non-cancer chronic and acute health impacts, which would be emitted under the Proposed Action. Similar to criteria pollutant emissions, HAP emissions were also calculated based on conservative assumptions. For example, hourly HAP emissions were calculated assuming that all activities would occur within the same hour over the span of 13 days per year, which is the average duration of activities.

Table 3.1-4: Estimated Increase in Total Carcinogenic HAP Emissions

Pollutant	Total, ton/year	Main Contributing Activity
1,3 Butadiene	0.0218	Personnel Commute to Sites
Acetaldehyde	0.0249	
Benzene	0.0887	
Ethylbenzene	0.0385	
Formaldehyde	0.0514	
Propanal (Propionaldehyde)	0.0017	

Table 3.1-5: Estimated Increase in Total Non-Cancer Chronic HAP Emissions

Pollutant	Total, ton/year	Main Contributing Activity
Acetaldehyde	0.0249	Personnel Commute to Sites
Benzene	0.0887	
Ethylbenzene	0.0385	
Formaldehyde	0.0514	
Hexane	0.0361	
Toluene	0.1883	
Styrene	0.0307	
Xylenes	0.1521	

Table 3.1-6: Estimated Increase in Total Non-Cancer Acute HAP Emissions

Pollutant	Total, lb/hour	Main Contributing Activity
Acetaldehyde	3.84	Personnel Commute to Sites
Benzene	13.64	
Formaldehyde	7.91	
Hexane	5.55	
Propanal (Propionaldehyde)	0.27	
Toluene	28.97	
Styrene	4.72	
Xylenes	23.39	

Criteria pollutants and HAP emissions would be generated during launch activities and while using systems, vehicles, generators, and other necessary equipment during training and testing activities. There would be no permanent or continuously emitting sources of criteria pollutant emissions associated with the Proposed Action.

Figure 3.1-2 presents the locations of closest receptors to the sites. Some sensitive receptors, such as Polihale State Park and Kokole Point, are close to some of the sites as discussed below.

Vehicle criteria pollutant and HAP emissions are short term (i.e., lasting less than 24 hours). At the highest average operational tempo (e.g., 40 days and 60 days per event for some launch and C5ISRT events, respectively), approximately 62,000 military vehicle miles traveled are estimated at PMRF Barking Sands annually from increased activities. As a conservative estimate, approximately 4 million vehicle miles represent the increased personnel travel distance associated with the Proposed Action. Emissions from vehicles operations are expected to initially rise in the immediate vicinity of the activity; however, wakes developed from wind flowing past the equipment body or equipment in motion cause downwash of the exhaust plume. Downwash is expected to overcome any plume rise that could have resulted from buoyancy and momentum and increase ground-level concentrations.

Generator sets are used in some of the areas in support of training and testing exercises. The criteria pollutant and HAP emissions generated from the diesel engines powering these generators could last several hours over a period of several days, depending on the exercise. Some of the sites, including North Launch Area 1 and South Launch Area are relatively close to sensitive receptors, such as Polihale State Park and Kokole Point. The prevailing northeasterly winds would help to disperse the emissions generated at North Launch Area 1 toward the ocean and away from the state park while during other periods, emissions would be transported toward Polihale State Park. Kokole Point is downwind of the South Launch Area where human exposure to emissions could occur. However, given the distance (approximately 0.2 mi.) and the magnitude of the emissions, occurring infrequently, any impact is expected to be minor. These emissions are not expected to contribute to human health risks from HAP exposure in areas where public presence is expected. For all other sites, the prevailing northeasterly winds would help to disperse the emissions away from the receptors while during other periods, emissions would be transported toward the receptors. However, the magnitude of emissions, occurring infrequently, are low enough that only minor impacts would be expected.

Due to the relatively low criteria pollutant and HAP emissions, occurring infrequently and given the distance to downwind receptors, emissions are not expected to interfere with the attainment of AAQS or contribute to human health risks from HAP exposure in areas where public presence is expected.

Therefore, air quality impacts would be less than significant as a result of implementation of the Proposed Action.

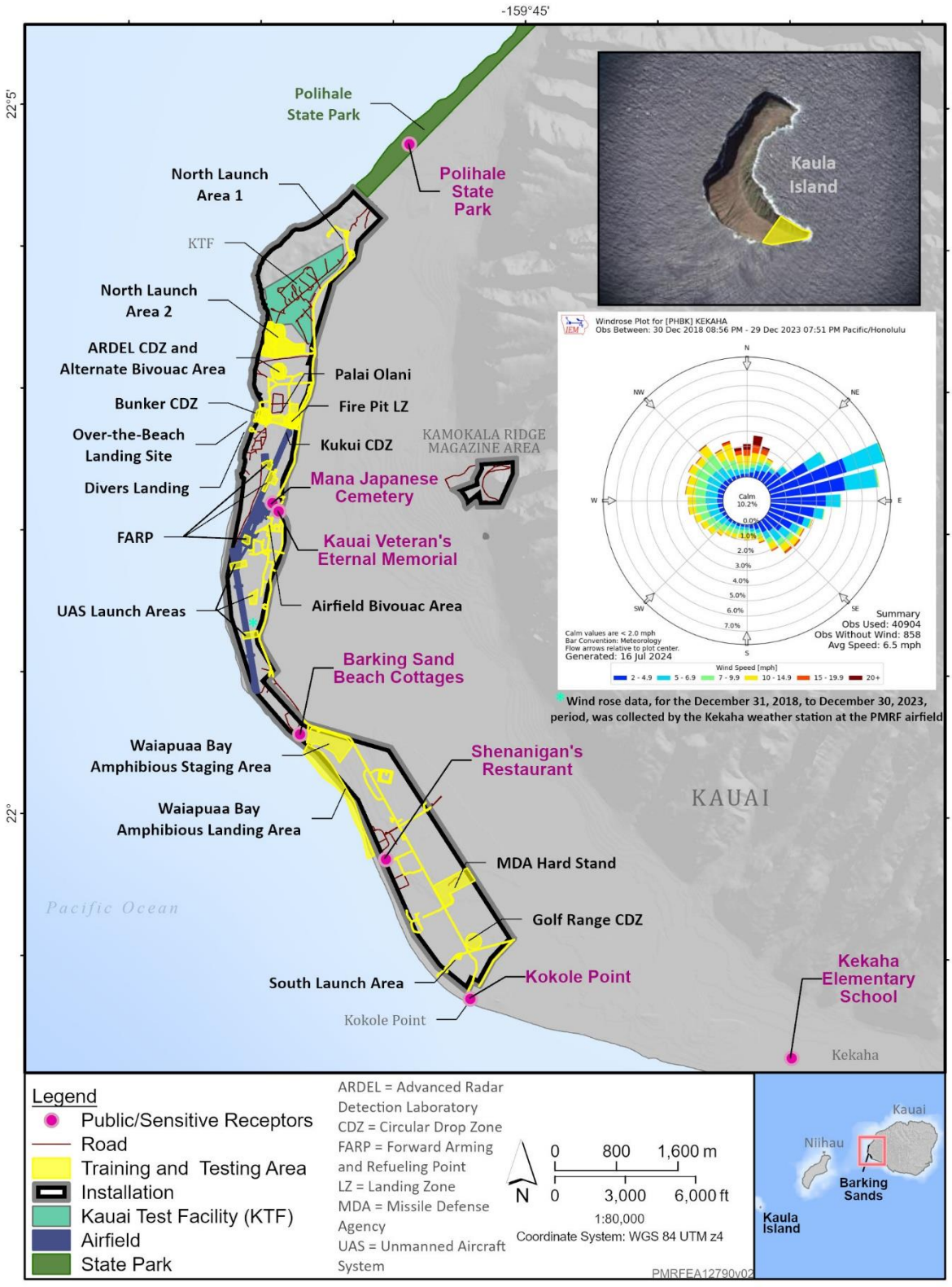

Figure 3.1-2: Proximity of Nearest Receptors to the Sites

3.2 Climate Change and Greenhouse Gases

3.2.1 Definition of Resource

Greenhouse gases (GHGs) are gases that trap heat in the atmosphere. These emissions are generated by both natural processes and human activities. The accumulation of GHGs in the atmosphere helps regulate the earth's temperature and contributes to global climate change. GHGs include water vapor, carbon dioxide, methane, nitrous oxide, ozone, and several hydrocarbons and chlorofluorocarbons. Each GHG has an estimated global warming potential, which is a function of its atmospheric lifetime and its ability to absorb and radiate infrared energy emitted from the earth's surface.

3.2.2 Regulatory Setting

The USEPA specifically identified carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, and nitrogen trifluoride as GHGs (U.S. Environmental Protection Agency, 2009) (74 Federal Register [FR] 66496). These gases influence global climate by trapping heat in the atmosphere that would otherwise escape to space. Increased concentrations of these gases due to human activities is the primary cause of global warming observed over the last 70 years and contributes significantly to climate change (National Academy of Sciences, 2020). GHGs have varying global warming potential (GWP). GWP is a measure of how much energy the emissions of 1 ton of a gas absorb over a given period of time (usually 100 years), relative to the emissions of 1 ton of CO_2 (U.S. Environmental Protection Agency, 2023a).

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

The guidance states that federal agencies should quantify the reasonably foreseeable direct and indirect GHG emissions of their proposed actions and reasonable alternatives (as well as the no action alternative). The guidance also recommends that "agencies provide additional context for GHG emissions, including through the use of the best available social cost of GHG estimates, to translate climate impacts into the more accessible metric of dollars, allow decision makers and the public to make comparisons, help evaluate the significance of an action's climate change effects, and better understand the tradeoffs associated with an action and its alternatives." (Council on Environmental Quality, 2023).

3.2.2.1 State of Hawaii Greenhouse Gas Program

The State of Hawaii Department of Health has established the Hawaii GHG Program to combat the threat of climate change and sea level rise. Act 15 of the 2018 Legislature established a statewide carbon net-negative goal by 2045. Act 238 of the 2022 Legislature established a goal for the level of statewide GHG emissions to be at least 50 percent below 2005 levels by the year 2030 (including airplane emissions). The program utilizes the Air Pollution Control Permit process of the Clean Air Branch to regulate GHG emissions statewide.

On June 30, 2014, HAR, Chapter 11-60.1 was amended to adopt the new Hawaii GHG program. The main requirements of the program are set forth in Subchapter 11, Greenhouse Gas Emissions. To reduce GHGs, the rules specify a 16 percent GHG emission cap for large existing stationary sources ("affected

sources") with potential carbon dioxide equivalent (CO_2e) emissions at or above 100,000 tons per year. Each affected source must submit a GHG emission reduction plan for establishing measures used to meet the emission cap.

3.2.3 Analysis Framework

The Proposed Action is anticipated to release GHGs into the atmosphere. These emissions are quantified for the Proposed Action and compared to the No Action Alternative.

3.2.4 Region of Influence

The ROI for GHG is the global atmosphere since climate change is a global issue.

3.2.5 Affected Environment

3.2.5.1 Existing Conditions

Global GHG in 2022 reached a high of 53.85 billion metric tons (MT) of CO_2e (Ritchie et al., 2020). CO_2e is a measurement of the total greenhouse gases emitted, expressed in terms of the equivalent measurement of carbon dioxide. As shown in Table 3.2-1, in 2021, the U.S. emitted over 6,300 million MT of CO_2e.

Table 3.2-1: Trends U.S. Greenhouse Gas Emissions, Million MT CO_2e

Economic Sector	2017	2018	2019	2020	2021
Industry	1,973.9	2,033.2	2,011.2	1,852.9	1,909.2
Transportation	1,846.0	1,876.2	1,879.2	1,629.2	1,809.5
Commercial	1,060.4	1,074.5	1,029.7	930.5	972.2
Residential	962.3	1,034.9	982.0	918.3	953.8
Agricultural	693.0	709.8	690.7	671.5	671.5
U.S. Territories	26.3	26.3	25.1	23.6	24.1
Total	6,561.8	6,754.8	6,617.9	6,026.0	6,340.2

Source: (U.S. Environmental Protection Agency, 2023b)
Note: Numbers may not add up exactly due to rounding.

In 2019, total GHG emissions in Hawaii were 22.01 million MT of CO_2e. Net emissions, including carbon sinks, were 19.42 million MT CO_2e. Emissions from the Energy sector accounted for 88.4 percent of total emissions in Hawaii, followed by the Agriculture, Forestry, and Other Land Use sector at 6.0 percent, the Industrial Processes and Product Use sector at 3.8 percent, and the Waste sector at 1.9 percent. In 2019 Kauai County accounted for 4.4 percent of the total emissions, with 77.6 percent of Kauai County emissions attributed to the Energy sector (Hawaii State Department of Health, 2023).

3.2.5.2 Sources of Emissions

The following activities would generate GHG emissions, primarily by the combustion of fuel.

- Military vehicles operations in support of training and testing activities. Depending on the exercise, JLTVs, 7-ton trucks, or Amphibious Combat Vehicles may be used.
- Generator utilized to provide power in support of certain activities. MEP-531A 2-kilowatt Military Diesel Generators are expected to be the only generators used, except for missile launch, missiles set up/no launch, and C5ISRT, which would use 60-kW generators.

- Aircraft utilized in support of FARP and Helicopter/Tilt-Rotor Landing Zone operations, Air-to-Ground GUNEX, and Air-to-Ground BOMBEX. GHG emissions were estimated for all altitudes, as applicable.
- Launches or firing of missiles, rockets, and munitions.
- Personnel travel to training and testing areas.

3.2.6 Environmental Consequences

Climate change presents a global problem caused by increasing concentrations of GHG in the atmosphere s. This section discusses the potential effects that could result from implementation of the Proposed Action's GHG emissions on climate change. GHG emissions generated from the Proposed Action contribute to the global atmosphere, regardless of the specific location within the ROI that they are produced. Table 3.2-2 presents the increase in GHG emissions that would result from implementing the Proposed Action.

Table 3.2-2: Increase in GHG Emissions, CO_2e (MT) per year

Source Type	Emissions Increase, CO_2e (MT) per year
Generators	2,192
Aircraft	3,353
Privately Owned Vehicles	1,702
Vessels (within 3 NM)	268
Military Vehicles	76
Missiles, Rockets, and Munitions	11
Total	**7,602**

3.2.6.1 No Action Alternative

Under the No Action Alternative, there would be no change from current levels of Navy-led training and testing activities, described in Table 2.1-1, and these activities would continue to occur within the same designated areas as previously analyzed in relevant environmental documentation listed in Table 1.6-1. Proposed increases in land-based training and testing activities would not occur, and there would be no change in designated training and testing areas. Therefore, no additional impacts on climate change and greenhouse gases would occur as a result of the No Action Alternative.

3.2.6.2 Proposed Action

The Proposed Action would increase GHG emissions by 7,602 MT of CO_2e per year as compared to the No Action Alternative. The estimated GHG emissions are comparable to approximately 1,653 cars per year on the road, as a typical passenger vehicle emits approximately 4.6 tons of CO_2 per year. The emissions are equivalent to 0.00001 percent of the global GHG emissions, approximately 0.0001 percent of the reported U.S. Emissions in 2021, and approximately 0.03 percent of the 2019 GHG emissions reported for Kauai County. Expected GHG emissions are relatively minor and make up a negligible percentage of the global GHG emissions. Therefore, climate change and greenhouse impacts would be less than significant as a result of implementation of the Proposed Action.

3.3 Noise

3.3.1 Definition of Resource

Noise is defined as unwanted or annoying sound that interferes with or disrupts normal human activities. Although continuous and extended exposure to high noise levels (e.g., through occupational exposure) can cause hearing loss, the principal human response to noise is annoyance. The response of different individuals to similar noise events is diverse and is influenced by the type of noise, perceived importance of the noise, its appropriateness in the setting, time of day, type of activity during which the noise occurs, and sensitivity of the individual. Potential impacts on biological species from noise are discussed in Section 3.5 (Terrestrial Biological Resources).

The loudest sounds that can be detected comfortably by the human ear have intensities that are a trillion times higher than those of sounds that can barely be detected. This vast range means that using a linear scale to represent sound intensity is not feasible. The decibel (dB) is a logarithmic unit used to represent the intensity of a sound, also referred to as the sound level. All sounds have a spectral content, which means their magnitude or level changes with frequency, where frequency is measured in cycles per second or Hz. To mimic the human ear's non-linear sensitivity and perception of different frequencies of sound, the spectral content is weighted. For example, environmental noise measurements are usually on an "A-weighted" scale that filters out very low and very high frequencies in order to replicate human sensitivity. It is common to add the "A" to the measurement unit in order to identify that the measurement has been made with this filtering process (A-weighted decibels [dBA]). In this document, the dB unit refers to A-weighted sound levels. Table 3.3-1 provides a comparison of how the human ear perceives changes in loudness on the logarithmic scale.

Table 3.3-1: Subjective Responses to Changes in A-Weighted Decibels

Change	Change in Perceived Loudness
3 dB	Barely perceptible
5 dB	Quite noticeable
10 dB	Dramatic – twice or half as loud
20 dB	Striking – fourfold change

Note: dB = decibel(s)

Figure 3.3-1 provides a chart of A-weighted sound levels from typical noise sources. Some noise sources (e.g., air conditioner, vacuum cleaner) are continuous sounds that maintain a constant sound level for some period of time. Other sources (e.g., automobile, heavy truck) are the maximum sound produced during an event like a vehicle pass-by. Other sounds (e.g., urban daytime, urban nighttime) are averages taken over extended periods of time.

3.3.2 Regulatory Setting

3.3.2.1 Noise Control Act

The Noise Control Act of 1972, as amended, directs all federal agencies to carry out programs within their jurisdiction in a manner that promotes an environment free from noise that jeopardizes health and welfare, to the fullest extent within agency authority.

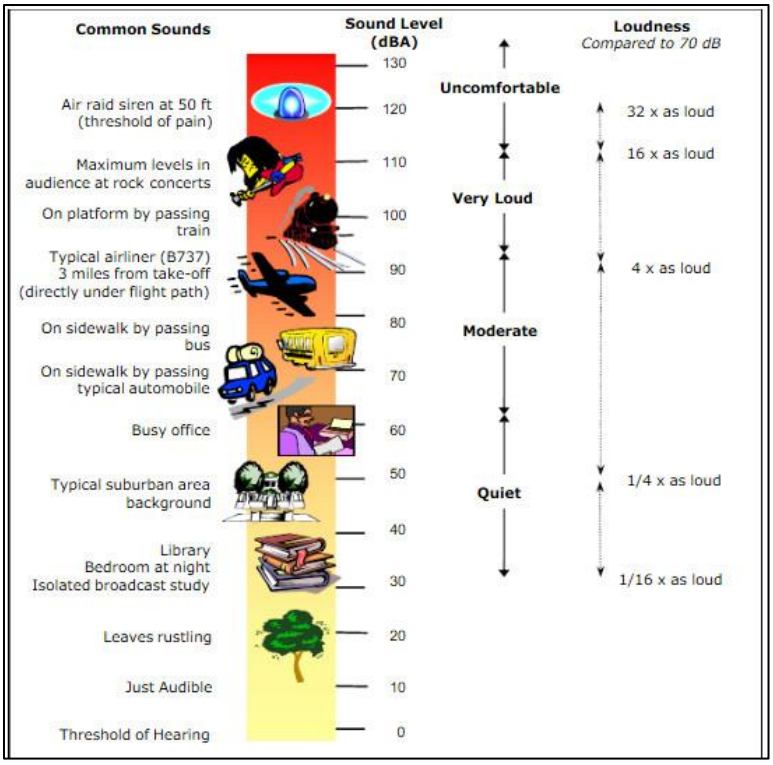

Figure 3.3-1: A-Weighted Sound Levels from Typical Sources

Source: Cowan (1994)

3.3.2.2 Federal Interagency Committee on Urban Noise

The federal government suggests land-use compatibility criteria for different noise zones; however, land use compatibility is regulated at the local level. Based on the guidelines in the Federal Interagency Committee on Urban Noise guidelines (Federal Interagency Committee on Urban Noise, 1980), residential areas and schools are considered compatible where the Day-Night average sound level (DNL) is less than or equal to 65 dBA. Outdoor recreational activities are compatible with noise levels less than or equal to 70 dBA. Parks are compatible with noise levels less than or equal to 75 dBA (Federal Interagency Committee on Urban Noise, 1980).

3.3.2.3 United States Environmental Protection Agency Noise Standards

The USEPA determined a 24-hour exposure level of 70 dB as the level of environmental noise at which no measurable hearing loss would be expected to occur over a lifetime (U.S. Environmental Protection Agency, 1974). This exposure level is also the threshold for hearing loss avoidance.

3.3.2.4 U.S. Occupational Safety and Health Administration

Title 29 of the CFR contains the principal set of rules and regulations from the U.S. Occupational Safety and Health Administration issued by federal agencies regarding occupational noise exposure. Specifically, regulations and standards governing general industry are provided in 29 CFR Part 1910.95.

3.3.3 Approach to Analysis

3.3.3.1 Noise Metrics

A metric is a system for measuring or quantifying a particular characteristic of a subject. Since noise is a complex physical phenomenon, multiple noise metrics help to quantify the noise environment more accurately. The noise metrics used in this EA are summarized below.

3.3.3.2 Day-Night Average Sound Level

The DNL metric is the energy-averaged sound level measured over a 24-hour period, with a 10 dB penalty assigned to noise events occurring between 10 p.m. and 7 a.m. (acoustic night). DNL values are average quantities, mathematically representing the continuous sound level that would be present if all variations in sound level that occur over a 24-hour period were averaged to have the same total sound energy. DNL is the standard noise metric used by the U.S. Department of Housing and Urban Development, Federal Aviation Administration (FAA ATO NAS Analytics - AJV-W25), USEPA, and the DoD. Most people are exposed to sound levels of 50–55 DNL or higher on a daily basis. Research indicates about 87 percent of the population is not highly annoyed by outdoor sound levels below 65 dB DNL (Federal Interagency Committee on Urban Noise, 1980).

3.3.3.3 Equivalent Sound Level

The Equivalent Sound Level, measured in dB, is a cumulative noise metric that represents the average sound level (on a logarithmic basis) over a specified period of time—for example, an hour, a school day, daytime, nighttime, weekend, facility rush periods, or a full 24-hour day (the equivalent sound level for a full 24-hour day is similar to the DNL metric but for the fact that the DNL metric includes the additional 10 dB for those events during acoustic night).

3.3.3.4 Noise Effects

Some studies have linked increases in noise with human health effects, such as hearing impairment, sleep disturbance, cardiovascular effects, and psychophysiological effects (U.S. Army Corps of Engineers, 2012; Van Kempen et al., 2002). Both short- and long-term exposure to very loud noises and long-term exposure to lower levels of sound (chronic exposure) can affect health. Damage to hair cells of the cochlea (the auditory portion of the inner ear) and hearing impairment can be caused by acute exposure to sounds greater than 120 dB (Babisch, 2005; Goelzer et al., 2001).

3.3.3.5 Propagation of Sound in the Environment

In an ideal setting in which sound propagates away from a point source in air without any outside influence (e.g., a barrier reflecting or attenuating the sound), sound energy radiates uniformly outward in all directions from the source in a pattern referred to as spherical spreading (noise in relation to biological resources, as well as how sound propagates in water, is discussed in Section 3.5, Terrestrial Biological Resources). As sound energy propagates away from the sound source, both the sound level and frequency change. For each doubling of distance from the source, the sound level attenuates (or drops off) at a rate of 6 dBA.

When a sound is not from a single point source but is instead from multiple sources along a line, like the noise made by the continuous movement of vehicles on a highway, the source of the sound appears to emanate from a linear source rather than from a point source. The sound level from a linear source decreases by approximately 3–4 dBA with a doubling of the distance from the source (Goelzer et al., 2001).

In a real-world setting, a number of factors can influence how sound propagates in the environment; the ideal case of spherical spreading is an approximation of reduction with distance. Wind is the single most important meteorological factor within approximately 500 feet of the sound source, while vertical air temperature gradients are more important in sound propagation over longer distances. Other atmospheric conditions such as air temperature, humidity, and turbulence also can have a major effect on received sound levels.

Whether natural or man-made, a large object or barrier in the path between a sound source and a receptor can reduce sound levels substantially. The impact of this shielding depends on the size and material of the object as well as the frequency content of the sound source. Natural terrain, buildings, and walls can serve as noise barriers, often reducing sound levels by 5–10 dB.

3.3.4 Region of Influence

For the purposes of the noise analysis, based on the types of activities and resources present, the ROI is comprised of two main areas (Figure 2.1-1):

- PMRF Barking Sands (North Launch Area 1, North Launch Area 2, South Launch Area, Palai Olani Area, Waiapuaa Bay Amphibious Staging Area, MDA Hard Stand, Airfield Bivouac Area, Alternate Bivouac Area, FARP Areas, UAS Launch Area, and Ground Maneuver Areas) (Figure 2.1-2 through Figure 2.1-12)
- Kaula Island (Figure 2.1-13)

Defining the ROI for each particular location is based on knowledge of the type of noise-generating activities, noise levels of equipment, length of time the noise would be generated, and proximity to human sensitive noise receptors, such as multi- and single-family residences, parks, churches, schools, and outdoor recreational areas.

3.3.5 Affected Environment

3.3.5.1 Barking Sands

Primary noise sources at PMRF Barking Sands include airfield and range operations and missile, rocket, and drone launches. Airfield operations include takeoffs and landings of high performance and cargo/passenger aircraft (such as KC-130, FA-18, F-35, and P-8) as well as tilt-rotor or helicopter operations (such as MV-22, CH-47, and AH-64). Range operations include training and research and development activities support. Ambient noise levels from natural sources include wind, surf, and wildlife. 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.

Noise generated at the PMRF airfield is from one active runway, four helicopter operating spots, and maintenance operations. Noise levels produced by airfield operations tend to be relatively continuous. Existing noise levels near the runway may average as high as 75 dBA. Noise levels farther away from the runway are more characteristic of a commercial park, with levels not exceeding 65 dBA. In 2020, an Air Installations Compatible Use Zone (AICUZ) study was conducted to evaluate and document the impact of noise from military operations at PMRF on the surrounding community. The primary purpose of the AICUZ study is to ensure the safety and welfare of the public while maintaining the operational capabilities of the military installation. The study analyzed noise contours and identified land use compatibility issues to help guide local planning and zoning decisions to prevent incompatible development near PMRF. The 2020 PMRF AICUZ study specifically focused on updating noise exposure

maps and assessing the potential impacts of noise on nearby residential areas, recreational spaces, and other human sensitive noise receptors.

In the AICUZ study, noise zones are used to determine the compatibility of various land uses around military airfields. Noise Zone I (below 65 dB DNL) is generally considered compatible with most land uses, including residential areas, schools, and hospitals. Noise Zone II (65-75 dB DNL) requires more careful land use planning, where less noise-sensitive uses such as industrial, commercial, and certain recreational activities are preferred.

Noise contours presented in the Navy's 2020 AICUZ Study Update represent the projected 2025 flight operations and generated contours (in 5 dB increments from 60 dB to greater than 75 dB) based on all flight activities at PMRF airfield (Naval Facilities Engineering Command Southwest, 2020). The 2020 PMRF AICUZ study determined that noise levels within the most affected areas, particularly Noise Zone II (65-75 dB DNL), are largely contained within the installation boundary with minimal off-base impact (Table 3.3-2). The analysis indicates that the nearest residential areas and other sensitive land uses are either outside the significant noise impact zones or subject to noise levels comparable to existing ambient conditions. The study did find that the 60 to 65 dB DNL noise zone affects 38 acres off-base; however, this land is vacant and not populated. Consequently, the study confirms that military activities at PMRF do not substantially elevate noise levels or adversely affect the quality of life in the surrounding community.

Table 3.3-2: DNL Footprint

DNL Noise Contour (dB)	On-Base (acres)	Off-Base (acres)		Total
		Over Water	Over Land	
60-65	140	995	38	1,173
65-70	115	481	9	606
70-75	99	57	-	156
> 75	25	1	-	26
Total	**379**	**1,535**	**47**	**1,961**

The activity with the most noticeable sound events is the launch of missiles, rockets, drones, and artillery firing events. Launches and artillery firing events result in high-intensity, short-duration sound events. Typical launches at PMRF Barking Sands (including KTF launch sites) include Strategic Target System, Terminal High Altitude Area Defense, NMESIS, Mid-Range Capability (MRC), and High Mobility Artillery Rocket System (HIMARS) launches (see Appendix A, Military Readiness Activity Descriptions). These launch activities have not resulted in public noise complaints. Each missile launch generates individual acoustical events that are very loud near the launch pad, but they attenuate rapidly with distance. For example, noise levels for the strategic target system launch at a distance of 575 feet was 125.3 dB, but less than 98 dB at a distance of 10,000 feet (U.S. Department of the Navy, 2008a). However, these events are relatively short in duration, non-impulsive, and lasting approximately 5–10 seconds each. Noise levels generated by each test vary, depending on missile system configuration, trajectory, and weather conditions. Similarly, artillery firing events are very loud (up to 181 dB) at the firing location but attenuate rapidly with distance, with received noise levels less than 115 dB at a distance of 10,000 feet.

In general, noise during the launches and in flight soon after launch as well as artillery firing events are clearly audible to nearby areas both on and off Barking Sands. None of the noise levels outside the ground hazard areas, where non-essential personnel and the public are excluded, exceed either DoD or

Occupational Safety and Health Administration's safety requirements. Data collected in the nearest town, Kekaha (Figure 3.3-2), indicated that launch levels were no louder than noise generated from passing vehicles on a nearby highway. For the larger launch systems described above, recorded noise levels in Kekaha were noted at 54 dB (U.S. Department of the Navy, 2008a). For artillery firing events, while noise at the firing source (North Launch Area 2) during the training activity can reach levels up to 181 dB, the received noise levels from this impulsive event in the Kekaha area reach up to 104 dB. However, artillery guns are oriented such that the artillery round is shot directly toward the open ocean, all within PMRF's restricted airspace, which reduces the received noise levels by 5 dB, below 99 dB. At a received noise level of 99 dB, a single firing event lasting less than a second, or even a series of multiple firing events lasting several seconds or minutes, would not elevate community DNL levels in the Kekaha area above 65 dB.

No noise-sensitive land uses are affected by existing noise levels.

3.3.5.2 Kaula Island

Kaula Island is located over 47 NM from PMRF Barking Sands. The southern 1,000 feet of the island is used for inert bombing and gunnery training. While no noise level data collection has occurred on Kaula Island, inert munition impact, weapons firing, and aircraft noise are likely the primary military-related noises at this location. There are no human sensitive noise receptors on Kaula Island.

3.3.6 Environmental Consequences

When evaluating noise effects, several aspects are examined, including (1) the degree to which noise levels generated by training and operations would be higher than the ambient noise levels, (2) the degree to which there would be hearing loss or annoyance, and proximity of human sensitive noise receptors (e.g., residences, schools, hospitals, parks) to the noise source. An environmental analysis of noise includes the potential effects on the local population and estimates the extent and magnitude of the noise generated by the Proposed Action.

3.3.6.1 No Action Alternative

Under the No Action Alternative, there would be no change from current levels of Navy-led training and testing activities, and these activities would continue to occur within the same designated areas previously analyzed in relevant environmental documentation listed in Table 1.6-1. Proposed increases in land-based training and testing activities would not occur, and there would be no change in designated training and testing areas. Noise levels would remain the same with no increase. Noise would continue to be sporadic, intermittent across all training and testing locations. Therefore, no significant impacts on noise would occur as a result of implementation of the No Action Alternative.

3.3.6.2 Proposed Action

3.3.6.2.1 Barking Sands

Under the Proposed Action, there would be no changes in the type of land-based training and testing activities that currently occur at PMRF Barking Sands; however, the continuation of these activities would occur at increased numbers depending on the activity type. The majority of training and testing activities described in Chapter 2 (Description of Proposed Action and Alternatives) are not significant noise-generating activities. Some activities generate noise from use of military vehicles and equipment, such as missile launcher setup, C5ISRT setup activities, and large unit bivouacking that could result in temporary noise levels between 74 and 90 dBA at a distance of 50 feet (Washington State Department of Transportation, 2012). However, noise levels from training and testing activities would quickly

attenuate with increasing distance. A 90 dB noise at 50 feet would propagate outward, but the received noise level would decrease with increased distance from the source. At a distance of 1,000 feet from the activity, the received noise level would be below 65 dB. As described above, the nearest human sensitive noise receptors are residences, located approximately 10,000 feet (about 2 miles) south of the western edge of PMRF Barking Sands, in the community of Kekaha (Figure 3.3-2). Due to this distance, noise from almost all land-based training and testing activities, even with an increase in training and testing, is anticipated to be inaudible and would not meaningfully change DNL levels near human sensitive noise receptors.

The Proposed Action includes an increase in aircraft activities. As noted in Chapter 2 (Description of Proposed Action and Alternatives), the Navy proposes FARP Operations as well as Helicopter/Tilt-Rotor Landing Zone Operations at the Fire Pit Landing Zone. Both the FARP and Landing Zone locations (Figure 2.1-1) are located near or adjacent to the existing four helicopter operating spots. The majority of aircraft operations associated with both FARP and Landing Zone include the MV-22. Approach/landing noise for the MV-22 has been documented at approximately 83 dB at a distance of 500 feet (U.S. Marine Corps, 2012). As these activities are adjacent to the airfield and would be flying in a concentrated area, it is unlikely that the DNL contours would expand greatly. As with propagation loss, the received noise level would be below 65 dB at a distance of 4,000 feet from the activity. Additionally, the closest of FARP and Landing Zone areas to the nearest sensitive noise receptor, Kekaha, is over 5.3 mi. away (Figure 3.3-2). Received noise levels in the community of Kekaha would be less than 50 dB. As such, aircraft operations associated with proposed FARP and the Landing Zones could be audible but would not significantly contribute to the noise environment at nearby human sensitive noise receptors.

Activities with the most noticeable sound events are the launch of missiles and rockets at North Launch Area 1 and North Launch Area 2, and howitzer artillery firing at North Launch Area 2. As previously discussed, launches would result in high-intensity, non-impulsive short-duration sound events lasting approximately 5–10 seconds each. While received noise levels from a missile launch at South Launch Area could create a brief noise event in Kekaha ranging between 82 and 94 dB, it would only minimally influence the community noise levels (e.g., DNL) in the Kekaha area because of the extremely short duration.

Artillery firing activities are proposed to increase from one to three annual activities (up to 300 rounds per four-day activity) at North Launch Area 2, which is approximately 6.5 mi. north of the Kekaha area. Although the number of firing events increases under the Proposed Action, a single firing event lasting less than a second, or even a series of multiple firing events lasting several seconds or minutes, would not elevate community DNL levels in the Kekaha area above 65 dB.

Given the sound environment in Kekaha, launch or firing noise would be higher than typical ambient levels but would be comparable to a large truck passing by on the road or low-altitude airplane overflight. Most launch and firing events are short in duration, distributed over time, and have minimal contribution to DNL levels. Therefore, an increase of launches from any launch area at Barking Sands (as shown in Table 2.1-1) or artillery firing activities, while audible, would not significantly degrade the noise environment.

Figure 3.3-2: Location of PRMF Barking Sands and Nearest Off-Base Residential Area

Proposed increases in training and testing activities would not result in an appreciable increase in noise levels in the vicinity of human sensitive noise receptors or the general public. Therefore, noise impacts would be less than significant as a result of implementation of the Proposed Action.

3.3.6.2.2 Kaula Island

Under the Proposed Action, GUNEX and BOMBEX training utilizing ships and aircraft would increase at Kaula Island. Inert munition impact, weapons firing, and aircraft noise would be the primary noise sources during these activities. However, there are no human sensitive noise receptors on the island, there would be no potential for degradation of the human noise environment. Therefore, noise impacts would be less than significant as a result of implementation of the Proposed Action.

3.4 Public Health and Safety

3.4.1 Definition of Resource

This discussion of public health and safety considers any ground activities, that have the potential to affect the safety, well-being, or health of military and civilian personnel or members of the public. Ground safety considers issues associated with activities that support training and testing, such as missile launching and firing artillery from Barking Sands shore locations.

3.4.2 Regulatory Setting

All U.S. government personnel and contractors working on PMRF are responsible for following applicable federal safety regulations and conducting activities in a manner that does not increase risk to workers or the public. U.S. Navy, Air Force, Army, and applicable Occupational Safety and Health Administration regulations and standards are used to implement safety and public health requirements for all workers on Hawaii's DoD installations.

PMRF takes every reasonable precaution during the planning and execution of range training and testing activities to prevent injury to human life or property. The PMRF Range Safety Office establishes and enforces safety restrictions related to potentially hazardous activities. PMRF procedures require a Range Safety Approval, reviewed by Range Safety and approved by the PMRF Commanding Officer, prior to commencing training and testing activities.

3.4.3 Region of Influence

The ROI for assessing potential impacts on public health and safety are the land-based training and testing areas within the PMRF Study Area (Figure 2.1-1). These include areas at Barking Sands (North Launch Area 1, North Launch Area 2, South Launch Area, Palai Olani, Waiapuaa Bay, MDA Hard Stand, Airfield Bivouac Area, Alternate Bivouac Area, FARP Areas, UAS Launch Area, Ground Maneuver Area) and Kaula Island. The population of concern primarily consists of DoD personnel and contractors directly involved with the Proposed Action, the local Kauai communities, and the public that access and use adjacent land and water areas for recreational and commercial purposes.

3.4.4 Affected Environment

3.4.4.1 Existing Conditions

Nationally registered Emergency Medical staff comprise Crash/Fire and Rescue teams are located at the airfield Air Traffic Control Tower, to provide safety, emergency, and basic life support services for military, civil service, and non-government personnel at PMRF 24 hours a day, 7 days a week. Fire protection and firefighting services are provided by Crash/Fire and Rescue. Personnel are trained to

respond with basic first aid and to activities in support of airfield operations, hazardous material incidents, confined space rescue, and hypergolic fuel releases, plus structural and brush fire fighting, fire prevention instruction, and fire inspections. More extensive emergency medical services are available from the West Kauai Medical Center in Waimea, 16 km (10 mi.) from the PMRF main gate.

3.4.4.1.1 Launch Hazards

PMRF conducts missile launches from land-based launching pads at Barking Sands. Potential hazards associated with missile launches include chemical contamination, non-ionizing radiation, lasers, and wildfire. 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, radioactivity, ionization, or other means; (2) describe radiation, toxic, explosive, or ionization problems that could accumulate as a result of their tests; (3)provide warhead information (if any), aerodynamic and flight control information, and system destruction information; (4) submit plans, specifications, and procedural or functional steps for operations involving explosives; and (5) provide complete operational specifications of any laser to be used and a detailed description of its planned use. To reduce the likelihood of launch-related wildfires, PMRF ensures that launch area flammable vegetation is maintained and therefore has minimal fire potential, non-native areas are regularly mowed, areas adjacent to pads are pre-soaked with water prior to a launch, and fire and emergency service crews are present at every launch.

Range Control is charged with surveillance, clearance, and real-time range safety, with the Range Control Officer solely responsible for determining range status and setting range firing conditions. The Range Safety Approval and the Range Safety Operation Plan documents are required for all weapons systems using PMRF. PMRF uses Range Commanders Council 321-23, Common Risk Criteria Standards for National Test Ranges, a document which sets requirements for minimally acceptable risk criteria to personnel and facilities during range operations.

PMRF is responsible for establishing ground hazard areas and launch hazard areas (over water areas) beyond which no potentially hazardous debris from an early flight termination is expected to fall. The hazard area is determined by size and flight characteristics of the missile, individual flight profile of each exercise or flight test, and reaction time between recognition of a flight malfunction and the decision to terminate flight. Any failure of the missile system that would cause potentially hazardous debris to fall outside the ground hazard area would be detected by the Missile Flight Safety Officer, who would terminate the missile flight before it could escape the hazard boundary. Data processed by ground-based or onboard missile computer systems may be used to recognize malfunctions and terminate missile flight. The Safety Officer monitors the flight continuously and always retains the capability to terminate the flight, if necessary.

To ensure the protection of all persons and property, safety procedures have been established and implemented for airspace, sea space, and ground hazard areas. These standard operating procedures include establishing road control points, clearing the area using vehicles and helicopters (if necessary), and water pre-soaking areas adjacent to launch pads. The road control points are established three hours prior to launch to allow security forces to monitor traffic as it passes through the ground hazard area. At 20 minutes prior to launch, the area is determined to be clear 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. No inhabited structures are located within the off-base sections of

the ground hazard area. To further minimize the potential for launch associated hazards, PMRF has a Missile Accident Emergency Team assembled for all launches and on-call status for PMRF launches.

Firing artillery from Barking Sands shore locations follows safety procedures and approvals similar to those described above for the missile launches.

3.4.4.1.2 Ordnance Transportation

Ordnance is delivered to PMRF Barking Sands via aircraft. All ordnance is transported in accordance with U.S. Department of Transportation regulations. Ordnance is stored in caves at the Kamokala Magazine area. Aircraft deliver ordnance to the on-base airfield. All ordnance is transported in accordance with the Department of Transportation regulations and PMRF procedures which cover the handling and transportation of ammunition, explosives, and hazardous materials on the facility.

PMRF's ordnance safety procedures minimize hazards and prevent exposure of personnel and property to unnecessary risks. The PMRF Range Control Branch (commonly referred to as "Range Safety") is responsible for (1) 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 when inside and when entering hazard areas; (3) reviewing the design of facilities in which ordnance items are to be handled to ensure that safety protection meets DoD requirements; (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. When an approved procedure is not available for a range user's ordnance item, the safety specifications in a PMRF-prepared Explosive Safety Approval are followed.

Barking Sands has defined Explosive Safety Quantity Distance (ESQD) arcs. These arcs represent the prescribed minimum distance between sites storing explosive material and specified locations (e.g., inhabited buildings, public highways) to afford an acceptable degree of protection and safety. The size of the ESQD arc is proportional to the net explosive weight present. The arcs at PMRF are generated by the launch pads, the Kamokala Magazine ordnance storage area, the Interim Ordnance Handling Pad, and the Missile Assembly Building. The ESQD arcs are incorporated into ground hazard area calculations.

3.4.4.1.3 Aviation Ground Safety

Aviation-related ground activities on the PMRF airfield include aircraft ground refueling and UAS launch and recovery. They require PMRF Airfield Manager coordination and approval. These activities are conducted using published safety procedures.

3.4.4.1.4 Electromagnetic Radiation

Electromagnetic radiation (EMR) zones around transmitter sites and tracking radars are designated at various locations on Barking Sands. High-density electromagnetic power may constitute a hazard to personnel (Hazards of Electromagnetic Radiation to Personnel [HERP]), explosives (Hazards of Electromagnetic Radiation to Ordnance [HERO]), or fuels (Hazards of Electromagnetic Radiation to Fuels [HERF]) or may interfere with nonmilitary electronic equipment. As directed by Navy procedures, PMRF uses a combination of establishing safety zones and conducting sector blanking (no radiation) in occupied areas to avoid potential EMR exposure. To ensure exposure risks to personnel are minimal, the Navy conducts regular radiation hazard surveys every five years and before any modifications to a unit

are made or when new radar equipment is installed. In addition, all radar units have red (radar unit is on) and blue (radar unit is emitting EMR) warning lights. EMR generated from radar units at PMRF do not expose the public to any hazardous radiation. Potential impacts on biological species from EMR are discussed in Section 3.5 (Terrestrial Biological Resources).

3.4.4.1.5 Aircraft Ordnance Delivery

Aerial inert bombing and gunnery occur on the southern tip of the Kaula Island; no other hazardous operations occur on the island. To minimize health and safety risks, a Danger Zone surrounding Kaula Island was established for the primary purpose of ensuring an adequate margin of safety to both personnel, and equipment during the conduct of inert bombing and gunnery training operations by the military. The Kaula Danger Zone is defined as the waters within a circular area with a radius of 4.8 km (3 mi.) centered on the island. In addition, because of the potential for unexploded ordnance to be present on and just below the surface of the island and adjacent waters should a misfire occur, the island and tidal shoreline are closed to unauthorized personnel at all times. Prior to any inert bombing or gunnery activities, military personnel in an aircraft fly over the island to inspect and determine if it is safe to conduct the training mission.

3.4.5 Environmental Consequences

Impacts from the Proposed Action are assessed according to the potential to increase or decrease safety risks to personnel, the public, property, or the environment. The analysis considers the types of activities, introduction of new health or safety risks, locations of hazardous operations and activities with respect to human sensitive noise receptors and the general public, and adequacy of safety-related planning and procedures in place. An adverse impact could occur if there was a significant increase in health and safety risks to military and civilian personnel on PMRF or the public due to project-related training and testing activities.

The Proposed Action includes the continuation of appropriate and relevant SOPs that avoid and minimize potential impacts on public health and safety. Relevant SOPs are listed in Table 3.4-1.

Table 3.4-1: List of Standard Operating Procedures for Public Health and Safety

Protection Focus	Requirements
Navy Safety Policy	The Navy Safety and Occupational Health Manual, OPNAV M-5100.23.
Public Safety	Operating restrictions and requirements defined for the use of Kaula Island for training per FACSFAC Pearl Harbor Operating Area and Range Manual (FACSFAC PH 3120.4).
PMRF Range Safety Policy	Defines the acceptable risk levels and basic range safety policy to be followed when conducting range operations at PMRF, per PMRF Instruction 8020.16A.
EMR Zone to Personnel	Restrict personnel from entering EMR hazard areas.
EMR Zone to Fuel	Restrict fuel operations to locations outside EMR hazard areas.
EMR Zone to Ordnance and Munitions	Restrict ordnance/munitions operations/storage to locations outside EMR hazard areas.
Explosive Hazards	Conduct ordnance/munitions operations such as storage, transportation, and launching/firing in accordance with DoD safety directives and range regulations per DoD Defense Explosives Safety Regulation 6055.09

Notes: DoD = Department of Defense, EMR = Electromagnetic Radiation, FACSFAC = Fleet Area Control and Surveillance Facility, OPNAV M = Chief of Naval Operations Manual

3.4.5.1 No Action Alternative

Under the No Action Alternative, there would be no change from current levels of Navy-led training and testing activities, and these activities would continue to occur within the same designated areas previously analyzed in relevant environmental documentation listed in Table 1.6-1. Proposed increases in land-based training and testing would not occur, and there would be no change in designated training and testing areas. Public health and safety risk would not change. At present there is low risk to public health and safety. PMRF has not experienced a reportable major, work-related, ground incident in over ten years. Given the historical data related to limited incidents creating low probability of elevated risk to public health and safety, no significant impacts on public health and safety would occur as a result of implementation of the No Action Alternative.

3.4.5.2 Proposed Action

3.4.5.2.1 Barking Sands

Potential public health and safety hazards on Barking Sands consists of EMR associated with radars and explosive safety associated with launch and firing activities. Under the Proposed Action, there would be no changes in the type of land-based training and testing activities that currently occur at Barking Sands; however, the continuation of these activities would occur at increased numbers depending on the activity type. PMRF takes every reasonable precaution during planning and execution of training and testing activities to prevent injury to human life or property. Under the Proposed Action, standard operating procedures listed in Table 3.4-1 would continue to be implemented. The same methodology to schedule events and de-conflict activities would occur. Although the number of activities may increase, each would still receive the same amount of attention and fall under the same SOPs as current activities—regardless of the service conducting the training or testing. Based on the adherence to established procedures, increasing activity would not increase risk to public health and safety. Proposed increases in activities would not pose any increased risks to military personnel or the general public. Therefore, public health and safety impacts would be less than significant as a result of implementation of the Proposed Action.

3.4.5.2.2 Kaula Island

Kaula Island is uninhabited, and the public is restricted from accessing the island. Under the Proposed Action, standard operating procedures as listed in Table 3.4-1 would continue to be implemented. Public health and safety impacts would be less than significant as a result of implementation of the Proposed Action.

3.5 Terrestrial Biological Resources

3.5.1 Definition of Resource

Biological resources include living, native, or naturalized plant and animal species and the habitats within which they occur. Plant associations are referred to generally as vegetation, and animal species are referred to generally as wildlife. Habitat can be defined as the resources and conditions present in an area that support a plant or animal. For the purposes of this EA, biological resources are divided into vegetation, wildlife, and special-status species.

3.5.2 Regulatory Setting

For purposes of this EA, *special-status species* are those species listed as threatened or endangered under the ESA, associated critical habitat for ESA-listed species, and species protected under the Marine

Mammal Protection Act (MMPA) and the MBTA. Special-status species also include those species addressed by State of Hawaii rules protecting threatened and endangered species. The federal regulatory frameworks relevant to biological resources analyzed in this EA are summarized below.

3.5.2.1 Endangered Species Act

The purpose of the ESA is to conserve the ecosystems upon which threatened and endangered species depend and to conserve and recover listed species. Section 7 of the ESA requires action proponents to consult with the USFWS to ensure that their actions are not likely to jeopardize the continued existence of ESA-listed threatened and endangered species or result in the destruction or adverse modification of designated critical habitat. Critical habitat is generally not designated on any areas owned, controlled, or designated for use by the DoD where an Integrated Natural Resources Management Plan has been developed that, as determined by the Secretaries of the Interior or Commerce, provides a benefit to the species subject to critical habitat designation. Informal consultation under Section 7 of the ESA is in progress with USFWS. The outcome of the informal consultation will be summarized in the Final EA.

3.5.2.2 Migratory Bird Treaty Act

Over 1,000 species of birds are protected in the United States under the MBTA of 1918 (16 U.S.C. sections 703–712; Ch. 128, July 13, 1918, 40 Stat. 755, as amended). A migratory bird is any species or family of birds that live or reproduce in or migrate across international borders at some point during their annual life cycle. Migratory and most native-resident bird species are protected under the MBTA, and their conservation by federal agencies is mandated by EO 13186 (*Responsibilities of Federal Agencies to Protect Migratory Birds*). Under the MBTA, it is illegal for anyone by any means or in any manner, to take, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird, or the parts, nests or eggs of such a bird at any time, except under the terms of a valid permit issued pursuant to federal regulations.

The 2003 National Defense Authorization Act gave the Secretary of the Interior authority to prescribe regulations to exempt the Armed Forces from the incidental taking of migratory birds during authorized military readiness activities. Congress defined military readiness activities as all training and operations of the armed forces that relate to combat and the adequate and realistic testing of military equipment, vehicles, weapons, and sensors for proper operation and suitability for combat use. Military readiness activities do not include (1) routine operation of installation support functions such as administrative offices, military exchanges, water treatment facilities, schools, housing, storage facilities, and morale, welfare, and recreation activities; (2) the operation of industrial activities; or (3) the construction or demolition of facilities listed in (1) or (2) (50 CFR section 21.6). The proposed training operations assessed in this EA fall within the definition of military readiness activities.

In 2007, the final rule, known as the DoD Migratory Bird Rule (50 CFR part 21), authorized the DoD to take migratory birds in such cases and includes a requirement that if the DoD determines that a proposed or an ongoing military readiness activity might result in a significant adverse effect on a population of a migratory bird species, DoD must confer and cooperate with the USFWS to develop appropriate and reasonable conservation measures to minimize or mitigate identified significant adverse effects. The analysis to determine if a significant adverse effect to a population would occur is done in accordance with, and through, the NEPA process (i.e., this EA).

3.5.2.3 Marine Mammal Protection Act

All marine mammals are protected under the provisions of the MMPA (16 U.S.C. section 1361 et seq.). The MMPA prohibits any person or vessel from “taking” marine mammals in the United States or the

high seas without authorization. The MMPA defines "take" to mean "to harass, hunt, capture, or kill or attempt to harass, hunt, capture, or kill any marine mammal." National Defense Authorization Act of fiscal year 2004 (Public Law 108-136) amended the definition of harassment as it applies to military readiness activities or scientific research activities conducted by or on behalf of the federal government, consistent with Section 104(c)(3)[16 U.S.C. 1374(c)(3). In the fiscal year 2004 National Defense Authorization Act, military readiness activities were defined as "all training and operations of the Armed Forces that relate to combat" and "the adequate and realistic testing of military equipment, vehicles, weapons, and sensors for proper operation and suitability for combat use." For military readiness activities, Level B harassment is defined as any act that disturbs or is likely to disturb a marine mammal or marine mammal stock in the wild by causing disruption of natural behaviors to a point where such behaviors are abandoned or significantly altered (16 U.S.C. 1362 (18)(B)(i) and (ii)). Section 101(a)(5) of the MMPA directs the Secretary of the Department of Commerce to allow, upon request, the incidental (but not intentional) taking of marine mammals if certain findings are made and regulations are issued.

3.5.3 Region of Influence

The ROI is comprised of two main areas (Figure 2.1-1):

- PMRF Barking Sands (North Launch Area 1, North Launch Area 2, South Launch Area, Palai Olani Area, Waiapuaa Bay Amphibious Staging Area, MDA Hard Stand, Airfield Bivouac Area, Alternate Bivouac Area, FARP Areas, UAS Launch Area, and Ground Maneuver Areas) (Figure 2.1-2 through Figure 2.1-12)
- Kaula Island (Figure 2.1-13)

3.5.4 Affected Environment

3.5.4.1 Existing Conditions

3.5.4.1.1 Vegetation

Barking Sands

There are six vegetation types found across the Barking Sands areas: kiawe (*Prosopis pallida*)-koa haole (*Leucaena leucocephala*) scrub, aalii (*Dodonaea viscosa*)-nama (*Nama sandwicensis*) scrub, pohinahina (*Vitex rotundifolia*)-naupaka (*Scaevola sericea*) dune, landscaped, agave, and ruderal vegetation (Table 3.5-1). Kiawe-koa haole scrub with *Agave* and kiawe-koa haole scrub with algaroba are depicted in the figures, but for the purposes of this analysis they are combined generally as kiawe-koa haole scrub. *Agave*, kiawe-koa haole scrub, landscaped, and ruderal vegetation are all non-native. Native aalii-nama scrub is common throughout undeveloped portions of Barking Sands. Pohinahina-naupaka dune vegetation is found along the dunes on the coast of Barking Sands. Sites that contain native vegetation are depicted in Figure 3.5-1 through Figure 3.5-10. The Waiapuaa Bay Amphibious Areas depicts algaroba (long-thorn kiawe) (Figure 3.5-5); however, since the vegetation type is not native and comprises only 0.02 acre, it is not significant and therefore not discussed further in this document.

Table 3.5-1: Vegetation Types at Barking Sands by Proposed Training and Testing Area

Proposed Training and Testing Area	Vegetation Type (acres)					
	Non-Native				Native	
	Landscaped	Ruderal	Kiawe-Koa Haole Scrub*	Agave	Aalii-Nama Scrub	Pohinahina-Naupaka Dune
North Launch Area 1	3.8	---	---	---	---	---
North Launch Area 2	34.9	---	3.1	---	---	0.02
South Launch Area	9.9	---	0.1	---	---	---
Palai Olani	17.3	---	6.0	---	0.4	0.02
Waiapuaa Bay Amphibious Areas	1.4	2.3	26.2	0.4		0.1
MDA Hard Stand	12.9	---	10.3	---	4.1	---
Alternate Bivouac Area	7.8	---	0.3	---	---	---
Airfield Bivouac Area	2.2	---	---	---	---	---
FARP Areas	10.1	---	---	---	---	---
UAS System Launch Area	11.8	---	---	---	---	---
Ground Maneuver Area†	---	---	---	---	---	---
Total	**96.4**	**2.3**	**58.2**	**0.4**	**8.3**	**0.14**

*Includes kiawe-koa haole scrub with *Agave* and kiawe-koa haole scrub with algaroba.
†The ground maneuver areas are currently paved or gravel roads/trails.
Notes: FARP = Forward Arming and Refueling Point, MDA = Missile Defense Agency, UAS = Uncrewed Aircraft System

Kaula Island

Due to the strong, dry, winds on Kaula Island, vegetation on the island is sparse. The dominant vegetation type in the island is semi-arid and strand plants of low-growing shrubs and herbaceous plants (Figure 2.1-13) (Naval Facilities Engineering Systems Command Hawaii, 2023). One ESA-listed species, *Portulaca villosa*, has been recorded on Kaula Island, as discussed in Section 3.5.4.1.3.

Figure 3.5-1: Vegetation Types within North Launch Area 1

Figure 3.5-2: Vegetation Types within North Launch Area 2

Figure 3.5-3: Vegetation Types within the South Launch Area

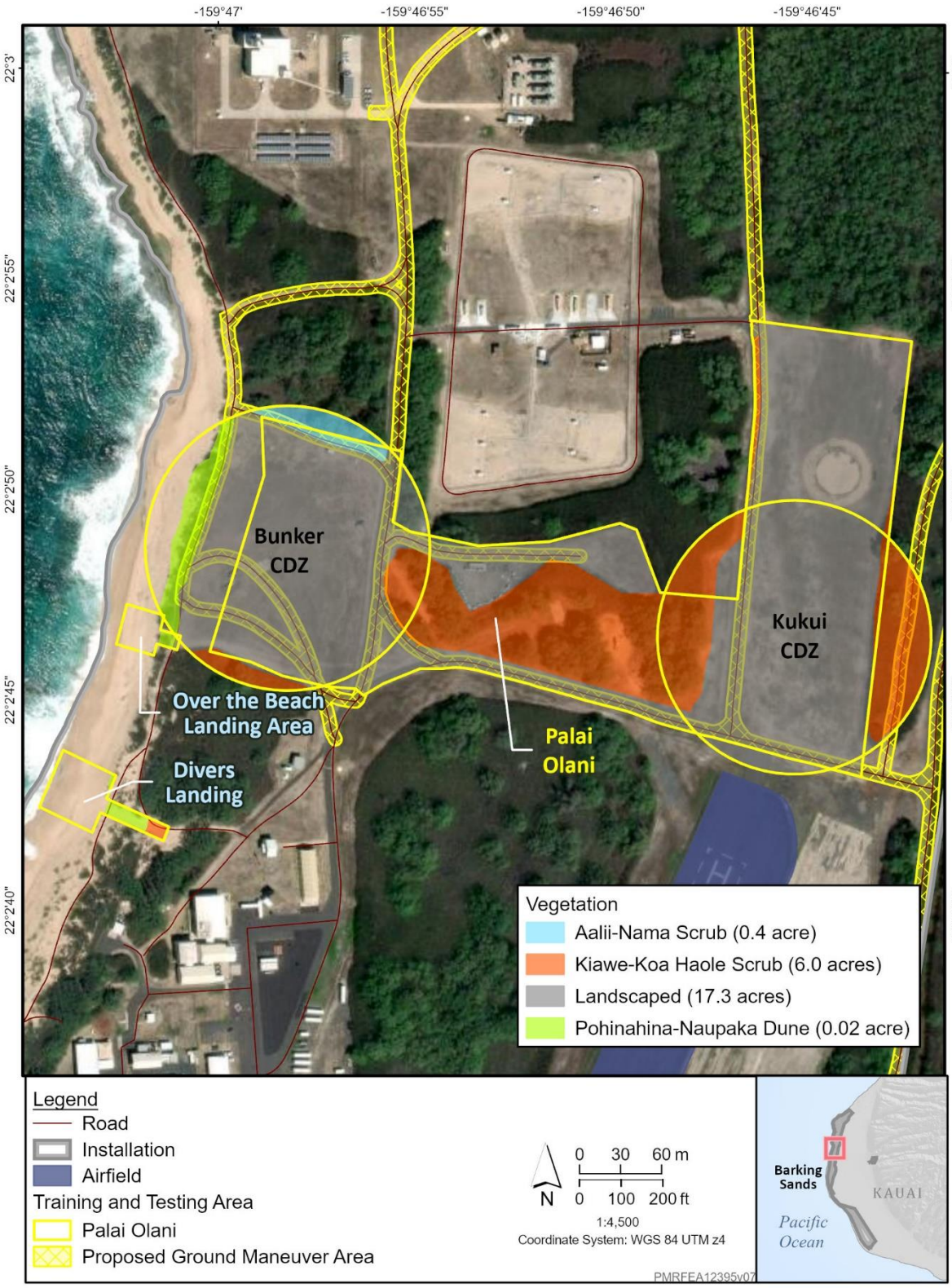

Figure 3.5-4: Vegetation Types within the Palai Olani Area

Figure 3.5-5: Vegetation Types within the Waiapuaa Bay Amphibious Landing and Staging Areas

Figure 3.5-6: Vegetation Types within the MDA Hard Stand Area

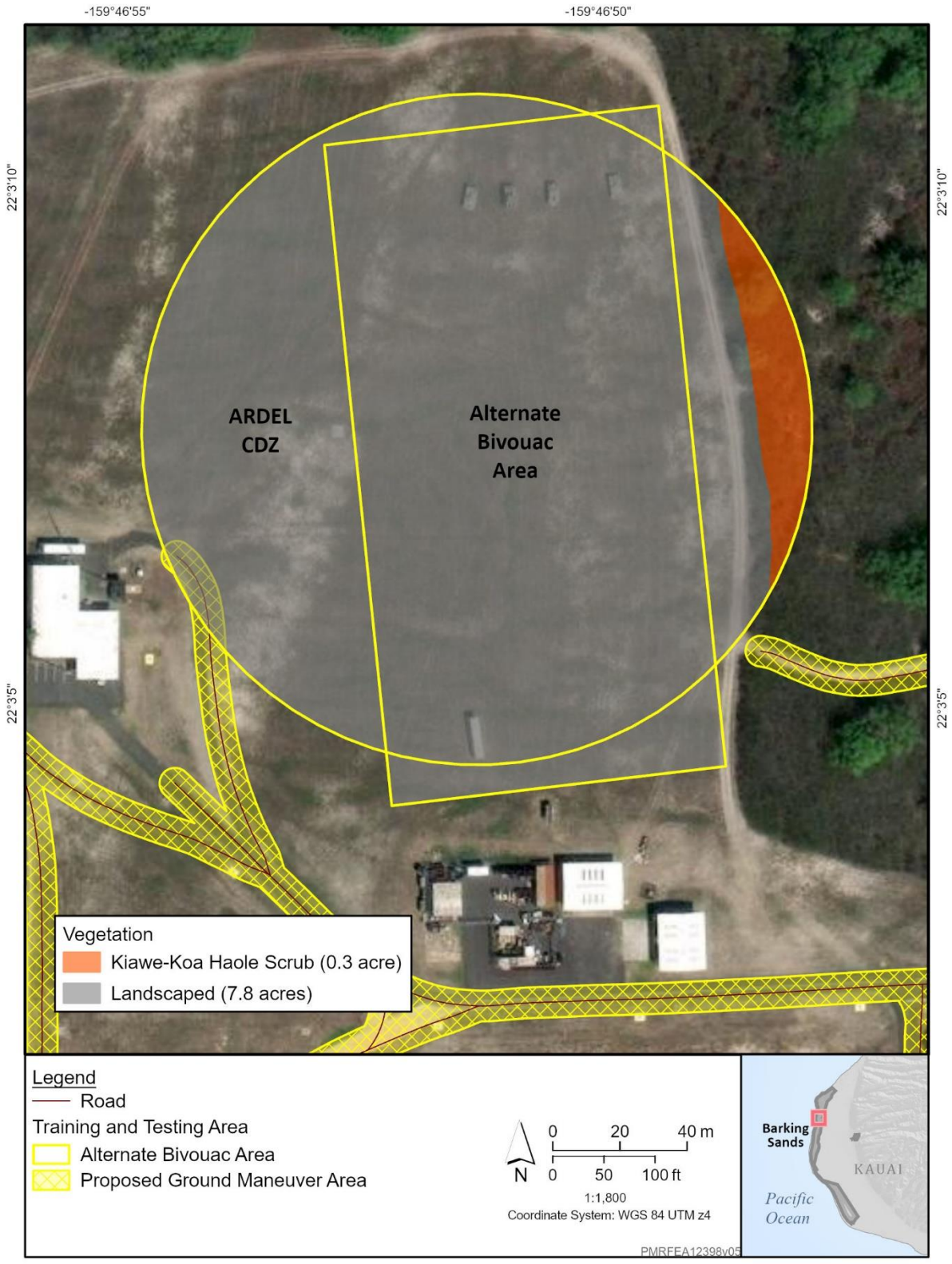

Figure 3.5-7: Vegetation Types within the Alternate Bivouac Area

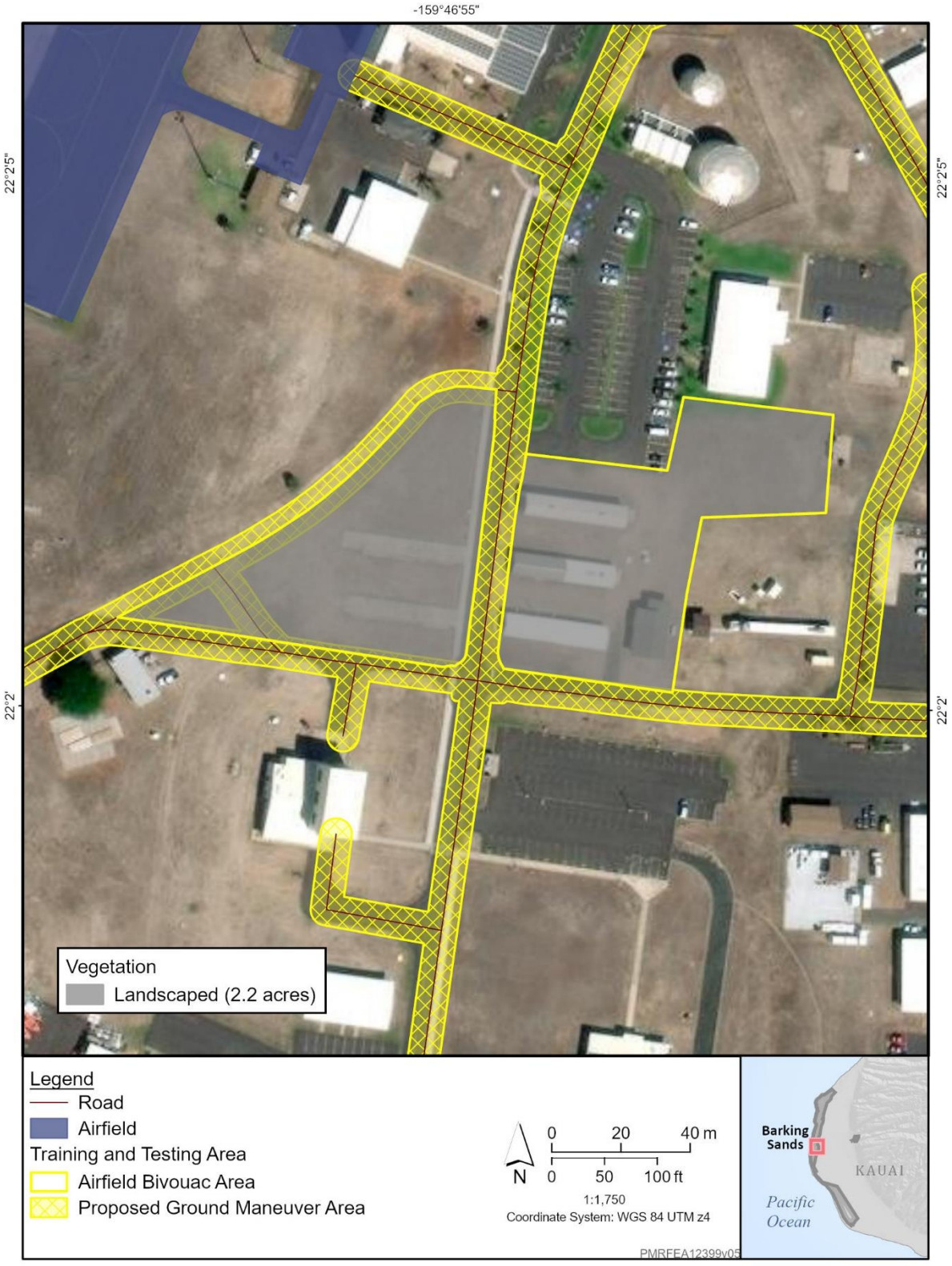

Figure 3.5-8: Vegetation Types within the Airfield Bivouac Area

Figure 3.5-9: Vegetation Types within the FARP Areas

Figure 3.5-10: Vegetation Types within the UAS Launch System Area

3.5.4.1.2 Wildlife

Barking Sands

A total of 76 species of birds have been documented at PMRF, of which 46 are native and 30 are non-native (Naval Facilities Engineering Systems Command Hawaii, 2023). The most widespread bird species observed throughout PMRF are the non-native Japanese white-eye (*Zosterops japonicus*) and non-native house finch (*Carpodacus mexicanus*). The Laysan albatross (*Phoebastria immutabilis*) is a breeding visitor that is commonly observed during nesting season (November to December) from Kinikini ditch to the north end of the base. The wedge-tailed shearwater (*Puffinus pacificus*) is also a breeding visitor that has three main active nesting colonies on Barking Sands: Nohili Dunes, Kinikini Ditch, and the Beach Cottages area. Additionally, wedge-tailed shearwaters are also found nesting throughout Barking Sands coastline in low densities (Naval Facilities Engineering Command Pacific, 2022) (Figure 3.5-11 and Figure 3.5-12). Eight species of birds are ESA listed and are described in detail in Section 3.5.4.1.3 (Special-Status Species).

Sixteen terrestrial mammal species have been documented at Barking Sands. The introduced feral cat (*Felis catus*) is the most common and widespread mammal. Other widespread invasive mammals include the Columbian black-tailed deer (*Odocoileus hemionus*), feral pig (*Sus scrofa*), feral goat (*Capra hircus*), and black or roof rat (*Rattus rattus*). The Hawaiian hoary bat (*Lasiurus cinerus semotus*) is the only native terrestrial mammal that could be present at PMRF and is discussed in detail in Section 3.5.4.1.3 (Special-Status Species). Hawaiian monk seals are commonly observed along the beaches of PMRF Barking Sands and are discussed in detail in Section 3.5.4.1.3 (Special-Status Species).

Several reptile and amphibian species have been documented, most of which are non-native terrestrial lizards and toads. The ESA-listed green sea turtle (*Chelonia mydas*) utilizes the beaches of PMRF for nesting and the nearshore waters for foraging and is discussed in detail in Section 3.5.3.1.3 (Special-Status Species) (Figure 3.5-11, Figure 3.5-12, and Figure 3.5-13).

Kaula Island

The Navy began using Kaula for ordnance training in 1952. Kaula Island's southern 1,000 feet is designated for inert bombing and gunnery training; however, the remainder of the 108-acre island remains untouched and a designated bird sanctuary since 1965 (Figure 2.1-13) (Naval Facilities Engineering Systems Command Hawaii, 2023). Few ground-based surveys have been conducted at Kaula due to the terrain and unexploded ordnance on the island. The most recent ground survey is the 1998 Kaula Rock Survey Trip Report (Hawaii Department of Land and Natural Resources, 1998). High-resolution imaging surveys of Kaula Island have identified seabird species that include sooty tern (*Onychoprion fuscatus*), grey-backed tern (*Onychprion lunatus*), Laysan albatross, great frigatebird (*Fregata minor*), brown noddy (*Anous stolidus*), red-footed booby (*Sula sula*), masked booby (*Sula dactylatra*), red-tailed tropicbird (*Phaethon rubricauda*), and wedge-tailed shearwater (Normandeau Associates Inc & Air Data Solutions, 2023; Normandeau Associates Inc & APEM Ltd Joint Venture, 2021). An aerial survey conducted in August 2023 identified 17,638 individuals of these nine species on the island (Normandeau Associates Inc & Air Data Solutions, 2023).

Only non-native rat and mice species have been documented on Kaula Island; no native terrestrial mammals have been recorded. The ESA-listed Hawaiian monk seal hauls out on the rocky ledges along the high-water line of Kaula Island and is discussed below in Section 3.5.4.1.3 (Special-Status Species) (Naval Facilities Engineering Command Pacific, 2022).

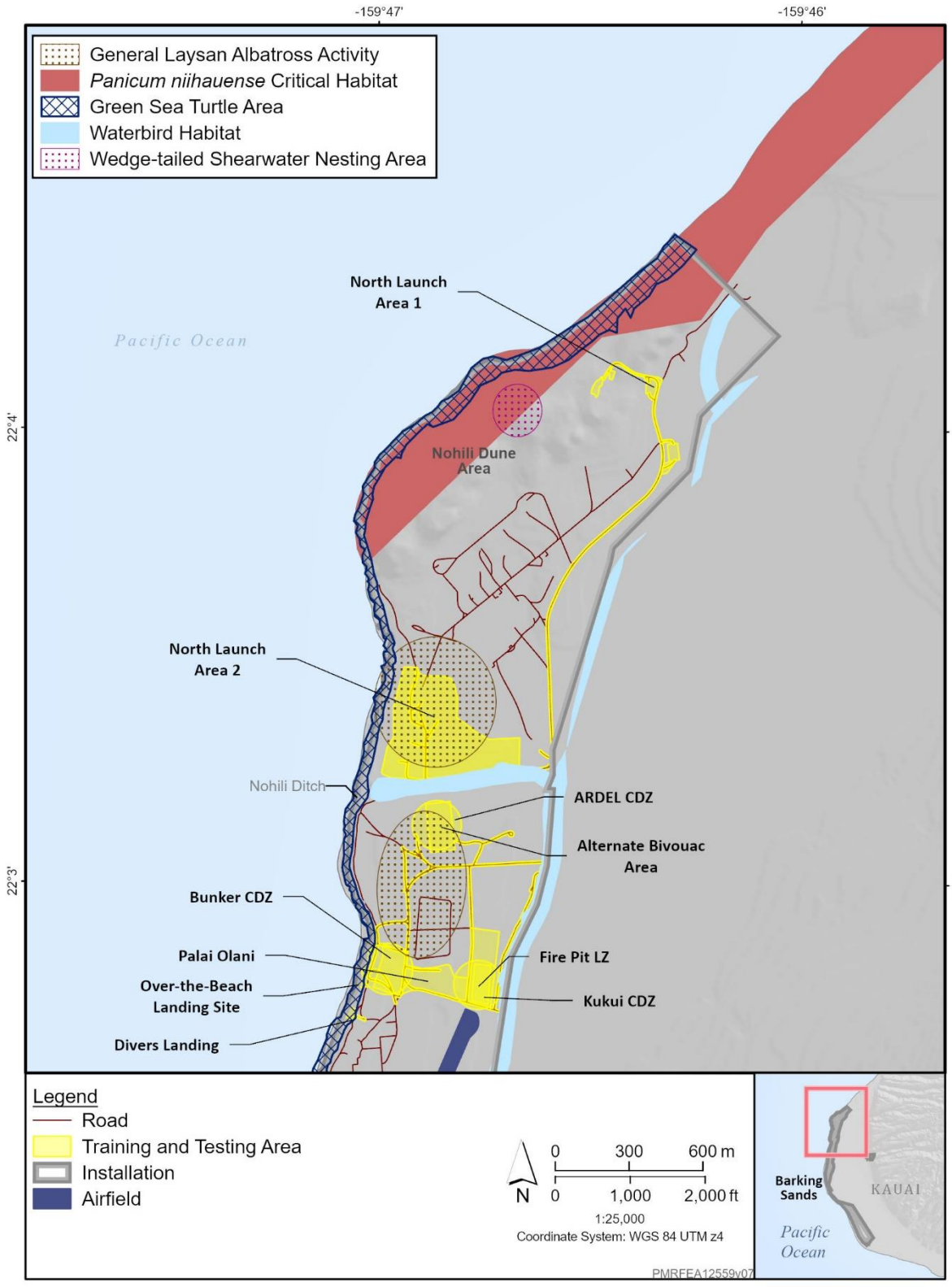

Figure 3.5-11: *Panicum niihauense* Critical Habitat, Green Sea Turtle Habitat, and Waterbird Habitat at North PMRF

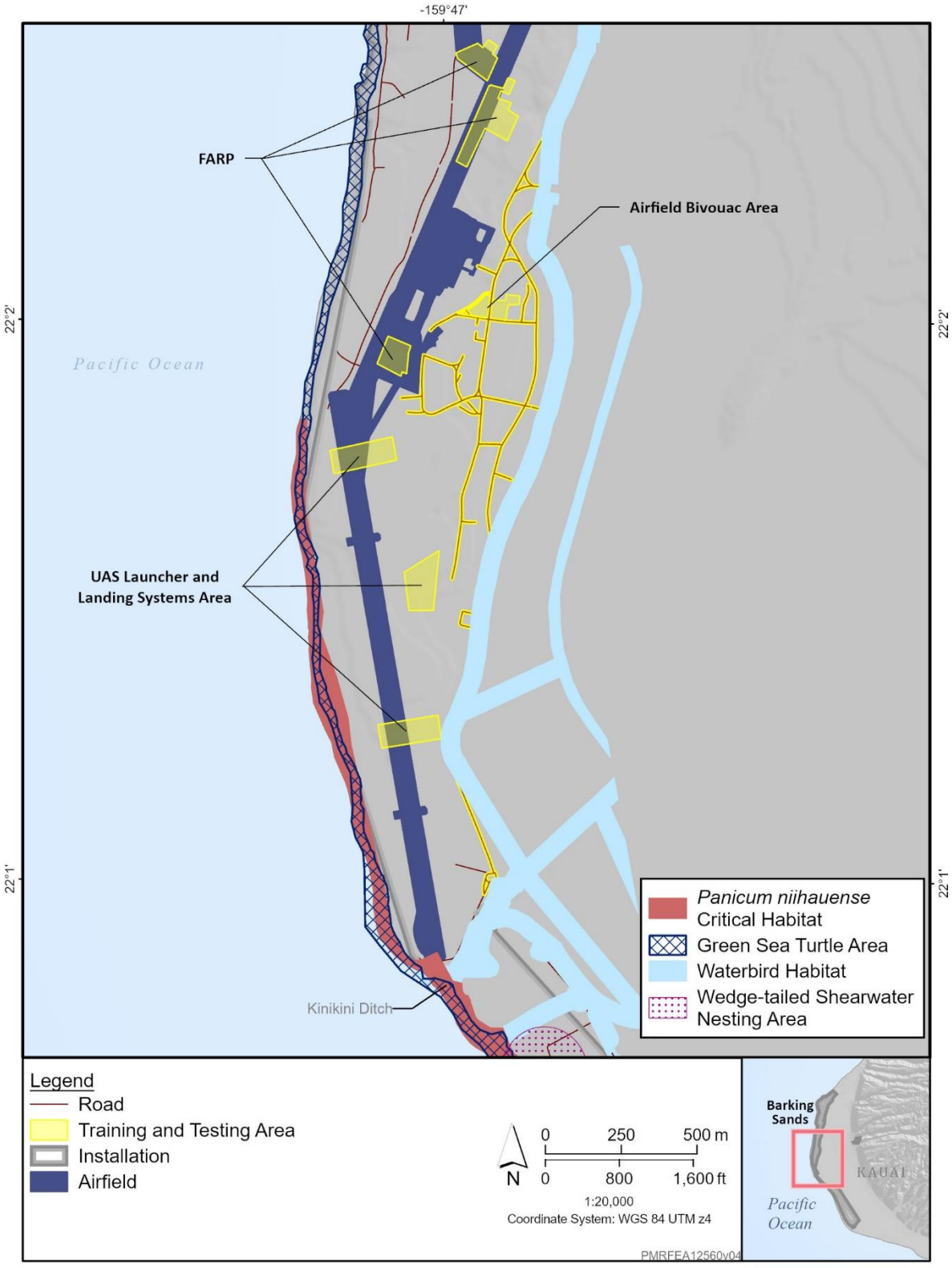

Figure 3.5-12: *Panicum niihauense* Critical Habitat, Green Sea Turtle Habitat, and Waterbird Habitat at Central PMRF

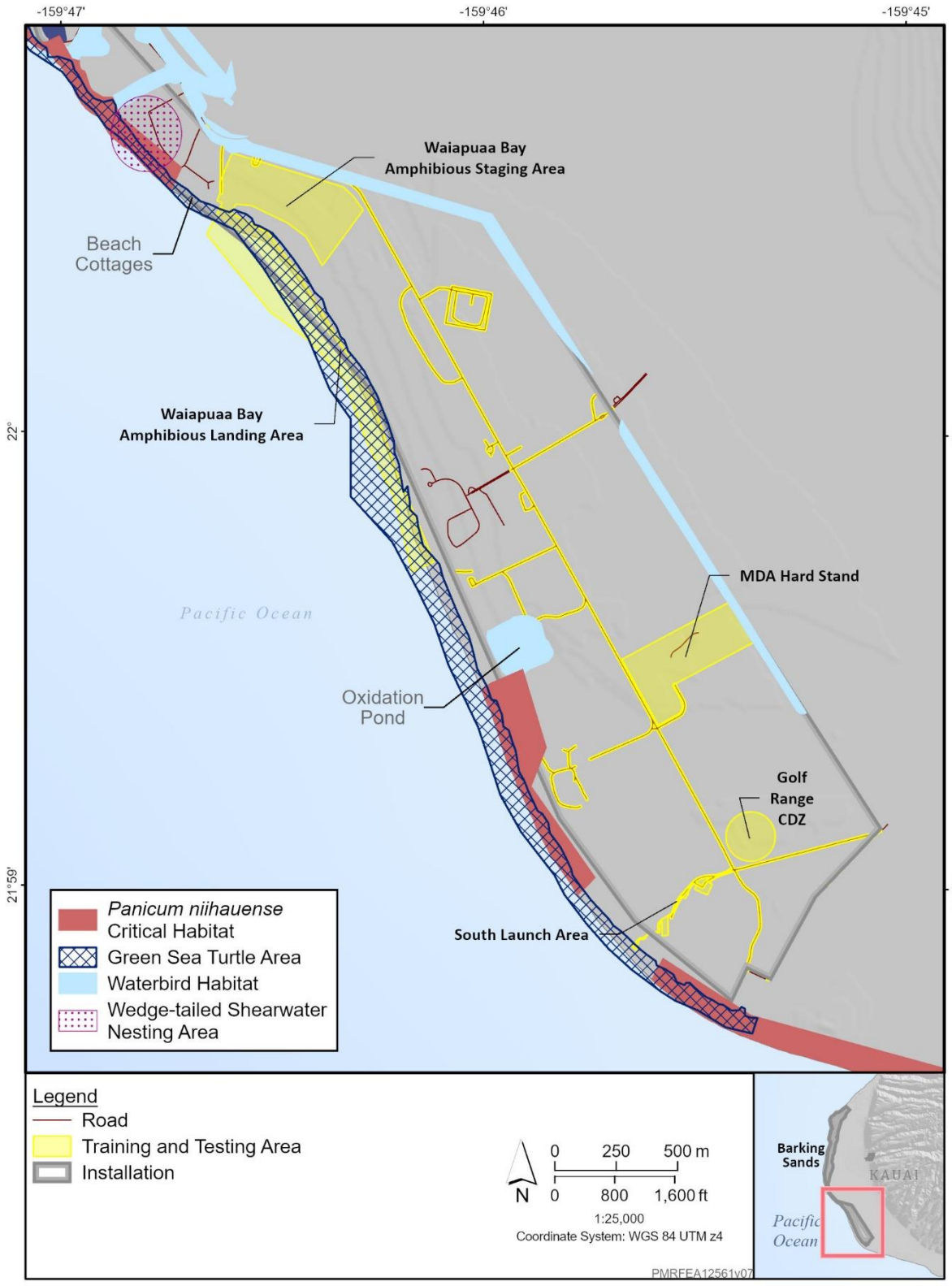

Figure 3.5-13: *Panicum niihauense* Critical Habitat, Green Sea Turtle Habitat, and Waterbird Habitat at South PMRF

A 1998 survey of Kaula found the non-native snake-eyed skink (*Cryptoblepharus poecilopleurus*) to be common throughout the island (Hawaii Department of Land and Natural Resources, 1998). Since surveys began in 1932, no other native or non-native reptile or amphibian species have been observed on Kaula Island. Sea turtles have also not been observed, and no suitable nesting or basking habitat is present (Commander United States Pacific Fleet, 2021; Naval Facilities Engineering Command Pacific, 2022).

3.5.4.1.3 Special-Status Species

Barking Sands

A total of 11 ESA-listed species are known to occur or potentially occur within the areas that would be used under the Proposed Action: one reptile, eight birds, and two mammals (Table 3.5-2: Known and Potential Occurrence of ESA-Listed Species Within the ROI at PMRF). ESA-listed plant species are not included as they have not been documented within the ROI and would therefore not be subject to impacts with implementation of the Proposed Action (Naval Facilities Engineering Systems Command Hawaii, 2023). However, critical habitat for the ESA-listed plant *Panicum niihauense* occurs on PMRF and is discussed below (Naval Facilities Engineering Systems Command Hawaii, 2023). Only species documented within the two ROI areas are discussed below.

Hawaiian Hoary Bat (*Lasiurus cinerus semotus*). The Hawaiian hoary bat is ESA-listed as endangered and is the only native terrestrial mammal in the State of Hawaii. Due to their cryptic and solitary nature, knowledge of Hawaiian hoary bat ecology is limited. They occur on all the main Hawaiian Islands and utilize habitat from sea level to at least 3,600 meters above sea level (U.S. Department of the Navy, 2021). The bat may be present at PMRF Barking Sands year-round but is most commonly found in the winter (Naval Facilities Engineering Command Pacific, 2022). The Hawaiian hoary bat may utilize suitable habitat on Barking Sands for foraging, breeding, and roosting. Hawaiian hoary bats roost primarily in trees 15 feet or taller. Breeding season occurs from June 1 to September 15. The greatest known threats to the bat include habitat loss and mortality from barbed wire fences (Commander United States Pacific Fleet, 2021; Naval Facilities Engineering Command Pacific, 2022).

Hawaiian Monk Seal (*Neomonachus schauinslandi*). Hawaiian monk seals are ESA-listed as endangered and can be found hauled out on the beaches of Barking Sands. Population estimates for the seals is around 1,600 individuals throughout the Hawaiian Islands (National Marine Fisheries Service, 2024). Breeding and pupping for monk seals occurs year-round, peaking between the months of April and August. At Barking Sands, common resting beaches include Kinikini Ditch, Diver's Landing, and Nohili Ditch (Figure 3.5-11, Figure 3.5-12, and Figure 3.5-13). Seals have also been observed hauled out at Waiapuaa Bay, Kokole Point (by the South Launch Area), and at the north end of the base in the Nohili Dunes area (north of Nohili Ditch) (Figure 3.5-11 and Figure 3.5-13) (Naval Facilities Engineering Systems Command Hawaii, 2023).

Green Sea Turtle (*Chelonia mydas*). The green sea turtle is ESA-listed as endangered and regularly utilizes Barking Sands beaches and nearshore waters for nesting, basking, and foraging (Figure 3.5-11 through Figure 3.5-13) (Commander United States Pacific Fleet, 2021; Naval Facilities Engineering Command Pacific, 2022). Green sea turtle sightings at Barking Sands are relatively common, and they are seen hauled out near the shoreline at the Nohili Ditch outfall, Diver's Landing, (Figure 3.5-11), and in front of Shenanigan's Restaurant (Naval Facilities Engineering Command Pacific, 2022). Between 2015 and 2023, a total of 12 green sea turtle nests were documented on PMRF (Commander United States Pacific Fleet, 2021; Naval Facilities Engineering Command Pacific, 2022).

Table 3.5-2: Known and Potential Occurrence of ESA-Listed Species Within the ROI at PMRF

Scientific Name	Common Name	ESA Status	Presence	
			Barking Sands	Kaula Island
Plants				
Panicum niihauense (critical habitat)	Lauehu	E	No	No
Portulaca villosa	Hairy purslane	E	No	X
Reptiles				
Chelonia mydas	Green turtle Central-North Pacific DPS	T	Bunker CDZ, Over the Beach Landing Area, Divers Landing, Waiapuaa Bay Landing Area, South Launch Area	No
Birds				
Oceanodroma castro	Band-rumped storm-petrel Hawaii DPS	E	X*	X[1]
Pterodroma phaeopygia sandwichensis	Hawaiian petrel	E	X*	X[1]
Puffinus auricularis newelli	Newell's shearwater	T	X*	X[1]
Anas wyvilliana	Hawaiian duck	E	X	No
Branta sandvicensis	Nene	T	X	No
Fulica americana alai	Hawaiian coot	E	X	No
Gallinula chloropus sandvicensis	Hawaiian common gallinule	E	X	No
Himantopus mexicanus knudseni	Hawaiian stilt	E	X	No
Mammals				
Lasiurus cinereus semotus	Hawaiian hoary bat	E	X	No
Neomonachus schauinslandi	Hawaiian monk seal	E	X	X

*Observed flying over/or known to fall out over PMRF.
[1]Although listed seabirds have the potential to occur at Kaula, they have not been recorded on the island.
Notes: DPS = Distinct Population Segment, E= Endangered, T = Threatened.
Sources: (Commander United States Pacific Fleet, 2021; Naval Facilities Engineering Command Pacific, 2022; Naval Facilities Engineering Systems Command Hawaii, 2023)

Nene (*Branta sandvicensis*). The nene was ESA-listed as endangered in 1967 with an estimate of fewer than 300 birds in the wild (U.S. Fish and Wildlife Service, 2004). Through captive breeding programs, predator control efforts, and dedicated conservation areas, the nene population numbers began to rise throughout the Hawaiian Islands. The 2017 statewide nene population estimate was 3,252 birds, in comparison to an estimated 2,855 birds in 2015 (Commander United States Pacific Fleet, 2021; Naval Facilities Engineering Command Pacific, 2022). The population on Kauai in 2017 was estimated at 1,482 birds and is believed to be stable and increasing. In 2019, the nene population was estimated at 3,252 and the species was downlisted to threatened. The 2022 annual nene population survey estimated 3,862 individuals throughout Hawaii, with 2,430 of those on Kauai (U.S. Fish and Wildlife Service, 2022). Nene are present year-round at Barking Sands. They are most commonly observed nesting at Kinikini Ditch, the oxidation pond complex, Hawaii Air National Guard complex, Terminal High Altitude Area Defense complex, and the beach cottages area. They are often also observed foraging in open grassy

areas in the central and southern portions of PMRF, as well as occasionally in the field north of Nohili Ditch (Naval Facilities Engineering Systems Command Hawaii, 2023). Nene are adaptable to human-modified habits, and predator control at PMRF ensures the nene continue to utilize the installation as habitat.

Hawaiian Duck (*Anas wyvilliana*). The Hawaiian duck was ESA-listed as endangered March 11, 1967 (32 FR 4001). As a waterbird, they are known to forage and reside in aquatic areas on PMRF, including the ditch and oxidation pond (Figure 3.5-11). Hawaiian ducks are known to occur within the ROI at Barking Sands. Breeding occurs year-round at PMRF, with the peak being April through September (Naval Facilities Engineering Systems Command Hawaii, 2023).

Hawaiian Common Gallinule (*Gallinula chloropus sandvicensis*). The Hawaiian common gallinule was ESA-listed as endangered March 11, 1967 (32 FR 4001). As a waterbird, they are known to forage and reside year-round in aquatic areas on PMRF, including the Nohili Ditch and oxidation pond (Figure 3.5-11). Breeding occurs year-round at PRMF, with the peak being March through August (Naval Facilities Engineering Systems Command Hawaii, 2023).

Hawaiian Coot (*Fulica alai*). The Hawaiian coot was ESA-listed as endangered October 13, 1970 (35 FR 16047). Similar to the gallinule, Hawaiian coots are known to forage and reside year-round in aquatic areas on PMRF, including the Nohili Ditch and oxidation pond (Figure 3.5-11). Breeding occurs year-round at PRMF, with the peak being April through September (Naval Facilities Engineering Systems Command Hawaii, 2023).

Hawaiian Stilt (*Himantopus mexicanus knudseni*). The Hawaiian stilt was ESA-listed as endangered October 13, 1970 (35 FR 16047). Hawaiian stilts are generally found year-round in the same habitat as Hawaiian coots: within the facility's ditches, at the oxidation pond, and within wetland areas along the center of the installation immediately east of the installation boundary (Figure 3.5-11) (Naval Facilities Engineering Systems Command Hawaii, 2023).

Band-rumped Storm-petrel (*Oceanodroma castro*), Hawaiian Petrel (*Pterodroma phaeopygia sandwichensis*), and Newell's Shearwater (*Puffinus auricularis newelli*). Newell's shearwater was ESA-listed as threatened in September 1975 (40 FR 44149), the Hawaiian petrel was ESA-listed as endangered in October 1967 (32 FR 4001), and the band-rumped storm-petrel was ESA-listed as endangered in September 2016 (81 FR 67786). All three seabird species spend the majority of their lives at sea, forage in the open ocean, and breed on Kauai. Beginning in March and April of each year, adults initiate breeding in colonial nesting grounds at high elevations in the interior portions of the island and fly over PMRF when traveling between nesting grounds and foraging areas on the open ocean. Fledglings travel from the nesting colony to the sea in the fall, with potential to fly over PMRF. These species only fly to and from their burrows at night and depend on the moon and starlight for navigation. Due to this, the presence of unshielded light along their flyways can result in confusion and disorientation. Newell's shearwaters and Hawaiian petrels pass over PMRF in significant numbers with an estimated 92 birds per night and an estimated total of 5,128 during the fall sampling period (Naval Facilities Engineering Command Pacific, 2022).

***Panicum niihauense* and Critical Habitat**. Potential ESA-listed plant species at Barking Sands include *Panicum niihauense*, a species of grass that was listed as endangered in 1996 (61 FR 53108). Surveys in 2023 identified four *Panicum niihauense* individuals just north of PMRF Barking Sands at Polihale State Park (Naval Facilities Engineering Systems Command Pacific, 2023). Although *Panicum niihauense* has not been observed during surveys of Barking Sands, USFWS designated 139.6 acres of (unoccupied)

critical habitat along beach strands and sand dunes on PMRF Barking Sands property (Figure 3.5-11, Figure 3.5-12, and Figure 3.5-13). Of that 139.6 acres, approximately 106.1 acres are located in the northern portion of PMRF Barking Sands property (Commander United States Pacific Fleet, 2021; Naval Facilities Engineering Command Pacific, 2022). In addition, designated critical habitat for *Panicum niihauense* is not present within the ROI. Therefore, *Panicum niihauense* critical habitat is not discussed further.

Kaula Island

Portulaca villosa. *Portulaca villosa* was ESA-listed as endangered on September 30, 2016 (81 FR 67786). The best available documentation of *Portulaca villosa* is cited in the 1980 Environmental Impact Assessment for the Kaula Island Target. The report indicated that *Portulaca villosa* (then known by *Portulaca caumii*) is most common on the northern half of the island on the ridge "where mats of 12 to 14 inches in diameter were found". This observation was attributed to ground surveys conducted in 1932 (prior to ordnance training on the island) (U.S. Department of the Navy, 1980). A 1998 ground survey at Kaula Island cited presence of *Portulaca villosa* as "occasional" but did not provide any further geographic, abundance, or distribution information and is therefore not considered a reliable source for the species presence on Kaula Island. No ground surveys have been conducted since 1998; sea-based or aerial surveys would likely be unable to identify the presence of this species on Kaula Island. The species presence has not been recorded since 1998 (U.S. Fish and Wildlife Service, 2021b). Species population information is limited and reliable documentation of the species occurred prior to ordnance training on the island. As such, it is unlikely that the species would be present in the small portion of the island that has been used for ordnance training since 1952. As such, *Portulaca villosa* is not discussed further.

Hawaiian monk seals. Hawaiian monk seals are known to frequent two main areas on the north and central portion of the west side of the island (outside of the ROI). Surveys between 2013 and 2023 have indicated that populations on the island have remained stable. The 2023 aerial survey of seabirds and marine mammals at Kaula Island identified 13 Hawaiian monk seals resting on the west side of Kaula, majority on the northernmost portion and outside of the ROI. Sea turtles have the potential to occur in the water surrounding Kaula Island; however, they have not been observed on Kaula Island, and no suitable nesting or basking habitat is present (Commander United States Pacific Fleet, 2021; Naval Facilities Engineering Command Pacific, 2022). Listed seabirds have potential to occur at Kaula Island; however, avian surveys conducted on Kaula from 1932 to 2023 have not identified the occurrence of any ESA-listed bird species (Naval Facilities Engineering Systems Command Hawaii, 2023; Normandeau Associates Inc & Air Data Solutions, 2023; Normandeau Associates Inc & APEM Ltd Joint Venture, 2021). As such, potential impacts on ESA-listed seabirds on Kaula Island are not discussed further.

3.5.5 Environmental Consequences

Impacts on biological resources would be significant if species or habitats of high concern are negatively affected over relatively large areas. Impacts are also considered significant if disturbances from the Proposed Action cause reductions in population size or distribution of a species of high concern.

The Proposed Action includes incorporation of appropriate and relevant SOPs that would avoid and minimize potential impacts on terrestrial biological resources with implementation of the Proposed Action. In addition, appropriate mitigation measures associated with previous consultations would be implemented as necessary to further minimize impacts as a result of the Proposed Action. Relevant SOPs and mitigation measures are listed in Table 3.5-3.

Table 3.5-3: SOPs and Mitigation Measures for Terrestrial Biological Resources

Protection Focus	Measure
SOPs	
Wildfire	• Prior to all launches and live-fire events, surrounding vegetation will be wet to reduce the risk of fire. • Emergency fire crews will be available during launches to quickly extinguish any fire and minimize its effects.
Vegetation	• All personnel will be briefed on avoiding undue impacts on vegetation on PMRF. • All equipment and vehicles will be washed/blown between locations to stop spread of invasives. • Existing cleared areas, trails, and roads will be used. • Per the 2014 PMRF Biological Opinion, there will be no trimming or removal of trees 15 feet or taller during Hawaiian hoary bat pupping season (June 1–September 15) (U.S. Fish and Wildlife Service, 2014).
Lighting	• For activities during the Dark Skies period (15 September to 15 December), all personnel will receive training on the PMRF Dark Skies Program Briefing & Natural Resources Training and Shearwater Fallout Instructions. • Night lighting will be shielded to the extent practical to minimize effects on night flying birds (Newell's shearwater and petrels), Hawaiian hoary bat, and green sea turtles. Night lighting can disorient turtle hatchlings and should be shielded from turtle nests, or nests shielded from lights. • Activities requiring night lighting will occur outside of seabird breeding and fallout season to the maximum extent practicable. • Red lights will be utilized to reduce impacts on wildlife if night lighting is necessary.
Amphibious Landings	• Prior to amphibious landings and other activities that may affect the sandy beaches, beaches will be surveyed 1 hour prior to beach landing exercises. If protected species are present, then training activity is delayed until the animal(s) voluntarily leaves the area. • Amphibious activities would only occur outside of the designated buffer zone. Any identified sea turtle nests in this area will be flagged and avoided.
UAS Capture Netting	• Capture netting for UAS would be installed only during training activities and would be taken down once activities have been concluded.
Electromagnetic Radiation	• Radars used during flight tests will not be directed toward the ground and will have a lower limit of 4–5 degrees above horizontal, which would preclude electromagnetic radiation impacts on terrestrial biological resources.
Nene and Waterbirds	• Hazing dogs will be used to deter nene from the MDA Hard Stand launch area. Under the ESA 4(d) Rule for Hawaiian geese, hazing is authorized for only non-breeding nene. Consultation is currently underway to request incidental hazing of waterbirds and nene. • PMRF has installed signs and rumble stripes along roadways where nene are known to occur to reduce car collisions. • A 25-mile-per-hour speed limit from 1800–0600 is implemented along the stretch of road most used by nene. Vegetation is managed back 10 feet from pavement along this stretch of road to discourage nene.
Kaula Island	• Per FACSFAC PH 3120.4 Scheduling & Operations Instruction, ordnance delivery is restricted to the first 1,000 feet of the southeast tip of the island. Only the use of inert ordnance is permitted. From November to May, the Humpback whale (an endangered species) may also be seen within the waters of Kaula Island. Presence of any marine mammal in the immediate exercise area or any Hawaiian monk seal on Kaula Island coastal ledges prohibits all ordnance delivery.

Protection Focus	Measure
Mitigation Measures	
Electromagnetic Radiation Effects on Hawaiian Hoary Bat	• Management and operations requirements with respect to the Hawaiian hoary bat stem from a USFWS informal section 7 consultation letter regarding ARDEL facility operations (U.S. Fish and Wildlife Service, 2009). The USFWS requires the area to be surveyed using an Anabat™ bat detector or the facilities' closed-circuit television cameras prior to operation of radar units at night. If one or more bats are present in the area of impact, radio frequency emission may not begin until the bat(s) has left of its own accord (Naval Facilities Engineering Systems Command Hawaii, 2023).

Notes: PMRF = Pacific Missile Range Facility, ESA = Endangered Species Act, FACSFAC PH = Fleet Area Control and Surveillance Facility, Pearl Harbor, ARDEL = Advanced Radar Detection Laboratory, USFWS = U.S. Fish and Wildlife Service, MDA = Missile Defense Agency

3.5.5.1 No Action Alternative

Under the No Action Alternative, there would be no change from current levels of Navy-led training and testing activities, and these activities would continue to occur within the same designated areas previously analyzed in relevant environmental documentation listed in Table 1.6-1. Impacts on terrestrial biological resources would remain as they do today, and activities would continue with the same SOPs and measures as presently conducted. Proposed land-based training and testing activities would not occur, and there would be no change in designated training areas. Therefore, no significant impacts on terrestrial biological resources would occur as a result of implementation of the No Action Alternative.

3.5.5.2 Proposed Action

3.5.5.2.1 Barking Sands

Vegetation

Under the Proposed Action, there would be no changes in the type of land-based training and testing activities that currently occur at Barking Sands. However, the continuation of these activities would occur at increased numbers depending on the activity type (Table 2.1-1). Damage to vegetation from movement of personnel, vehicles, and equipment across the beach and into upland areas during Amphibious Warfare Training is not likely since the movement would be limited to existing routes that are regularly used for this activity. Damage to vegetation from other activities such as bivouacking and ground maneuvers is also unlikely since troops would stay within previously disturbed areas. Troops would be instructed on and comply with SOPs to avoid impacts on vegetation. Equipment and vehicles would be blown/washed down in a controlled facility between locations to limit the spread of invasive weeds and plants as noted in Table 3.5-3:.

Missile, rocket, and aerial target drone launches are currently conducted at North Launch Areas 1 and 2 and the South Launch Area and would continue to be conducted at these areas under the Proposed Action. During these types of activities, ground disturbance may occur during implementation of the stabilizing system that would disturb 18 inches of ground below the surface. This ground disturbance is minimal, localized, and would not significantly impact vegetation communities (see Appendix A, Military Readiness Activity Descriptions). In accordance with SOPs and established wildfire mitigation measures, launch pads are kept clear of vegetation, and surrounding areas are maintained/landscaped. Analysis provided in the Strategic Target Systems 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 emissions, there is no evidence of any long-term adverse effect on vegetation from two decades of launches at PMRF (U.S. Department of the Navy, 2008a).

For these reasons, it is unlikely that an increase in the tempo of ongoing activities would significantly impact vegetation at Barking Sands. Therefore, with continued implementation of the SOPs and mitigation measures listed in Table 3.5-3, impacts on vegetation would not be significant at Barking Sands.

Wildlife

North Launch Area 1. Proposed activities at North Launch Area 1 include the same type of training and testing activities that currently occur (launches, launch set up, C5ISRT, and ground maneuvers). However, proposed activities would occur at different tempos than baseline (Table 2.1-1). Under the Proposed Action, annual launch activities would decrease from the baseline; however, launch set up and C5ISRT activities would increase.

Noise from increased personnel presence and vehicles associated with launch set up and C5ISRT may temporarily displace birds and other wildlife species. Wildlife may avoid the areas while activities occur and then return once activities are complete. Increased frequency of these activities may result in more instances where wildlife flee the area; however, training and testing activities are not new to the area and would be short term. Any temporarily displaced wildlife due to the firing event would likely return to the area once the activities conclude as previously analyzed in the 2008 HRC EIS (U.S. Department of the Navy, 2008a).

Increased C5ISRT activities may result in an increased potential of electromagnetic radiation exposure to wildlife. Potential exposure would be limited to birds, as terrestrial species would be below the beam of any ground-based tracking radar (U.S. Department of the Navy, 2008a). The potential for impacts on birds and other wildlife was addressed in the Ground-Based Radar Family of Radars EA (U.S. Army Space and Strategic Defense Command, 1993). The study determined that a bird would need to hover within the radar beam for an extended period of time to be at risk of any adverse effects from electromagnetic radiation. As hovering is not a behavior observed in the bird species found on PMRF, the potential for exposure would be highly unlikely.

Some activities occurring at North Launch Area 1 would require lighting to support night operations (Appendix A, Military Readiness Activity Descriptions). Artificial lighting has the potential to affect terrestrial wildlife through attraction and disorientation. Hawaiian seabirds are particularly affected by artificial lights, especially fledglings making their first flights to the ocean from their natal colonies. Effects are greatest during seabird fledgling season, from September 15 to December 15. To minimize impacts, all lighting would be in compliance with the SOPs listed in Table 3.5-3

In summary, all proposed increases activities would be short in duration and occur within regularly used training and testing sites. In addition, there would be no change in the type of training and testing activities or the current location where training and testing occurs. Therefore, with continued implementation of SOPs as listed in Table 3.5-3, impacts on wildlife would be less than significant at North Launch Area 1.

North Launch Area 2. Similar proposed increases in training and testing activities would occur at North Launch Area 2 as analyzed under North Launch Area 1 (launch setup, C5ISRT). Other proposed training and testing activities at North Launch Area 2 include an increase from 9 to 20 annual launches and an

increase in artillery training activities from one to three annually (see Chapter 2, Description of Proposed Action and Alternatives).

Launches and artillery exercises would result in short-term increased noise levels in the area during such events. Noise from these activities may startle nearby wildlife and cause flushing behavior in birds, but this startle reaction would be of short duration. Sound associated with launches is generally short in duration, with scheduled launches all under seven seconds. Under the Proposed Action, launches could increase from 26 to 39 (Table 2.1-1). As such, an increase in launch-related noise disturbances to wildlife would be brief and is not likely to result in long-term impacts on individual or populations of wildlife species. This conclusion is further supported by a study conducted for a rookery at Kennedy Space Center (Cape Canaveral Air Station) used by wood storks and other species of wading birds located approximately 2,461 feet from a shuttle launch pad. Based on the study, the rookery continued to be used successfully, even though it has received peak sound levels of up to approximately 138 dBA (U.S. Department of the Navy, 2008a). The study also noted that monitoring of birds during the breeding season indicated that adults respond to shuttle noise by flying away from the nest but return within two to four minutes. In addition, birds within 820 feet of Titan launch complexes at Cape Canaveral Air Station showed no mortality or reduction in habitat use from the 170 dBA sounds levels from Titan IV launches (U.S. Department of the Navy, 2008a). Under the Proposed Action, sound levels at 200 feet for most flight vehicles and weapons systems averages 125.5 dBA, with the loudest (Aegis readiness assessment vehicles) at 138 dBA. Although birds would be exposed to a maximum level of 138 dBA if in the immediate vicinity of a launch, levels would likely be less as North Launch Area 2 is landscaped and not considered high-quality habitat for birds or other wildlife. For more information on noise under the Proposed Action, see Section 3.3 (Noise). Wedge-tailed shearwaters are known to nest in the immediate coastal environment around North Launch Area 2 and nearby Nohili ditch, and Laysan albatross are known to loaf in and around North Launch Area 2. Based on conclusions from Cape Canaveral studies and maximum received sound levels of 138 dBA, birds may fly away from a nest or roost during a launch at Barking Sands but would likely return soon after. In addition, wildlife species have occurred at Barking Sands for decades during current launch activities, and no adverse effects have been observed. Wildlife species continue to use the habitats of Barking Sands before, during, and after launch operations.

Artillery exercises would occur at North Launch Area 2 and would result in a short-term noise disturbance that may result in the temporary flushing of birds and other wildlife. The annual activities would only increase from one to up to three under the Proposed Action. Birds and wildlife may exhibit a startle response similar to launches, temporarily leaving the area but would be expected to return once activities are complete with no long-term impacts on birds or other wildlife.

In summary, all proposed training and testing activities would be short in duration and occur within regularly used training and testing sites. In addition, there would be no change in the type of training and testing activities or the location where they are currently conducted and all SOPs would be adhered to. Therefore, with implementation of the SOPs as listed in Table 3.5-3, impacts on wildlife would be less than significant at North Launch Area 2.

South Launch Area. Similar proposed increases in training and testing activities would occur at South Launch Area as analyzed under North Launch Areas 1 and 2 (launch set up and C5ISRT). Similar to North Launch Areas 1 and 2, surrounding habitat on the site is maintained and would not be considered high quality habitat for birds or other wildlife. Wedge-tailed shearwaters are known to breed in nearby coastal environment; however, impacts are not likely to be significant for the same reasons analyzed under North Launch Area 1 and North Launch Area 2. All proposed training and testing activities would

be short in duration and occur within regularly used training and testing sites. In addition, there would be no change in the type of training and testing activities or the location where they are currently conducted and all SOPs would be adhered to as listed in Table 3.5-3. Therefore, impacts on wildlife would be less than significant at the South Launch Area.

Palai Olani Area. Proposed activities at Palai Olani area includes an increase from the baseline for amphibious landings (small boat operations and swimmer insertion/extraction) (from 4 to 21 activities annually) and bivouac (from one to six activities annually) (see Chapter 2, Description of Proposed Action and Alternatives). Wedge-tailed shearwaters are not known to be present or nest in or around Palai Olani and therefore would not be disturbed. Laysan albatross nest in the vegetation backing up to the dune, however this area would likely remain undisturbed. Further, any eggs found in the vicinity are moved by PMRF biologists and taken to suitable habitat away from military activities to discourage nesting and species presence. As such, Laysan albatross are unlikely to be present. Disturbance to wildlife from increased personnel and vehicles may temporarily displace wildlife in the vicinity. However, training and testing exercises would be brief, and any displaced wildlife would return to the area once activities are complete. In addition, there would be no change in the type of training and testing activities or the location at Palai Olani where they are currently conducted. SOPs would continue to be implemented as described in Table 3.5-3. Therefore, impacts on wildlife would result in less than significant impacts at Palai Olani.

Waiapuaa Bay. Proposed activities at Waiapuaa Bay includes an increase from a baseline of 4 to 24 activities annually for amphibious operations (e.g., raid, small boat operations, swimmer insertion/extraction) (see Chapter 2, Description of Proposed Action and Alternatives).

Wedge-tailed shearwaters are known to nest near the access point to the parking lot/staging area. SOPs as listed in Table 3.5-3 are adhered to when conducting activities at Waiapuaa Bay, and no impacts have occurred to wedge-tailed shearwaters as a result of training and testing activities. As such, there would be no change in the type of training and testing activities or the location where training and testing activities are currently conducted and all SOPs would continue to be implemented as described in Table 3.5-3. Therefore, impacts on wildlife from increased tempo of amphibious landings would be less than significant at Waiapuaa Bay.

MDA Hard Stand. Increases in the number of C5ISRT (from 2 to 10 annually) and bivouac activities (from one to up to four activities annually) are proposed at the MDA Hard Stand training and testing site (see Chapter 2, Description of Proposed Action and Alternatives). However, there would be no change in the type of training and testing activities or the location where they are currently conducted, and all SOPs would continue to be implemented as described in Table 3.5-3. Potential impacts on wildlife from these activities would be the same as analyzed above. As such, impacts on wildlife would be less than significant at MDA Hard Stand.

Airfield Bivouac Area. An increase in bivouacking activities from 5 to 26 annual activities at the Airfield Bivouac Area would occur under the Proposed Action (see Chapter 2, Description of Proposed Action and Alternatives). The area is landscaped and in a developed area that would not be considered high-quality habitat for wildlife. In the unlikely event wildlife were present during proposed activities, bivouacking may temporarily displace birds and other wildlife species. Such exercises would be short term, and any displaced wildlife would return to the area once the activities are complete. In addition, there would be no change in the type of training and testing activities or the location where they are currently conducted, and all SOPs would continue to be implemented as described in Table 3.5-3.

Therefore, impacts on wildlife from an increase in the tempo bivouac activities at the Airfield Bivouac Area would be less than significant.

Alternate Bivouac Area. Under the Proposed Action, an increase in parachute operations from 1 to up to 16 annual activities would occur at the Alternative Bivouac Area (see Chapter 2, Description of Proposed Action and Alternatives). Bivouacking activities would not increase from the baseline. Operations would occur on regularly used areas, there would be no change in the type of training and testing activities or the location where they are currently conducted, and all SOPs would be adhered to as listed in Table 3.5-3. Therefore, impacts on wildlife would be less than significant at the Alternative Bivouac Area.

FARP Areas. An increase in FARP exercises from 1 to 20 annually would occur under the Proposed Action (see Chapter 2, Description of Proposed Action and Alternatives). FARP exercises would continue to occur in the same location as currently conducted. Additionally, the FARP site is within the PMRF Airfield that conducts frequent flights and landings. Disturbance to wildlife from increased personnel presence, vehicles, generators, and aircraft would be minor given the ongoing aircraft activities associated with the Airfield. FARP activities would require an increase in aircraft operations in the surrounding FARP areas; however, Bird Aircraft Strike Hazard (BASH) potential would not increase due to the ongoing BASH management for the airfield. The FARP area is entirely landscaped and not considered high-quality habitat for wildlife. Although waterbirds are known occur in nearby Kinikini Ditch, any BASH hazards would be managed under the PMRF BASH program and therefore not increase impacts from what was previously analyzed in the 2008 HRC EIS (U.S. Department of the Navy, 2008a). If wildlife is present in the FARP area during training and testing activities, the analysis of noise-related impacts would be similar as analyzed under North Launch Area 2. However, noise levels at the FARP areas would be considerably less, and therefore noise-related impacts would be less than those analyzed at North Launch Area 2. All appropriate SOPs would continue to be implemented to further minimize impacts, as described in Table 3.5-3. Therefore, impacts on wildlife would be less than significant at FARP areas.

UAS Launch Area. Under the Proposed Action, UAS operations at the UAS Launch Area would increase from 2 to 45 annual activities. Activities would occur at the PMRF airfield, a developed and landscaped area that is regularly used for training and testing activities. Capture netting would only be used during training activities and would be taken down once training has concluded. Since capture netting would only be present for brief periods of time, it is not likely birds would be at risk of entanglement. There would be no change in the type of training and testing activities or the location where they are currently conducted. Therefore, impacts on wildlife would be less than significant at UAS Launch Area.

Ground Maneuver Area. An increase from 1 to 22 ground maneuver activities would occur under the Proposed Action. Ground maneuver activities within the Ground Maneuver Area would be limited to regularly used, paved or gravel roads and trails. There would be no change in the type of training and testing activities or the location where they are currently conducted. Increases in ground maneuvers would increase instances of wildlife strike potential. Personnel would continue to adhere to required speed limits to avoid impacts (Table 3.5-3). There could be minor disturbances to wildlife from increased personnel and vehicles at Barking Sands from ground maneuvering activities. However, as previously stated, disturbances would be brief, and wildlife would likely return once activities are complete. As such, impacts on wildlife would be less than significant within the designated Ground Maneuver Areas.

Special-Status Species: ESA-Listed Species

Hawaiian Hoary Bat. Impacts on the Hawaiian hoary bat from the Proposed Action may result from increased noise levels from launches and radar operations. The majority of proposed activities would take place in training and testing areas that are paved, landscaped/maintained, or have low-growing vegetation. The nearest high quality roosting site (e.g., patch of ironwood [*Casuarina equisetifolia*] trees) for nonvolant Hawaiian hoary bats on PMRF Barking Sands is 1,155 feet from launch areas (North Launch Area 1 and 2, South Launch Area). Lower quality roosting habitat (nonnative trees > 15 feet) are in proximity to Launch Area 1, although less likely to support nonvolant bats. Sound levels at 200 feet for most flight vehicles and weapons systems is on average 125.5 dBA, with the loudest (Aegis readiness assessment vehicles) at 138 dBA. At 1,155 feet from North Launch Areas 1 and 2, maximum received noise levels to bats would be 123 dBA. The South Launch Area is surrounded by landscaped vegetation and the nearest forested area is approximately 1,000 feet from the launch pad and is likely dominated by kiawe-koa haole scrub (Figure 3.5-3). As such, maximum received noise levels from launches at South Launch Area would be similar (124 dBA) to North Launch Area 1 and 2. Additionally, sound associated with launches is generally short in duration, with scheduled launches all under seven seconds. All vehicles and weapons have been fired before at PMRF Barking Sands and the Navy has no evidence that the short duration of sound during launch events results in adverse effects to bats (Commander United States Pacific Fleet, 2021). Therefore, since all proposed activities have been conducted previously at Barking Sands within regularly used training and testing sites, and there is no evidence that the short duration of launch events result in adverse effects to bats, impacts on Hawaiian hoary bats would be less than significant.

Electromagnetic radiation impacts from radar operations under the Proposed Action would occur at North Launch Area 1, North Launch Area 2, South Launch Area, and MDA Hard Stand. As analyzed above for birds, bats would need to hover over the radar beam, during a period of operation, for an extended period of time in order to experience negative effects from EMR. Hovering is not a behavior typically observed in bats, so exposure to adult bats is highly unlikely. Potential for exposure to roosting bats or bat pups exists during the bat pupping season (June 1–September 15) when young are non-volant (non-flying), and if trees 15 feet or higher are within the EMR hazard area (284 feet around radar). As previously mentioned, no suitable bat roosting habitat is within 1,155 feet of North Launch Area 1 and North Launch Area 2 or 1,000 feet of South Launch Area, well outside the EMR hazard area of 284 feet. Bat surveys conducted in the vicinity of MDA Hard Stand from June 2020 through June 2021 identified foraging bats in the forest abutting the MDA Hard Stand training and testing site at the same or greater levels than what was surveyed in 2010-2011. As such, ongoing activities at MDA Hard Stand have not had a negative impact on Hawaiian hoary bat population at MDA Hard Stand, and potential impacts under the Proposed Action would not change from what was previously analyzed under the 2008 HRC EIS (U.S. Department of the Navy, 2008a). Although the forest surrounding MDA Hard Stand is comprised of non-native species, trees over 15 feet tall in the kiawe-koa haole scrub could support roosting habitat for bats. (Figure 3.5-6). Management and operations of radars with respect to bats potentially flying within the radar beam stem from a USFWS informal section 7 consultation letter regarding ARDEL facility operations. In accordance with the mitigation measures described in Table 3.5-3, if bats are detected within the vicinity of the radar, the radar would not operate until bats have left the area on their own accord (U.S. Fish and Wildlife Service, 2009). Therefore, impacts on Hawaiian hoary bats from the Proposed Action would be less than significant.

Green Sea Turtle. Green sea turtles may bask and nest on beaches across the installation and therefore may be impacted by the increase in training and testing activities, including launches, live-fire activities, and amphibious landings.

Amphibious landing activities would occur at Palai Olani and Waiapuaa Bay. However, the area of Waiapuaa Bay used for landing activities is located in part of the shoreline not typically used by green sea turtles. Green sea turtles basking and nesting could be disturbed by human and vehicle presence, noise, or direct strike from increased training and testing activities such as increased night lighting due to night activities or bivouac. In accordance with ESA section 7 consultations on similar activities (U.S. Fish and Wildlife Service, 2021a), Barking Sands has implemented several SOPs for amphibious landings, launches, and live-fire training exercises to minimize potential impacts. Beaches are surveyed one hour prior to landings and launches and, in the event a sea turtle is observed basking on the beach, activities are delayed until the animal leaves on its own accord. Beaches are also be surveyed for sea turtle nests and, if found, are marked and avoided entirely (Table 3.5-3). These measures would continue to be implemented under the Proposed Action. Therefore, impacts would be considered less than significant.

Hawaiian Monk Seal. Hawaiian monk seals are often observed hauled out on the beaches at PMRF Barking Sands and the sea-level ledges on Kaula Island. At Barking Sands, seals may experience the greatest disturbance from an increase in amphibious landings. PMRF has implemented several SOPs to minimize impacts on seals. Prior to amphibious landings and other activities that may affect the sandy beaches, beaches are surveyed one hour prior to beach landing exercises. If protected species are present, then training activity is delayed until the animal(s) voluntarily leaves the training and testing area (Table 3.5-3). With the implementation of SOPs, impacts on Hawaiian monk seals from an increase in these events would be unlikely as individuals would be avoided. As such, impacts would be considered less than significant.

Nene, Hawaiian Duck, Hawaiian Common Gallinule, Hawaiian Coot, and Hawaiian Stilt. Impacts on ESA-listed birds from the Proposed Action would not change significantly from the baseline as no events would be conducted in wetlands or known habitat. Increases in ground maneuvers could increase potential vehicle strikes of nene. However, impacts would not be significant with the continuation of signs and speed limits per PMRF SOPs (Table 3.5-3). Impacts from the same activities at PMRF have been previously analyzed in the 2021 HRC Re-Initiation Letter of Concurrence (U.S. Fish and Wildlife Service, 2021a). USFWS determined there to be no adverse impacts with the implementation of SOPs as described in Table 3.5-3. The Proposed Action would not significantly increase impacts on Hawaiian waterbirds and nene. As such, determinations made by previous analyses would remain the same, and impacts on Hawaiian waterbirds and nene would be less than significant.

Newell's Shearwater, Band-rumped Storm Petrel, and Hawaiian Petrel. The Newell's shearwater, band-rumped storm petrel, and Hawaiian petrel are frequently observed flying over training and testing areas and are subject to fallout. Impacts from the same activities at PMRF were previously consulted in the 2018 Biological Opinion of the USFWS for the Proposed Base-Wide Infrastructure, Operations, and Maintenance Activities at PMRF (U.S. Fish and Wildlife Service, 2018). Impacts were determined to be minimal with the implementation of SOPs and conservation measures as described in Table 3.5-3. The Proposed Action would not substantially increase night lighting, and activities would be conducted to the maximum extent practicable outside of peak seabird fledging season. Further, all artificial lighting would continue to be shielded in accordance with USFWS guidelines. All other SOPs (including PMRF's Dark Skies Program) would continue to be implemented in order to minimize effects and are described

in Table 3.5-3. Therefore, impacts on Newell's shearwater and Hawaiian petrel would be less than significant.

Special-Status Species: MBTA-Listed Species

Impacts on MBTA-listed species from the proposed training and testing activities and associated noise would be similar to those described above for wildlife. Therefore, impacts are expected to be minimal and short term and would not result in a significant adverse effect on populations of any bird species protected under the MBTA.

3.5.5.2.2 Kaula Island

Vegetation

Under the Proposed Action Alternative, there would be no change in the type of training and testing activities that occur on Kaula Island. However, there would be an increase in the tempo for GUNEX (from 14 to 24 annual activities) and BOMBEX (from 12 to 31 annual activities) activities (Table 2.1-1). Vegetation on the island 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 documentation of fires from previous training activities is available, consistent with previous analysis in the 2008 HRC EIS (U.S. Department of the Navy, 2008a). Therefore, because vegetation on the island is minimal, impacts on vegetation would be less than significant.

Wildlife

As mentioned above, no change would occur in the type of activities, only the tempo at Kaula Island. Noise from increased numbers of inert munitions impacts, weapons firing, and aircraft could result in birds exhibiting a startle response in which they would temporarily leave the area; however, they would be expected to return once activities are complete, with no long-term impacts on seabird populations. Seabirds on Kaula Island have been surveyed from 1932 through 2023, and surveys indicate that the seabird composition of the island has remained very consistent over time despite ongoing GUNEX and BOMBEX activities conducted on the island (Naval Facilities Engineering Systems Command Hawaii, 2023). All activities would occur on a small portion within the first 1,000 feet of the southeast tip of the island and would continue to adhere to the SOPs described in Table 3.5-3. As such, impacts on wildlife would be less than significant.

Special-Status Species: ESA-Listed Species

Hawaiian Monk Seal. Proposed increases in GUNEX and BOMBEX activities may impact Hawaiian monk seals hauled out at Kaula Island. Impacts on Hawaiian monk seals from increases in similar activities were previously analyzed in the 2018 Hawaii-Southern California Training and Testing Biological Opinion. The NMFS concluded that the rate at which Hawaiian monk seal populations are increasing has not been affected by Navy training and testing activities in the Hawaiian Range Complex (which includes Kaula Island) (National Marine Fisheries Service, 2018). In addition, monk seals are known to haul out on rocky ledges at sea level outside of the ROI. Per SOPs, if monk seals are observed hauled out on Kaula Island, any planned ordnance delivery is prohibited (Table 3.5-3).

For these reasons, an increase in the tempo of training and testing activities would not result in greater disturbance to Hawaiian monk seals than what is currently conducted at Kaula Island. Therefore, impacts on Hawaiian monk seals under the Proposed Action would be less than significant.

Special-Status Species: MBTA-Listed Species

The impacts on MBTA-listed species from the proposed training and testing activities and associated noise at Kaula Island would be similar to those described above for wildlife. Therefore, impacts are expected to be minimal and short term and would not result in a significant adverse effect on populations of any bird species on Kaula Island protected under the MBTA.

3.5.5.3 Conclusion

Proposed training and testing activities could result in minor and short-term elevated noise levels. Activities conducted on unpaved areas would occur on maintained landscaped or low-quality habitat within areas regularly used for training and testing activities. Artificial night lighting would be minimal and limited to short-term events. Impacts would be short term and no long-term impacts would occur under the Proposed Action. SOPs as listed in Table 3.5-3 would be implemented to minimize impacts from invasive species, noise, and physical disturbance to wildlife or ESA-listed species. Therefore, impacts on terrestrial biological resources would be less than significant as a result of implementation of the Proposed Action.

3.6 Cultural Resources

3.6.1 Definition of Resource

Cultural resources, to include historic properties, consist of prehistoric and historic sites, structures, artifacts, or any other physical evidence of human activity considered important to a culture, subculture, or community for scientific, traditional, religious, or any other reason.

Cultural resources are limited, nonrenewable resources whose value may be easily diminished by actions impacting their integrity and can include, but are not limited to, the resources described subsequently. Archaeological resources (prehistoric and historic) are locations where human activity measurably altered the earth or left deposits of physical remains. While many archaeological sites consist only of subsurface materials, others may include remnant surface ruins, structures, or components related to subsurface materials. Architectural resources include standing buildings, structures, landscapes, and districts composed of one or more of these resource types. Resources of traditional, religious, or cultural significance can include archaeological resources, sacred sites, buildings, structures, districts, prominent topographic features, landscapes, habitats, plants, animals, minerals, or social institutions considered essential for the preservation of traditional culture. A traditional cultural property (TCP), while not defined in law or regulation, is defined by the National Park Service as a resource that is eligible for inclusion on the National Register because of its association with cultural practices or beliefs of a living community that (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of the community (Parker & T. F. King, 1992). The term has come to be widely used within the historic preservation community as synonymous with the term “properties of traditional religious and cultural importance” referred to in the NHPA and its implementing regulations (54 U.S.C. 302706). When the terms traditional cultural property, traditional cultural place, or the abbreviation TCP is used, it means properties of traditional religious and cultural importance as defined under the NHPA.

Cultural resources include historic properties as defined under the NHPA of 1966. Historic properties are defined as any prehistoric or historic district, site, building, structure, or object included on, or eligible for inclusion on, the National Register of Historic Places (NRHP) (36 CFR part 60). “Historic properties” include artifacts, records, and remains that are related to and located within such properties (36 CFR

800.16(1)). As outlined in 36 CFR part 60, to be eligible for listing on the NRHP, a resource must retain integrity and meet one of the four criteria below:

- Associated with events that have made a significant contribution to the broad patterns of our history (Criterion A);
- Associated with the lives of persons significant in our past (Criterion B);
- Embody distinctive characteristics of a type, period, or method of construction, or represent the work of a master, or possess high artistic values, or represent a significant and distinguishable entity whose components may lack individual distinction (Criterion C); and/or
- Have yielded or be likely to yield information important in prehistory or history (Criterion D).

Properties that are less than 50 years old can be considered eligible for the NRHP under Criterion Consideration G if they possess exceptional historical importance. Those properties must also retain historic integrity and meet at least one of the four NRHP criteria (Criteria A, B, C, or D). The term "historic property" refers to National Historic Landmarks, NRHP-listed, and NRHP-eligible cultural resources. Further detail regarding the regulations applicable to cultural resources are included in Section 3.6.2 (Regulatory Setting).

3.6.2 Regulatory Setting

NEPA is a procedural statute intended to ensure Federal agencies consider the environmental impacts of their actions in the decision-making process, including impacts on cultural resources. Effects to cultural resources under NEPA include ecological, aesthetic, historic, cultural, economic, social, or health; whether direct, indirect, or cumulative (40 CFR section 1508.1(i).

NEPA's analysis incorporates a broad range of federal laws, regulations, and executive orders, including Archaeological and Historic Preservation Act of 1974 (16 U.S.C. section 469) as amended, the American Indian Religious Freedom Act of 1978 (42 U.S.C. section 1996), the Archaeological Resources Protection Act of 1979 (16 U.S.C. sections 470aa–470mm), the Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. section 3001, et seq.), and the NHPA of 1966 (54 U.S.C. 300101 et seq.) and its associated regulations (36 CFR part 800).

Section 106 of the NHPA (54 U.S.C. section 301608) mandates that federal agencies with jurisdiction over a proposed federal or federally assisted undertaking in any State shall take into account the effect of the undertaking on any historic property, and shall seek to avoid, minimize, or mitigate adverse effects to historic properties (36 CFR section 800.1[a]). The process for implementing Section 106 is codified by 36 CFR part 800, Protection of Historic Properties. A property is considered significant if it meets one or more of four criteria listed earlier in Section 3.6.1.

NHPA's implementing regulations seek to accommodate historic preservation concerns with the needs of federal undertakings through consultation among the agency and other parties with an interest in the effects of the undertaking on historic properties. For this Proposed Action, the Navy plans on meeting the responsibilities pursuant to Section 106 of the NHPA for the subject undertaking in accordance with the 2012 Programmatic Agreement (PA) among the Commander Navy Region Hawaii, the Advisory Council on Historic Preservation, and the Hawaii State Historic Preservation Officer Regarding Navy Undertakings in Hawaii (U.S. Department of the Navy, 2012c). The 2012 PA is an established Section 106 program alternative that provides a framework for professional review and assessments of effects, responses to post-review discoveries and emergencies, periodic reporting, and processes for participation by Native Hawaiian organizations (NHO) and consulting parties. In accordance with the

2012 PA, all training and testing activities would be reviewed in advance by qualified subject matter experts to confirm the effectiveness of measures to avoid and minimize harm to historic properties. At SHPD's request, Commander, Navy Region Hawaii will commit to quarterly reporting of activities reviewed under Stipulation XII in the PA, in addition to the annual report.

Significant historic and archaeological resources are present at Barking Sands. As a steward of cultural resources, the Navy must comply with federal regulations related to those resources. The analysis in this EA addresses cultural resources compliance at PMRF in accordance with applicable Integrated Cultural Resources Management Plan (ICRMP) SOPs and Navy agreements (U.S. Department of the Navy, 1999a, 2011, 2012c) which outline avoidance measures, minimization efforts, and best management practices (BMPs) regarding protection of cultural resources and historic properties.

3.6.3 Region of Influence

For purposes of this EA, the ROI is comprised of two main areas (Figure 2.1-1):

- PMRF Barking Sands (North Launch Area 1, North Launch Area 2, South Launch Area, Palai Olani Area, Waiapuaa Bay Amphibious Staging Area, MDA Hard Stand, Airfield Bivouac Area, Alternate Bivouac Area, FARP Areas, UAS Launch Area, and Ground Maneuver Areas) (see Figures 2.1-2–2.1-12);
- Kaula Island (see Figure 2.1-13).

For historic properties analyzed under the NHPA, the ROI is the Area of Potential Effects, defined as the "geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist," (36 CFR section 800.16[d]) and thereby diminish their historic integrity.

3.6.4 Affected Environment

3.6.4.1 Existing Conditions

3.6.4.1.1 Barking Sands

Barking Sands is situated on the Mana Plain, which is a low-lying coastal terrace on the western flank of Kauai. Human habitation of the Mana Plain dates back centuries, with the earliest traditional Hawaiian archaeological site dating back to the 11th century. Traditional Native Hawaiian land uses near the ROI include habitation, subsistence activities, burial, and travel. It is likely that permanent settlements were concentrated at the inland edge of the Mana Plain. Small fishing communities, possibly limited to temporary camps, were scattered along the coast. Archaeological evidence suggests inhabitants of the Mana Plain engaged in marine subsistence activities, including fishing and harvesting shellfish. Fishing was not confined to the ocean and shoreline of Mana, but also included the swamps and ponds on the coastal plain, where wild resources could be obtained alongside those raised through aquaculture. The coastal plain was a source of natural resources that were collected and used for a variety of purposes, including aalii shrubs for firewood, hialoa and other plants for medicine, and makaloa and neki for weaving.

Large-scale agriculture was adopted in the Mana Plain in the mid-19th century, introducing sugar cane and rice plantations as well as Chinese, Filipino, and Japanese workers to the area. Cemeteries from these cultures and artifact scatters have been identified as plantation-era resources at PMRF. The U.S. military took ownership of a Hawaii territorial airstrip and activated Barking Sands in June 1940. The base provided support to the Army, Air Force, and Navy through several significant historical events, including World War II, the Cold War, and the National Aeronautics and Space Administration's Man in

Space program, among others (U.S. Department of the Navy, 2012b). As a result, archaeological resources such as building ruins and deteriorated structures, roads, and trash dumps associated from past military activities have been identified at PMRF.

Coastal dune deposits are extensive areas of archaeological sensitivity present within the PMRF installation. Identified coastal deposits at PMRF stretch from Nohili Dunes in the north to the north edge of Waiapuaa Bay. The dune deposits are generally characterized by charcoal-rich sand layers containing shell midden and artifacts. They are interpreted as temporary camps, presumably related to seasonal fishing or other resource collection activities (U.S. Department of the Navy, 2012a). Traditional Hawaiian and some plantation-era burials have also been identified. The coastal dunes of the Mana Plain were the burial grounds of ancient Hawaiians.

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. Culturally, spirits are placed in one of the following realms: the realm of the wandering spirits, the realm of the ancestral spirits, or the realm of the endless night. Although historic and modern disturbances have impacted remains of back beach habitation predating World War II, the coastal dune areas of PMRF remain culturally sensitive (International Archaeological Research Institute Inc., 2005).

Previous professional identification and evaluation studies at Barking Sands include (1) reconnaissance and surface surveys to identify archaeological sites, (2) subsurface testing and excavation at archaeological sites, (3) ground-penetrating radar surveys to identify subsurface anomalies possibly indicative of cultural deposits, (4) archaeological monitoring projects, and (5) historic research and cultural studies to identify traditional cultural places. Most of the archaeological investigations at Barking Sands have involved surface surveys. Coverage includes nearly all of PMRF Barking Sands.

Five historic properties have been identified in three of the training and testing sites, two World War II-era sites and three traditional Hawaiian sites. All sites are located on the Main Base, Barking Sands (Table 3.6-1). No historic properties have been identified within the activity area of Kaula Island.

Table 3.6-1: Historic Properties Identified on PMRF Barking Sands within the Training and Testing Areas [1]

SIHP No./Name	Description	Type	Date	NRHP Eligibility Criterion	Training and Testing Area Location
50-30-01-1860	Nohili Dune	TH	Pre-Contact	Eligible; Criteria A and D	North Launch Area 1
50-30-05-2035	Midden deposits and burials	TH	Pre-Contact	Eligible; Criterion D	Palai Olani
50-30-05-2040	Defense revetment	WWII-CW	1941–1991	Eligible; Criterion A	Palai Olani
50-30-05-4016	Habitation (fire pit remnant)	TH	Pre-Contact	Eligible: Criterion D	Waiapuaa Bay
50-30-05-2272	Two WWII gun emplacements	WWII-CW	1941–1991	Eligible: Criterion D	Waiapuaa Bay

[1]Information included as available per the 2012 ICRMP and provided GIS data (U.S. Department of the Navy, 2012a).
Notes: SIHP = State Inventory of Historic Places, TH = traditional Hawaiian archaeological site, WWII-CW = World War II – Cold War

North Launch Area 1. One historic property is located within the North Launch Area 1. Nohili Dune (Site 50-30-01-1860) is a multi-component Traditional Hawaiian archaeological site and TCP that includes Elekuna Heiau, dune burials, and evidence of temporary habitation (Table 3.6-1). The Nohili Dune site subsumes four previously recorded Traditional Hawaiian habitation and burial sites (01-0007, 01-0008, 01-0009, and 01-6027) and extends from within PMRF Barking Sands north to Polihale, where the plain ends at the southern edge of the Na Pali.

Referenced in several studies (Bennet, 1931; Ching, 1974; Drolet et al., 1996; Flores & A. Kaohi, 1992; International Archaeological Research Institute Inc., 2005; Nagata, 1994; Soehren, 1965; Thrum, 1907; Wulzen & P.M. Jensen, 1997), the historic property contains cultural deposits, burials, religious and habitation features. Bennett (1931) described 01-0007 as dune burials and campsites between Polihale and Barking Sands; cultural material reported included grooved sinkers, grindstones, adzes, files, and marine shell (U.S. Department of the Navy, 2012a). Thrum (1907) and Bennett (1931) described Site 01-0008 as Elekuna Heiau at the Nohili Dune, with Flores and Kaohi (1992) noting that "It was considered to be a heiau of 'marked distinction' that was visited by King Kalakaua and his priests on various occasions. It was also unique in that it was not constructed of lava stones as the others, but instead was a ledge of sandstone at the base of Nohili dunes" (Flores & A. Kaohi, 1992). Site 01-0009 was recorded by Bennett (1931) as house sites constructed of low stone walls on the inland side on Nohili Dune. Nagata (1994) and Wulzen & P.M. Jensen (1997) report that Site 01-6027 is an eroding midden present containing marine shell, charcoal, and fire-affected rock.

Nohili Dune has played a part in community traditions and served as a destination of visitors following the lure of the legend of the "barking sand," an unusual barking noise made by the sand under certain conditions. Flores and Kaohi write that "its distinction was praised in chants from the earliest of the traditional period and still recounted in recently composed songs of the contemporary period." (Flores & A. Kaohi, 1992). In 2019, the Navy consulted with NHOs and SHPD in advance of proposed conservation work at the Nohili Dune site. Based on prior studies and past discussions with NHOs, the Navy determined the Nohili Dune Site (50-30-01-1860) was a TCP and eligible for inclusion on the NRHP. In 2020, the Hawaii SHPD concurred with the determination.

Palao Olani. Two historic properties are located within the boundaries of Palai Olani training and testing site that are eligible to be listed on the NRHP (Table 3.6-1). Site 50-30-05-2040 is a revetment associated with airfield development and defense against possible attack in World War II. The site is a "double horseshoe" or "M" shape revetment that includes graveled pavement extending from revetment toward the runway (Wulzen & P.M. Jensen, 1997). Training conducted within World War II defense structures such as this revetment is considered continual and beneficial use to the military and training mission. Site 50-30-05-2035 is a large traditional midden deposit containing several other cultural sites and materials including fire-affected rock, water-worn rock, basalt debitage, marine shell, human burials, flakes, marine shell, charcoal, and ash. The deposit is visible as distinct dark layers from 3–78 centimeters observed in exposed portions of the seaward dune face and spans nearly 900 meters along the coastal dunes and extends nearly 30 meters inland. It encompasses previously identified burials (Sites 05-1831 and 05-1884) as well as two bone exposures that have not been assigned SIHP numbers (International Archaeological Research Institute Inc., 2005). Due to prior disturbance from installation activity and environmental factors such as wave and wind activity, archaeological sites within the dune are largely not in-situ. Training activities conducted near the site are restricted to remain within maintained corridors or pathways approved by PMRF. These areas are previously disturbed and avoid cultural resources.

Waiapuaa Bay. Two historic properties are located within Waiapuaa Bay training and testing site. One is on the north side of Waiapuaa Bay (Site 50-30-05-4016) and is located inland from Waiapuaa Bay and the existing recreational cottages on the back beach. This site is a fire pit exposed at 85 centimeters below surface in a 27-meter-long backhoe trench. The fire pit occurred at the interface of two layers, neither of which contained evidence of cultural use. A charcoal sample from the fire pit yielded a radiocarbon date ranging from the 12th to the 14th century, making it the earliest dated evidence of human activity on the southwest coast of Kauai (Sweeney, 1994). The other historic property, Site 50-30-05-2272, is located inland from Waiapuaa Bay and the existing Morale, Welfare, and Recreation camping area on the back beach. The site consists of two World War II gun emplacements constructed with concrete blocks and mortar. These two aboveground keyhole-shaped enclosures include circular portions with poured concrete floors and rectangular portions with soil floors.

3.6.4.1.2 Kaula Island

Located approximately 20 NM off Niihau, Kaula Island is uninhabited due to high winds, steep slopes, instability of the island's surface, and lack of fresh water. An archaeological survey was completed across all accessible terrain on Kaula Island (Robins & L. Anderson, 2001). Excluding the steep cliffs and eroding slopes encircling the island, and areas inaccessible due to high winds and ground surface instability, archaeologists surveyed approximately 36 acres or 50 percent of the accessible surface of the island. Six archaeological sites were recorded on Kaula Island. Five sites were recorded in the northern portion of the island; four were interpreted to be traditional Hawaiian sites, while one lacked sufficient integrity for cultural or functional interpretation. One site, a concrete lighthouse foundation, was recorded at the summit of the island between the northern and southern ends. No cultural resources, to include historic properties, were identified in the southern portion of the island within the training and testing area. However, it should be noted that some NHOs consider Kaula Island a sacred place (Anae et al. 2024, *in draft*).

3.6.5 Environmental Consequences

Analysis of potential impacts on cultural resources considers both direct and indirect impacts. Direct impacts may be the result of physically altering, damaging, or destroying all or part of a resource; altering characteristics of the surrounding environment that contribute to the importance of the resource, introducing visual, atmospheric, or audible elements that are out of character for the period the resource represents (thereby altering the setting); or neglecting the resource to the extent that it deteriorates or is destroyed. Indirect effects may be the result of direct effects such as a physical damage to an architectural resource, with the indirect effect that people are no longer able to see or access that resource.

Under the Proposed Action, the types of training currently being conducted at PMRF would not change. A variety of measures are currently in place to protect and avoid effects to historic properties at Barking Sands during training and testing activities. Measures and stipulations in the 2012 PA have been incorporated into the PMRF ICRMP SOPs and installation BMPs listed in Table 3.6-2. The Proposed Action includes continued use of appropriate and relevant SOPs and measures that would avoid and minimize potential impacts on cultural resources. Avoidance of cultural resources was considered a priority in the design and placement of the training and testing areas. Relevant SOPs and minimization measures, established in existing Navy agreements and management plans, are discussed below for each training and testing activity (Table 3.6-3 through Table 3.6-14). Classifications of the scales of the exercises for the activities described can be found in Appendix A (Military Readiness Activities Descriptions).

Table 3.6-2: SOPs, BMPs, and Minimization Measures for Cultural Resources

Protection Focus	Measure
Pre-Training and Testing	
ICRMP SOPs	
Section 106 Compliance	• Navy cultural resources SMEs review undertaking(s), evaluate effects of the proposed undertaking, and complete NHPA Section 106 compliance as stipulated under the 2012 PA (ICRMP SOP#4). Navy Cultural Resource Manager (CRM) may solicit assistance from SME at NAVFAC Pacific if needed.
Briefing of Personnel	• Navy SME conducts briefings to operational personnel for cultural resource sensitivities prior to training exercises (ICRMP SOP #8). o Range Users are informed that discovery (or damage) of cultural resources within training areas must be immediately reported, and activity must cease.
Unanticipated Discoveries	• If unanticipated cultural resources are encountered, all activities will cease in the immediate vicinity of the find and reported to the Navy CRM. Subsequent SOPs that may be triggered: o Inadvertent discovery of Archaeological Remains (ICRMP SOP#9) o Inadvertent discovery of Human Remains (ICRMP SOP# 10) ▪ Consultation with NHOs is triggered if Native Hawaiian remains are encountered or suspected ▪ No photography or movement of osteological materials, secure area, and call Navy SME.
Fire Suppression	• Fire suppression communication (ICRMP SOP #14) o Navy CRM communicates with Navy SMEs regarding emergency management procedures.
On-site Monitoring	• Monitoring during construction and/or ground-disturbing activities (ICRMP SOP #8) o Navy SME carries out field checks prior to amphibious operations and other operations to ensure avoidance of historic properties.
Emergency Situations	• Emergency Situations (ICRMP SOP #14)
ARPA Compliance	• ARPA Compliance (ICRMP SOP#5) Removal of historical, cultural, or archeological objects is prohibited and punishable by law. • ARPA compliance is included in PMRF Site Approval Request dig permit process, where archaeology signature block is coordinated with other Navy SME review blocks. Navy Installation POCs review and sign off on dig permits prior to a proposed ground disturbing activity. • Digging or excavating is prohibited unless clearance obtained by Navy approvals (dig permit). • Range Users prioritize the use of sand bags for stabilization measures over excavations.
BMPs	
Avoidance of Known Historic Properties	• Navy cultural resources SMEs completes review prior to proposed action and avoidance of known historic properties is prioritized.
Approved Pathways	• Range Users are required to stay on designated pathways without deviation. • Vehicles are restricted to established roads, maintenance corridors, and approved roadways. No off-roading or driving on beaches without Navy approvals.
Cultural Resource Surveys	• Navy SME supports pre-exercise pedestrian survey relative to the proposed action.

Protection Focus	Measure
Amphibious Landings	• Range Users lay down mats during amphibious operations. Mats are used in the area where small boats come ashore to prevent disturbance to resources in the sand. During small boat operations, a four-wheel drive pickup truck and trailer used to transport the small boats (Combat Rubber Raiding Craft) briefly traverse the mats to hardened landing area access road. • Prior to amphibious landings that may affect the sandy beaches, beaches will be surveyed prior to beach landing exercises. • Amphibious activities would only occur outside of the designated buffer zone. Any sensitive cultural resources within this area will be flagged and avoided.
Program Funding	• Annually, Navy CRM works to solicit CR funding to support compliance requirements and field staff.
Post Training and Testing	
ICRMP SOPs	
Cultural Resource Surveys	• Navy CR SME supports post-exercise survey of area, triggered by unexpected fires or mishap (SOP#14).
Consultation Agreement Compliance	• The PMRF CRM completes Programmatic Agreement (PA) Memos for all activities that fall under the 2012 NRH PA. These memos are included in the NRH PA Annual Report per Section XII.
BMPs	
Annual Reporting	• Navy CR SME provides input for Annual Reporting requirements (2012 PA Section XII)
Field Checks	• Navy CRM carries out field checks after amphibious operations and other operations to ensure avoidance of historic properties.
Cultural Resource Surveys	• Navy CRM supports post-exercise pedestrian survey relative to the proposed action.
Reporting	• Follow-up reporting on unanticipated finds discovered during training activities
De-Briefing	• After action de-briefing for training activities and unanticipated incidents (i.e., Navy CR SME contributes to after action reports).
Archaeological Signage	• Navy has established signs that provide information on federally protected cultural resources and areas. • Cordoned off areas are marked to prevent unauthorized entry (keep out signage).
Mats	• Mats are utilized wherever possible for amphibious landings to limit ground disturbance.
Sand Bags	• Sand bags are prioritized for stabilization over excavations.

Notes: CRM = Cultural Resources Manager, SOP = Standard Operating Procedure, ICRMP = Integrated Cultural Resources Management Plan, SME = Subject Matter Expert, ARPA = Archaeological Resources Protection Act, NHPA = National Historic Preservation Act, CR = Cultural Resources, NRH = Navy Region Hawaii

3.6.5.1 No Action Alternative

Under the No Action Alternative, there would be no change from current levels of Navy-led training and testing activities and these activities would continue to occur within the same designated areas previously analyzed in relevant environmental documentation listed in Table 1.6-1. Impacts on cultural resources would remain as they do today and activities would continue with the same SOPs and minimization measures as presently conducted. Proposed increases in land-based training and testing activities would not occur, and there would be no change in designated training areas. Therefore, no significant impacts on cultural resources would occur as a result of implementation of the No Action Alternative.

3.6.5.2 Proposed Action

3.6.5.2.1 Barking Sands

North Launch Area 1. North Launch Area 1 is an area that has been previously disturbed by landscaping and development. The entire area has been graded, and paved areas contain launch pads, a launcher, and communication facilities. Approximately 1.2 acres of the western portion of North Launch Area 1 extends into the boundary of Site 50-30-01-1860, known as Nohili Dune (see Section 3.6.4.1.1). Most of the roughly 157-acre Nohili Dune site falls outside of the North Launch Area 1 training and testing site.

Proposed training and testing activities at North Launch Area 1 are listed in Table 3.6-3. In addition, the table presents activities with the potential for impacts via ground disturbance as well as existing avoidance and protection measures. Additional detail on proposed training and testing activities are provided in Appendix A (Military Readiness Activity Descriptions).

Missile, Rocket, and Aerial Target Drone Launch: Under the Proposed Action, the tempo of Missile, Rocket, and Aerial Target Drone Launch activities would decrease from 16 to 15 annual activities at North Launch Area 1. Per ongoing activities, ground disturbance may include equipment stabilizing systems and grounding rods (Table 3.6-3). Missile, rocket, and aerial target drone launch activities produce noise and vibrations. However, noise events associated with these activities are intermittent and brief (5–10 seconds), resulting in relatively small increases in overall noise levels. While launch noise results in higher than typical ambient levels, it is comparable to a large truck passing by on the road or airplane overflight. Noise and vibration from ongoing launch activities are not intense enough to physically impact or alter the setting of the existing Nohili Dune site. Under the Proposed Action, given the decrease in tempo of launches, no changes in baseline conditions would be expected to occur on the Nohili Dune site because training and testing activities would continue to avoid the site per existing SOPs.

Missile, Rocket, and Aerial Target Drone Target Set-Up (No Launch): Under the Proposed Action, the tempo of Missile, Rocket, and Aerial Target Drone Target set-up activities would increase to up to six annual activities at North Launch Area 1. Types of potential ground disturbance associated with this activity include equipment stabilizing systems and grounding rods (Table 3.6-3). While there is a proposed increase in this activity, potential ground disturbance would not impact the Nohili Dune site because the site would continue to be avoided per existing SOPs.

C5ISRT: Under the Proposed Action, the tempo of C5ISRT activities would increase to up to 30 annual activities at North Launch Area 1. Types of potential ground disturbance associated with C5ISRT activities include setting grounding rods and tent stakes (Table 3.6-3). While there is a proposed increase in this activity, potential ground disturbance would not impact the Nohili Dune site because the site would continue to be avoided per existing SOPs.

In summary, all proposed activities at North Launch Area 1 would occur on previously disturbed ground that is either hardscape or graded. Proposed activities would be conducted within the existing infrastructure and developed area of North Launch Area 1 and would avoid the Nohili Dune TCP. Access to identified cultural resources within PMRF Barking Sands would continue to be managed through written requests processed and approved by the PMRF Command. Although the increase in the tempo of activities associated with the Proposed Action could lessen schedule availability, PMRF installation personnel would continue to provide Native Hawaiians with access to the Nohili Dune TCP at North Launch Area 1 in accordance with the American Indian Religious Freedom Act and EO 13007, on a case-by-case basis.

North Launch Area 2. North Launch Area 2 is an area that has been previously disturbed. The entire area has been graded, and paved areas contain launch pads, a launcher, and command and communication facilities. No historic properties have been identified within the training and testing site. Proposed training and testing activities at North Launch Area 2 are listed in Table 3.6-4.

Missile, Rocket, and Aerial Target Drone Launch: Under the Proposed Action, the tempo of Missile, Rocket, and Aerial Target Drone Launch activities would increase to up to 20 annual activities at North Launch Area 2. Types of potential ground disturbance associated with this activity include equipment stabilizing systems and grounding rods (Table 3.6-4).

Table 3.6-3: Proposed Training and Testing Activities at North Launch Area 1

Activity	Activity Description	Potential for Impacts	Avoidance and Protection Measures
Missile, Rocket, and Aerial Target Drone Launch	Terrestrial component of launching missiles, rockets, and aerial target drones from established launch areas ashore. Aerial or surface target intercepts to occur offshore, on or above water. This activity is conducted within current existing, launch areas that are graded and include supporting infrastructure. Launches are oriented such that the missile, rocket, or aerial target drone head directly toward the open ocean, all within PMRF's restricted airspace. Various fixed or mobile systems and platforms may be used.	• For some mobile systems, the stabilizing system requires ground disturbance in small areas. Hand excavations with shovels are used to dig up to 18 inches deep. • Grounding rods (5/8 inch in diameter and 3-6 feet long) needed for up to 3 generators.	• All proposed activities would occur on previously disturbed ground (graded or hardscape). • Proposed activities would be conducted within existing infrastructure and developed area of North Launch Area 1. • No excavation or ground disturbance would take place within the Nohili Dune TCP (Site 50-30-05-1860).
Missile, Rocket, and Aerial Drone Target Set-up (No Launch)	Conduct non-live-fire missile or rocket system launch preparation by deploying, making ready for launch, and redeploying a transportable tactical missile or rocket system.	• For some mobile systems, the stabilizing system requires ground disturbance in small areas. Hand excavations with shovels are used to dig up to 18 inches deep. • Grounding rods (5/8 inch in diameter and 3-6 feet long) needed for up to 3 generators.	• All proposed activities would occur on previously disturbed ground (graded or hardscape). • Proposed activities would be conducted within existing infrastructure and developed area of North Launch Area 1. • No excavation or ground disturbance would take place within the Nohili Dune TCP (Site 50-30-05-1860).
C5ISRT	Establish and operate a tactical field command post, communication systems, radar tracking and surveillance systems, optical tracking systems, and	• Equipment stabilization using stakes measuring not more than 45 cm	• All proposed activities would occur on previously disturbed ground (graded or hardscape).

Activity	Activity Description	Potential for Impacts	Avoidance and Protection Measures
	electronic warfare equipment. May use existing facilities or mobile, vehicle-based systems.	long (18 in) and 1.6 cm (5/8 in) in diameter. • Grounding rods (5/8 inch in diameter) associated with generators, sensors, and other equipment; ground disturbance could vary between 3 and 6 feet deep per rod.	• Proposed activities would be conducted within existing infrastructure and developed area of North Launch Area 1. • No excavation or ground disturbance would take place within the Nohili Dune TCP (Site 50-30-05-1860).

Table 3.6-4: Proposed Training and Testing Activities at North Launch Area 2

Proposed Activity	Activity Description	Potential for Impacts	Avoidance and Protection Measures
Missile, Rocket, and Aerial Target Drone Launch	Terrestrial component of launching missiles, rockets, and aerial target drones from established launch areas ashore. Aerial or surface target intercepts to occur offshore, on or above water. This activity is conducted within current existing, launch areas that are graded and include supporting infrastructure. Launches are oriented such that the missile, rocket, or aerial target drone head directly toward the open ocean, all within PMRF's restricted airspace. Various fixed or mobile systems and platforms may be used.	• For some mobile systems, the stabilizing system requires ground disturbance in small areas. Hand excavations with shovels are used to dig up to 18 inches deep. • Grounding rods (5/8 inch in diameter and 3-6 feet long) needed for up to 3 generators.	• No historic properties have been identified in this training and testing site. All proposed activities would occur on previously disturbed ground (hardscape or graded).
Missile, Rocket, and Aerial Drone Target Set-up (No Launch)	Conduct non-live-fire missile or rocket system launch preparation by deploying, making ready for launch, and redeploying a transportable tactical missile or rocket system.	• For some mobile systems, the stabilizing system requires ground disturbance in small areas. Hand excavations with shovels are used to dig up to 18 inches deep. • Grounding rods (5/8 inch in diameter and 3-6 feet	• No historic properties have been identified in this training and testing site. All proposed activities would occur on previously disturbed ground (hardscape or graded).

Proposed Activity	Activity Description	Potential for Impacts	Avoidance and Protection Measures
		long) needed for up to 3 generators.	
Artillery	Terrestrial component of land-based forces live firing of artillery guns at surface (waterborne) or air targets. Artillery guns oriented such that artillery round heads directly toward the open ocean, all within PMRF's restricted airspace. A typical artillery system is the M777 Howitzer, a mobile live-fire system that fires 155-millimeter (mm) rounds. Other artillery systems fire smaller 105 mm rounds.	• The M777 stabilizing system (using shovels) requires ground disturbance to a depth of approximately 18 inches.	• No historic properties have been identified in this training and testing site. All proposed activities would occur on previously disturbed ground (hardscape or graded).
C5ISRT	Establish and operate a tactical field command post, communication systems, radar tracking and surveillance systems, optical tracking systems, and electronic warfare equipment. May use existing facilities or mobile, vehicle-based systems.	• Equipment stabilization using stakes measuring not more than 45 cm long (18 in) and 1.6 cm (5/8 in) in diameter. • Grounding rods (5/8 inch in diameter) associated with generators, sensors, and other equipment; ground disturbance could vary between 3 and 6 feet deep per rod.	• No historic properties have been identified in this training and testing site. All proposed activities would occur on previously disturbed ground (hardscape or graded).
Bivouacking	Establish and operate expeditionary field lodging for personnel conducting training.	• Placement of tent stakes (18-inch length, 5/8-inch diameter) for up to 20-person shelters. • Grounding rods (5/8 inch in diameter) associated with up to 2 generators; ground disturbance could vary between 3 and 6 feet deep per rod.	• No historic properties have been identified in this training and testing site. All proposed activities would occur on previously disturbed ground (hardscape or graded).

Missile, Rocket, and Aerial Target Drone Target Set-Up (No Launch): Under the Proposed Action, the tempo of missile, rocket, and aerial target drone target set-up activities would increase to up to six annual activities at North Launch Area 2. The types of potential ground disturbance associated with this activity include equipment stabilizing systems and grounding rods (Table 3.6-4).

Artillery: Under the Proposed Action, the tempo of artillery activities would increase to up to three annual activities at North Launch Area 2. The only type of potential ground disturbance associated with this activity is the use of the M777 stabilization system (Table 3.6-4).

C5ISRT: Under the Proposed Action the tempo of C5ISRT activities would increase to up to 12 annual activities at North Launch Area 2. Types of potential ground disturbance associated with C5ISRT activities include setting grounding rods and tent stakes (Table 3.6-4).

Bivouacking: Under the Proposed Action, the tempo of Bivouacking activities would increase to up to nine annual activities at North Launch Area 2. Types of potential ground disturbance associated with bivouacking activities include setting grounding rods and tent stakes (Table 3.6-4).

In summary, all training and testing activities at North Launch Area 2 would occur on previously disturbed ground that is either hardscape or graded. No historic properties have been identified within the North Launch Area 2 training and testing site.

South Launch Area. South Launch Area, which includes the Golf Range CDZ, is an area that is previously disturbed by grading and development. The entire area has been graded and paved areas include a single launch facility. No historic properties have been identified within the training and test site.

Proposed activities at South Launch are listed in Table 3.6-5 and summarized below. In addition, the table presents activities with the potential for impacts via ground disturbance as well as existing avoidance and protection measures. Additional detail on proposed training and testing activities are provided in Appendix A (Military Readiness Activity Descriptions).

Missile, Rocket, and Aerial Target Drone Target Set-Up (No Launch): Under the Proposed Action, the tempo of missile, rocket, and aerial target drone target set-up activities would increase to up to six annual activities at South Launch Area. The types of potential ground disturbance associated with this activity include equipment stabilizing systems and grounding rods (Table 3.6-5).

Parachute Operations: Under the Proposed Action, the tempo of parachute operations conducted at Golf Range CDZ within the South Launch Area would increase to up to 16 annual activities. No ground disturbance is associated with these activities (Table 3.6-5). Parachute operations at Golf Range CDZ are only conducted on previously disturbed, hard surface areas and would continue to be conducted within the CDZ in a manner that does not result in ground disturbance.

C5ISRT: Under the Proposed Action, the tempo of C5ISRT activities would increase to up to 18 annual activities at South Launch Area. Types of potential ground disturbance associated with C5ISRT activities include setting tent stakes and grounding rods (Table 3.6-5).

In summary, all proposed activities at the South Launch Area would occur on previously disturbed ground that has been graded. No historic properties have been identified within the South Launch Area training and testing site.

Table 3.6-5: Proposed Training and Testing Activities at South Launch Area

Proposed Activity	Activity Description	Potential for Impact	Avoidance and Protection Measures
Missile, Rocket, and Aerial Drone Target Set-up (No Launch)	Conduct non-live-fire missile or rocket system launch preparation by deploying, making ready for launch, and redeploying a transportable tactical missile or rocket system.	• For some mobile systems, the stabilizing system requires ground disturbance in small areas. Hand excavations with shovels are used to dig up to 18 inches deep. • Grounding rods (5/8 inch in diameter and 3-6 feet long). needed for up to 3 generators.	• No historic properties have been identified in this training and testing site. All proposed activities would occur on previously disturbed ground (hardscape or graded).
Parachute Operations	Conduct parachute operations (terrestrial landings).	• No ground disturbance is associated with pedestrian or equipment contact.	• No historic properties have been identified in this training and testing site. All proposed activities would occur on previously disturbed ground (hardscape or graded).
C5ISRT	Establish and operate a tactical field command post, communication systems, radar tracking and surveillance systems, optical tracking systems, and electronic warfare equipment. May use existing facilities or mobile, vehicle-based systems.	• Equipment stabilization using stakes measuring not more than 45 cm long (18 in) and 1.6 cm (5/8 in) in diameter. • Grounding rods (5/8 inch in diameter) associated with generators, sensors, and other equipment; ground disturbance could vary between 3 and 6 feet deep per rod.	• No historic properties have been identified in this training and testing site. All proposed activities would occur on previously disturbed ground (hardscape or graded).

Palai Olani Area. Palai Olani is an area that has been previously disturbed from previous military use, hydrophone trenching, and constant wind and tidal action. The area includes Diver's Landing, Over the Beach Landing, Bunker CDZ, Kukui CDZ, and Fire Pit LZ. Approximately 1.4 acres of the Palai Olani study area overlaps with the boundary of Site 50-30-05-2035 (0.1 acres of Diver's Landing, 0.2 acres of Over-the-Beach Landing, and 1.1 acres of Bunker CDZ); the majority of the 6.4-acre site falls outside of the training and testing area. The entire 1.1-acre Site 50-30-05-2040 falls within the Palai Olani study area.

Proposed training and testing activities at Palai Olani are listed in Table 3.6-6. In addition, the table presents activities with the potential for impacts via ground disturbance as well as existing avoidance and protection measures. Additional detail on proposed training and testing activities are provided in Appendix A (Military Readiness Activity Descriptions).

Small Boat Operations: Under the Proposed Action, the tempo of small boat operations would increase to up to 19 annual activities at Over-the-Beach Landing. Types of potential ground disturbance and minimization measures associated with small boat operations include vehicle and personnel movement over the beach (Table 3.6-6). Under the Proposed Action, mats would be laid down in the area where the small boats would come ashore to prevent disturbance to resources in the sand. A four-wheel drive pickup truck and trailer used to transport the small boats (Combat Rubber Raiding Craft) would briefly traverse over the sand while traveling across the mats to the hardened landing area access road. Vehicle movement would not cause significant sand displacement and would occur in areas that are previously disturbed. While there is a proposed increase in this activity, potential ground disturbance would not impact Site 50-30-05-2035 because the site would continue to be avoided per existing SOPs.

Swimmer Insertion and Extraction: Under the Proposed Action, the tempo of swimmer insertion and extraction activities would increase to up to two annual activities at Diver's Landing and Over-the-Beach Landing. The only type of potential ground disturbance for swimmer insertion and extraction activities is personnel movement over the beach (Table 3.6-6). Swimmer insertion and extraction activities would be conducted on foot and within previously disturbed areas. While there is a proposed increase in this activity, potential ground disturbance would not impact Site 50-30-05-2035 because the site would continue to be avoided per existing SOPs.

Table 3.6-6: Proposed Training and Testing Activities at Palai Olani

Proposed Activity	Activity Description	Potential for Impact	Avoidance and Protection Measures
Amphibious Small Boat Operations	A Unit using small boats move from offshore location to a beach-landing site. Forces manually carry boats to an inland site, conduct reconnaissance, and then return to the sea via small boats.	• Vehicle and personnel movement.	• All proposed activities at Palai Olani would be conducted on previously disturbed land or in active coastal zone. • No excavations would take place within historic properties (50-30-05-2035 and 50-30-05-2040). • Personnel use mats to protect against ground disturbance during training activities that include vehicle movement in the active coastal zone • Personnel use established pathways when transporting small boats and moving from the

Proposed Activity	Activity Description	Potential for Impact	Avoidance and Protection Measures
			active coastal zone to the hinterland. • Pedestrian movements associated with follow-on activities do not include dune areas. • Vehicles do not operate in dune areas.
Amphibious Swimmer Insertion and Extraction	Swimmer Insertion/Extraction. Personnel conduct over-the-beach water entry swimmer insertion and extraction training in PMRF amphibious landing areas.	• Pedestrian movements associated with follow-on activities.	• All proposed activities at Palai Olani would be conducted on previously disturbed land or in active coastal zone. • No excavations would take place within historic properties (50-30-05-2035 and 50-30-05-2040). • Pedestrian movements associated with follow-on activities do not include dune areas.
Parachute Operations	Conduct parachute operations (terrestrial landings).	• No ground disturbance is associated with pedestrian or equipment contact.	• All proposed activities at Palai Olani would be conducted on previously disturbed land or in active coastal zone. • No excavations would take place within historic properties (50-30-05-2035 and 50-30-05-2040). • Pedestrian movements associated with follow-on activities do not include dune areas.
Helicopter/Tilt-Rotor LZ Operations	Helicopter/Tilt-Rotor aircraft conduct LZ Operations (off airport surface). Deliver/recover personnel or equipment from/to unimproved landing zone locations.	• Ground disturbance may result from rotor downwash.	• All proposed activities at Palai Olani would be conducted on previously disturbed land or in active coastal zone. • No excavations would take place within historic properties (50-30-05-2035 and 50-30-05-2040).

Proposed Activity	Activity Description	Potential for Impact	Avoidance and Protection Measures
			• Pedestrian movements associated with follow-on activities do not include dune areas. • Watering down the landing zone prior to LZ operations to minimize disturbance resulting from rotor wash.
Bivouacking	Establish and operate expeditionary field lodging for personnel conducting training.	• Placement of tent stakes (18-inch length, 5/8-inch diameter) for up to 20-person shelters. • Grounding rods (5/8 inch in diameter) associated with up to 2 generators; ground disturbance could vary between 3 and 6 feet deep per rod.	• All proposed activities at Palai Olani would be conducted on previously disturbed land or in active coastal zone. • No excavations would take place within historic properties (50-30-05-2035 and 50-30-05-2040). • Pedestrian movements associated with follow-on activities do not include dune areas.

Parachute Operations: Under the Proposed Action, the tempo of parachute operations would increase to up to 16 annual activities at Bunker CDZ and Kukui CDZ. No potential ground disturbance is associated with these activities (Table 3.6-6). Parachute operations at Bunker CDZ and Kukui CDZ are only conducted on previously disturbed, hard-surface areas and would continue to be conducted within the CDZs in a manner that does not result in ground disturbance. Parachute operations would continue to avoid Site 50-30-05-2035.

Helicopter or Tilt-Rotor Landing Zone Operations: Under the Proposed Action, the tempo of helicopter or tilt-rotor landing zone operations would increase to up to 12 annual activities at Fire Pit LZ. The only type of potential ground disturbance associated with this activity is rotor wash (Table 3.6-6). Fire Pit Landing Zone is located in a previously disturbed area where no historic properties have been identified. However, site 50-30-05-2040 is located immediately adjacent to the boundary of Fire Pit Landing Zone within Palai Olani and could potentially be disturbed by rotor wash. During helicopter or tilt-rotor landings, however, the landing zone is watered down to reduce erosion from rotor wash. Additional minimization measures are described in Table 3.6-6. While there is a proposed increase in this activity, potential ground disturbance would not impact Site 50-30-05-2040 because the site would continue to be avoided per existing SOPs.

Bivouacking: Under the Proposed Action, the tempo of bivouacking activities would increase to up to six annual activities at Palai Olani. Types of potential ground disturbance associated with this activity include setting tent stakes and grounding rods (Table 3.6-6). Bivouacking would only occur in previously disturbed areas and would not occur on the beach or the dune areas. While there is a proposed increase

in this activity, potential ground disturbance would not impact Sites 50-30-05-2035 or 50-30-05-2040 because the site would continue to be avoided per existing SOPs.

In summary, all proposed activities at Palai Olani would be conducted on previously disturbed land and would avoid known historic properties (50-30-05-2035 and 50-30-05-2040). Access to identified cultural resources within PMRF Barking Sands would continue to be managed through written requests processed and approved by the PMRF Command. Although the increase in the tempo of activities associated with the Proposed Action could lessen schedule availability, PMRF installation personnel would continue to provide Native Hawaiians with access to the historic properties in accordance with the American Indian Religious Freedom Act and EO 13007, on a case-by-case basis.

Waiapuaa Bay. Waiapuaa Bay is an area that has been previously disturbed from past military activity, public use, and constant wind and tidal action. No historic properties have been identified in the Waiapuaa Bay Amphibious Landing Area. Two historic properties, 50-30-05-4016 (0.01 acre) and 50-30-05-2272 (0.04 acres), fall entirely within the Waiapuaa Bay Amphibious Staging Area, which is located in the back beach (Table 3.6-1).

Proposed training and testing activities at Waiapuaa Bay are listed in Table 3.6-7. In addition, the table presents activities with the potential for impacts via ground disturbance as well as existing avoidance and protection measures. Additional detail on proposed training and testing activities are provided in Appendix A (Military Readiness Activity Descriptions).

Amphibious Raid: Under the Proposed Action, the tempo of amphibious raid activities would increase to up to two annual activities at Waiapuaa Bay. Types of ground disturbance associated with this activity include vehicle and personnel movement over the beach (Table 3.6-7). Under the Proposed Action, mats would be laid down in the area where the amphibious crafts would come ashore to prevent disturbance to resources in the sand. Vehicles used during amphibious raids (e.g., JLTVs, ACVs) would briefly traverse over the sand while traveling across the mats to the hardened landing area access road. Activities would be restricted to utilizing the existing corridor, which supports installation infrastructure and maintenance operations.

No historic properties have been identified in the Waiapuaa Bay Amphibious Landing Area or access road. Two historic properties have been identified in the Waiapuaa Bay Amphibious Staging Area. While there is a proposed increase in amphibious raid activities, potential ground disturbance would not impact Sites 50-30-05-4016 or 50-30-05-2272 because the sites would continue to be avoided per existing SOPs.

Small Boat Operations: Under the Proposed Action, the tempo of small boat operations would increase to up to 19 annual activities at Waiapuaa Bay. Types of potential ground disturbance associated with small boat operations include vehicle and personnel movement over the beach (Table 3.6-7). Under the Proposed Action, mats would be laid down in the area where the small boats would come ashore to prevent disturbance to resources in the sand. During small boat operations, a four-wheel drive pickup truck and trailer used to transport the small boats (Combat Rubber Raiding Craft) would briefly traverse over the sand while traveling across the mats to the hardened landing area access road. However, activities would be restricted to utilizing the existing corridor, which supports installation infrastructure and maintenance operations; training activities would continue to be conducted in a manner that avoids historic properties.

No historic properties have been identified in the Waiapuaa Bay Amphibious Landing Area or access road; two historic properties have been identified in the Waiapuaa Bay Amphibious Staging Area. While there is a proposed increase in small boat operations, potential ground disturbance would not impact Sites 50-30-05-4016 or 50-30-05-2272 because the sites would continue to be avoided per existing SOPs.

Table 3.6-7: Proposed Training and Testing Activities at Waiapuaa Bay

Proposed Activity	Activity Description	Potential for Impact	Avoidance and Protection Measures
Amphibious Raid	Company (unit-sized) forces move from amphibious ships at sea, conduct amphibious landing via various vessels/watercraft/vehicles, and conduct follow-on activities ashore. Return to amphibious ships at sea.	• Vehicles and personnel movement.	• All proposed activities at Waiapuaa Bay would be conducted on previously disturbed land or in the active coastal zone. • No historic properties have been identified in the amphibious landing area where the majority of proposed activities would take place. • Two historic properties (50-30-05-4016 and 50-30-05-2272), located in the back beach amphibious staging area, would be entirely avoided. • Vehicle movement on the beach during amphibious operations is in the active coastal zone, and mats are used in the area to prevent disturbance to potential resources in the sand. • Personnel use established pathways when carrying small boats and moving from the active coastal zone to the hinterland. • Pedestrian movements associated with follow-on activities do not include dune areas.
Amphibious Small Boat Operations	A Unit using small boats move from offshore location to a beach-landing site.	• Vehicles and personnel Movement.	• All proposed activities at Waiapuaa Bay would be conducted on previously

Proposed Activity	Activity Description	Potential for Impact	Avoidance and Protection Measures
	Forces manually carry boats to an inland site, conduct reconnaissance, and then return to the sea via small boats.		disturbed land or in the active coastal zone. • No historic properties have been identified in the amphibious landing area where the majority of proposed activities would take place. • Two historic properties (50-30-05-4016 and 50-30-05-2272), located in the back beach amphibious staging area, would be entirely avoided. • Vehicle movement on the beach during amphibious operations is in the active coastal zone, and mats are used in the area to prevent disturbance to potential resources in the sand. • Personnel use established pathways when carrying small boats and moving from the active coastal zone to the hinterland. • Pedestrian movements associated with follow-on activities do not include dune areas.
Amphibious Swimmer Insertion and Extraction	Swimmer Insertion/Extraction. Personnel conduct over-the-beach water entry swimmer insertion and extraction training in PMRF amphibious landing areas.	• Vehicles and personnel movement	• All proposed activities at Waiapuaa Bay would be conducted on previously disturbed land or in the active coastal zone. • No historic properties have been identified in the amphibious landing area where the majority of proposed activities would take place.

Proposed Activity	Activity Description	Potential for Impact	Avoidance and Protection Measures
			• Two historic properties (50-30-05-4016 and 50-30-05-2272), located in the back beach amphibious staging area, would be entirely avoided. • Personnel use established pathways when carrying small boats and moving from the active coastal zone to the hinterland. • Pedestrian movements associated with follow-on activities do not include dune areas.

Swimmer Insertion and Extraction currently occurs at Waiapuaa Bay in heavily disturbed areas. Under the Proposed Action, the tempo of swimmer insertion and extraction activities would increase to up to two annual activities at Waiapuaa Bay. The only type of potential ground disturbance associated with this activity is personnel movement over the beach (Table 3.6-7). Swimmer insertion and extraction activities would be restricted to utilizing the existing corridor, which supports installation infrastructure and maintenance operations. While there is a proposed increase in swimmer insertion and extraction activities, potential ground disturbance would not impact Sites 50-30-05-4016 or 50-30-05-2272 because the sites would continue to be avoided per existing SOPs.

In summary, all proposed activities at Waiapuaa Bay would be conducted on previously disturbed land. No historic properties have been identified in the Waiapuaa Bay Amphibious Landing Area where the majority of proposed activities would take place. Two historic properties (Sites 50-30-05-4016 and 50-30-05-2272), located in the Waiapuaa Bay Amphibious Staging Area, would be avoided. Access to identified cultural resources within PMRF Barking Sands would continue to be managed through written requests processed and approved by the PMRF Command. Although the increase in the tempo of activities associated with the Proposed Action could lessen schedule availability, PMRF installation personnel would continue to provide Native Hawaiians with access to the historic properties in accordance with the American Indian Religious Freedom Act and EO 13007, on a case-by-case basis.

MDA Hard Stand. MDA Hard Stand is in an area that has been previously disturbed by landscaping and development. Developed areas support radar testing. No historic properties have been identified within the training and testing site.

Proposed training and testing activities at MDA Hard Stand are listed in Table 3.6-8. In addition, the table presents activities with the potential for impacts via ground disturbance as well as existing avoidance and protection measures. Additional detail on proposed training and testing activities are provided in Appendix A (Military Readiness Activity Descriptions).

C5ISRT: Under the Proposed Action, the tempo of C5ISRT activities would increase to up to 10 annual activities at MDA Hard Stand. Types of potential ground disturbance associated with C5ISRT activities include setting tent stakes and grounding rods (Table 3.6-8).

Bivouacking: Under the Proposed Action, the tempo of bivouacking activities would increase to up to four annual activities under the Proposed Action. Types of potential ground disturbance associated with bivouacking activities include setting tent stakes and grounding rods (Table 3.6-8).

In summary, C5ISRT and Bivouacking at MDA Hard Stand would be conducted on previously disturbed or hardscaped land, and no cultural resources have been identified within the MDA Hard Stand training and testing site.

Table 3.6-8: Proposed Training and Testing Activities at MDA Hard Stand

Proposed Activity	Activity Description	Potential for Impact	Avoidance and Protection Measures
C5ISRT	Establish and operate a tactical field command post, communication systems, radar tracking and surveillance systems, optical tracking systems, and electronic warfare equipment. May use existing facilities or mobile, vehicle-based systems.	• Equipment stabilization using stakes measuring not more than 45 cm long (18 in) and 1.6 cm (5/8 in) in diameter. • Grounding rods (5/8 inch in diameter) associated with generators, sensors, and other equipment; ground disturbance could vary between 3 and 6 feet deep per rod.	• No historic properties have been identified in this training and testing site. All proposed activities would occur on previously disturbed ground (hardscape or graded).
Bivouacking	Establish and operate expeditionary field lodging for personnel conducting training.	• Placement of tent stakes (18-inch length, 5/8-inch diameter) for up to 20-person shelters. • Grounding rods (5/8 inch in diameter) associated with up to 2 generators; ground disturbance could vary between 3 and 6 feet deep per rod.	• No historic properties have been identified in this training and testing site. All proposed activities would occur on previously disturbed ground (hardscape or graded).

Airfield Bivouac Area. Airfield Bivouac Area is in an area that has been previously disturbed by landscaping and development. The site supports several logistics buildings. No historic properties have been identified within the training and testing site.

Proposed activities at the Airfield Bivouac Area are listed in Table 3.6-9. In addition, the table presents activities with the potential for impacts via ground disturbance as well as existing avoidance and protection measures. Additional detail on proposed training and testing activities are provided in Appendix A (Military Readiness Activity Descriptions).

Bivouacking: Under the Proposed Action, the tempo of bivouacking activities would increase to up to 26 annual activities at Airfield Bivouac Area. Types of potential ground disturbance associated with bivouacking activities include setting tent stakes and grounding rods (Table 3.6-9).

In summary, bivouacking activities at Airfield Bivouac Area would continue to be conducted on previously disturbed or hardscaped land, and no cultural resources have been recorded within the training and testing site.

Table 3.6-9: Proposed Training and Testing Activities at Airfield Bivouac Area

Proposed Activity	Activity Description	Potential for Impact	Avoidance and Protective Measures
Bivouacking	Establish and operate expeditionary field lodging for personnel conducting training.	• Placement of tent stakes (18-inch length, 5/8-inch diameter) for up to 20-person shelters. • Grounding rods (5/8 inch in diameter) associated with up to 2 generators; ground disturbance could vary between 3 and 6 feet deep per rod.	• No historic properties have been identified in this training and testing site. All proposed activities would occur on previously disturbed ground (hardscape or graded).

Alternate Bivouac Area. The Alternate Bivouac Area is an area that has been previously disturbed by grading. No historic properties have been identified within the training and test site.

Proposed activities at the Alternate Bivouac Area are listed in Table 3.6-10. In addition, the table presents activities with the potential for impacts via ground disturbance as well as existing avoidance and protection measures. Additional detail on proposed training and testing activities are provided in Appendix A (Military Readiness Activity Descriptions).

Parachute Operations: Under the Proposed Action, the tempo of parachute operations would increase to up to 16 annual activities at Alternate Bivouac Area. No potential ground disturbance is associated with this activity (Table 3.6-10). Parachute operations at ARDEL CDZ are only conducted on previously disturbed, hard surface areas and would continue to be conducted within the CDZ in a manner that does not result in ground disturbance.

Bivouacking: Under the Proposed Action, the tempo of bivouacking activities would increase to up to 2 annual activities at Alternate Bivouac Area. Types of potential ground disturbance associated with bivouacking activities include setting tent stakes and grounding rods (Table 3.6-10).

In summary, parachute operations and bivouacking activities at Alternate Bivouac Area would only be conducted on previously disturbed or hardscaped land. No cultural resources have been recorded within the training and testing site.

Table 3.6-10: Proposed Training and Testing Activities at the Alternate Bivouac Area

Proposed Activity	Activity Description	Associated Ground Disturbance	Existing Minimization/SOPs from ICRMP
Parachute Operations	Conduct parachute operations (terrestrial landings).	• No ground disturbance is associated with pedestrian or equipment contact.	No historic properties have been identified in this training and testing site. All proposed activities would occur on previously disturbed ground (hardscape or graded).
Bivouacking	Establish and operate expeditionary field lodging for personnel conducting training.	• Placement of tent stakes (18-inch length, 5/8-inch diameter) for up to 20-person shelters. • Grounding rods (5/8 inch in diameter) associated with up to 2 generators; ground disturbance could vary between 3 and 6 feet deep per rod.	No historic properties have been identified in this training and testing site. All proposed activities would occur on previously disturbed ground (hardscape or graded).

FARP Areas. FARP Areas are located on the PMRF airfield and are previously disturbed from the development and operation of the airfield. No historic properties have been identified within the training and testing site.

Proposed activities that would occur at FARP Areas are listed in Table 3.6-11. In addition, the table presents activities with the potential for impacts via ground disturbance as well as existing avoidance and protection measures. Additional detail on proposed training and testing activities are provided in Appendix A (Military Readiness Activity Descriptions).

FARP Operations: Under the Proposed Action, the tempo of FARP operations would increase to up to 20 annual activities within FARP Areas. The only type of potential ground disturbance associated with FARP operations is setting grounding rods (Table 3.6-11).

In summary, FARP operations at the FARP Areas would be conducted on previously disturbed or hardscaped land on or adjacent to the PMRF airfield. No cultural resources have been identified within the training and testing site.

Table 3.6-11: Proposed Training and Testing Activities at the FARP Areas

Proposed Activity	Activity Description	Potential for Impact	Avoidance and Protective Measures
Forward Arming and Refueling Point (FARP) Operations	Establish, operate, and re-deploy a FARP site using the Tactical Airfield Fuel Dispensing Systems, Helicopter Expedient Refueling System, or	Existing grounding points are present throughout the airfield to ensure electrical continuity and reduce fire risk. Should a new placement or replacement of a grounding point be	No historic properties have been identified in this training and testing site. All proposed activities would occur on previously disturbed ground (hardscape or graded).

Proposed Activity	Activity Description	Potential for Impact	Avoidance and Protective Measures
	similar type expeditionary aircraft refueling system.	necessary, grounding rods (5/8 inch in diameter) associated with up to one generator would need to be placed; ground disturbance could vary between 3 and 6 feet deep per rod.	

Unmanned Aircraft System (UAS) Launch Area. The UAS Launch Area is an area that has been previously disturbed from the development and operation of the PMRF airfield. No historic properties have been identified within the training and testing site.

Proposed activities at UAS Launch are listed in Table 3.6-12 and summarized below. In addition, the table presents activities with the potential for impacts via ground disturbance as well as existing avoidance and protection measures. Additional detail on proposed training and testing activities are provided in Appendix A (Military Readiness Activity Descriptions).

Small Unmanned Aircraft Systems (sUAS) and Counter-UAS Operations: Under the Proposed Action, the tempo of sUAS and UAS operations would increase to up to 45 annual activities at the UAS Launch Area. Types of potential ground disturbance associated with sUAS and UAS launch operations include setting tent stakes and grounding rods (Table 3.6-12).

sUAS and UAS operations activities at the UAS Launch Area would be conducted on previously disturbed or hardscaped land on or adjacent to the PMRF airfield. No historic properties have been identified within the UAS Launch Area.

Table 3.6-12: Proposed Training and Testing Activities at the UAS Launch Area

Proposed Activity	Activity Description	Potential for Impact	Avoidance and Protective Measures
Small Unmanned Aircraft Systems (sUAS) and Counter-Unmanned Aircraft Systems (UAS) Operations	• Conduct sUAS operations. Launch and control sUAS. • Conduct counter-UAS operations. Launch and control a counter-UAS system from a terrestrial location.	• Existing grounding points are present throughout the airfield to ensure electrical continuity and reduce fire risk. Should a new placement or replacement of a grounding point be necessary, grounding rods (5/8 inch in diameter) associated with up to one generator would need to be placed; ground disturbance could vary between 3 and 6 feet deep per rod. • Placement of tent stakes (18-inch length, 5/8-inch diameter) associated with the catch net system.	No historic properties have been identified in these areas. All proposed activities would occur on previously disturbed ground (hardscape or graded).

Ground Maneuver Area. The Ground Maneuver Area is previously disturbed from hardscaping and ongoing use in support of the installation; the site consists of improved roads, surfaces, or pathways throughout the PMRF Barking Sands. No historic properties have been identified within the training and testing site. Proposed activities within the Ground Maneuver Area are listed in Table 3.6-13. In addition, the table presents activities with the potential for impacts via ground disturbance as well as existing avoidance and protection measures. Additional detail on proposed training and testing activities are provided in Appendix A (Military Readiness Activity Descriptions).

Ground Maneuver Activities: Under the Proposed Action, the tempo of ground maneuver activities would increase to up to 22 annual activities in the Ground Maneuver Area. No ground-disturbing activities would occur for this activity (Table 3.6-13).

Ground maneuver activities within the Ground Maneuver Areas would be conducted on previously disturbed areas. No historic properties have been identified within the Ground Maneuver Area.

Table 3.6-13: Proposed Training and Testing Activities at the Ground Maneuver Area

Proposed Activity	Activity Description	Potential for Impact	Avoidance and Protection Measures
Ground Maneuver	Units conduct terrestrial movement to land objectives.	No ground disturbance is associated with this activity; activity would only occur on hardscape and improved areas.	No historic properties have been identified in these areas. All proposed activities would occur on previously disturbed ground (hardscape or graded).

3.6.5.2.2 Kaula Island

Parts of Kaula Island are previously disturbed from ongoing military training operations. No historic properties have been identified within the training and testing site. Proposed activities at Kaula Island are listed in Table 3.6-14. In addition, the table presents activities with the potential for impacts via ground disturbance as well as existing avoidance and protection measures. Additional detail on proposed training and testing activities are provided in Appendix A (Military Readiness Activity Descriptions).

Air-to-Ground GUNEX: Under the Proposed Action, the tempo of GUNEX activities would increase to up to 24 annual activities at Kaula Island. Potential ground disturbance associated with GUNEX activities are projectile impacts (Table 3.6-14). GUNEX activities would continue to only occur in the heavily disturbed ordnance impact area on the southern 1,000 feet tip of the island, where no historic properties have been identified (see Figure 2.1-13).

Air-to-Ground BOMBEX: Under the Proposed Action, the tempo of BOMBEX activities using inert (non-explosive) munitions would increase to up to 31 annual activities at Kaula Island. The only type of potential ground disturbance associated with BOMBEX activities are bomb impacts (Table 3.6-14). BOMBEX activities and associated bomb impacts would continue to only occur in the heavily disturbed ordnance impact area on the southern 1,000 feet tip of the island, where no historic properties have been identified (see Figure 2.1-13).

In summary, GUNEX and BOMBEX activities at Kaula Island would only occur on previously disturbed ground. No cultural resources have been identified within the Kaula Island training and testing impact area, and these activities would continue to only occur in the heavily disturbed ordnance impact area.

Table 3.6-14: Proposed Training and Testing Activities at Kaula Island

Proposed Activity	Activity Description	Potential for Impact	Avoidance and Protection Measures
Air-to-Ground Gunnery Exercise (GUNEX)	GUNEX involves strike fighter aircraft and helicopter crews employing guns to attack ground targets, day or night, with the goal of destroying or disabling enemy vehicles, structures, or personnel. Inert ordnance only. GUNEX may include the use of targeting laser.	Ground disturbance results from projectile penetration.	No historic properties have been identified in the impact areas. All proposed activities would occur on previously disturbed ground.
Air-to-Ground Bombing Exercise (BOMBEX)	BOMBEX involves training of strike fighter aircraft delivery of inert ordnance only against land targets in day or night conditions and may include the use of targeting laser.	Ground disturbance results from pressure-driven ground stress as bombs used during training and testing in this location are non-explosive (inert) material.	No historic properties have been identified in these areas. All proposed activities would occur on previously disturbed ground.

3.6.5.2.3 Conclusion

Under the Proposed Action, all activities would be conducted in installation-designated areas that have been previously disturbed from ongoing military use, development, or element exposure. Proposed activities would continue to be conducted in a manner that avoids historic properties. In the unlikely event cultural materials are discovered during training and testing activities, all activities in the immediate vicinity would be halted and the PMRF Cultural Resources Manager and Range Point of Contact (POC) would be contacted to implement appropriate notification and SOPs.

Cultural Resources compliance at Barking Sands shall be in accordance with Navy agreements (U.S. Department of the Navy, 1999a, 2011, 2012c), and all applicable ICRMP SOPs, and BMPs (Tables 3.6-2 through 3.6-14). Avoidance and/or minimization measures in established SOPs and BMPs would continue to be implemented to ensure that there would be no adverse effect on historic properties. All training and testing activities that occur at PMRF are reviewed in advance by a qualified subject matter expert to confirm the effectiveness of measures to avoid harm to historic properties and comply with terms of the Navy's PA. Therefore, impacts on cultural resources would be less than significant.

4 Cumulative Impacts

This chapter (1) defines cumulative impacts; (2) describes past, present, and reasonably foreseeable actions relevant to cumulative impacts; (3) and analyzes the cumulative impacts potentially resulting from the incremental interaction of the Proposed Action with the other actions.

4.1 Definition of Cumulative Impacts

The approach taken in the cumulative impacts analyses follows the objectives of NEPA, CEQ regulations, and CEQ guidance. Cumulative effects are defined in 40 CFR section 1508.1(i)(i)(3) as "effects on the environment that results from the incremental effects of the action when added to the other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative effects can result from actions with individually minor but collectively significant effects taking place over a period of time."

To determine the scope of environmental impact analyses, agencies shall consider cumulative actions which, when viewed with other proposed actions, have cumulatively significant impacts and should therefore be discussed in the same impact analysis document.

In addition, CEQ and USEPA have published guidance addressing implementation of cumulative impact analyses—*Guidance on the Consideration of Past Actions in Cumulative Effects Analysis* (Council on Environmental Quality, 2005) and *Consideration of Cumulative Impacts in Environmental Protection Agency Review of NEPA Documents* (U.S. Environmental Protection Agency, 1999). CEQ guidance entitled *Considering Cumulative Impacts Under NEPA* (Council on Environmental Quality, 1997) states that cumulative impact analyses should:

> "…determine the magnitude and significance of the environmental consequences of the proposed action in the context of the cumulative impacts of other past, present, and future actions...identify significant cumulative impacts…[and]…focus on truly meaningful impacts."

Cumulative impacts are most likely to arise when a relationship or synergism exists between a proposed action and other actions expected to occur in a similar location or during a similar time period. Actions overlapping with or in proximity to a proposed action would be expected to have greater potential for a relationship than those more geographically separated. Similarly, relatively concurrent actions would tend to offer a higher potential for cumulative impacts. To identify cumulative impacts, the analysis needs to address the following three fundamental questions.

- Does a relationship exist such that affected resource areas of the proposed action might interact with the affected resource areas of past, present, or reasonably foreseeable actions?
- If one or more of the affected resource areas of the proposed action and another action could be expected to interact, would the proposed action affect or be affected by impacts of the other action?
- If such a relationship exists, does an assessment reveal any potentially significant impacts not identified when the proposed action is considered alone?

4.2 Scope of Cumulative Impacts

The scope of the cumulative impacts analysis involves both the geographic extent of the effects and the time frame in which the effects could be expected to occur. For purposes of this analysis, past and reasonably foreseeable projects are those within five years of the preparation of this EA (i.e., the time

period 2019 through 2029). The geographic extent for the cumulative impacts analysis includes PMRF, while also generally factoring in relevant impacts in surrounding land areas and airspace outward from the boundaries of PMRF. The area of analysis may vary per resource and is determined for each resource section analyzed for cumulative impacts in Section 4.4 (Cumulative Impact Analysis).

Beyond determining that the geographic scope and time frame for the actions interrelate to the Proposed Action, the analysis employs the measure of "reasonably foreseeable" to include or exclude other actions. For the purposes of this analysis, public documents prepared by federal, state, and local government agencies form the primary sources of information regarding reasonably foreseeable actions. Documents used to identify other actions include notices of intent for EISs and EAs, management plans, land use plans, and other planning-related studies.

4.3 Past, Present, and Reasonably Foreseeable Actions

Table 4.3-1 summarizes past, present, and reasonably foreseeable actions while identifying potentially impacted resources relevant to the Proposed Action.

Table 4.3-1: Cumulative Action Evaluation

#	Project	Project Description	Project Timeframe		
			Past	Present	Future
1	Photovoltaic and Battery Energy Storage Systems	Renewable energy project consisting of combined utility-scale photovoltaic array on 87 acres and 94 acres, and overhead or underground electrical transmission lines. The project improved power quality and energy resiliency in support of PMRF. The solar array system can generate up to 44 megawatts of direct current electrical power and feeds electricity into the Kauai Island Utility Cooperative electrical grid for public and military users. The environmental impacts are primarily associated with terrestrial resources.	X		
2	Long-Range Strike Weapons Systems Evaluation Program	The long-range evaluation tests include live and inert weapons systems deployed from aircraft for detonation in the air and at and below the water surface (U.S. Department of the Air Force, 2016). These tests occurred 44 miles offshore of Kauai in the Barking Sands Underwater Range Extension. Missions were proposed to occur once a year between 2017 and 2022. Detonation produced underwater noise and explosions.	X		
3	Kawaiele Pump Operation and Maintenance	To ensure PMRF was able to safely conduct its missions with compatible neighbors, the Navy permanently preserved the land adjacent to PMRF for agricultural purposes. The Navy lease of this land includes the Kawaiele and Nohili pump stations and associated ditches. The Navy contracted Agribusiness Development Corporation to operate and maintain these stations.	X		
4	Hawaii-Southern California Training and Testing (HSTT) EIS/OEIS	Sea-based training covered under the HSTT EIS/OEIS does not include land-based components. In the EIS/OEIS, the Navy assessed military readiness activities that could potentially impact human and natural resources,	X	X	X

#	Project	Project Description	Project Timeframe		
			Past	Present	Future
	2018	especially marine mammals, sea turtles, and other marine resources. Consultations were conducted under the ESA and MMPA. Proposed military readiness activities included the use of active sonar and explosives within the HSTT Study Area. These military readiness activities are generally consistent with and representative of training and testing that the Navy has been conducting in the HSTT Study Area for decades (U.S. Department of the Navy, 2018a).			
5	Hawaii-California Training and Testing (HCTT) EIS/OEIS 2025	At-sea military readiness activities to be analyzed in this EIS/OEIS were previously covered in the 2018 HSTT EIS/OEIS and the 2022 Point Mugu Sea Range EIS/OEIS. Proposed military readiness activities include training and research, development, test, and evaluation activities that are generally consistent with and representative of activities the Navy has been conducting in the Study Area for decades. Proposed military readiness activities include the use of active sonar and explosives within the Study Area.			X
6	Naval Special Operations (NSO) Training in the State of Hawaii	The Proposed Action includes historical and proposed water and land-based training activities for Special Operations forces. Training activities would occur in areas on Kauai, Oahu, Maui, Lanai, and Molokai.		X	
7	PMRF and KPGO Real Estate EIS	The Navy and NASA are jointly preparing an EIS to evaluate the potential impacts of real estate agreements with the State of Hawaii Department of Land and Natural Resources for state lands at PMRF and KPGO.			X
8	Coastal Land Development and Tourism	Coastal land development adjacent to the Study Area would include the buildup of homes, businesses, recreation, vacation, and port facilities and marinas on Kauai. Foreseeable coastal tourism development includes (hotels, resorts, restaurants, food industry, and vacation homes), its supporting infrastructure (retail businesses, marinas, fishing tackle stores, dive shops, fishing piers, recreational boating harbors, beaches), and tourism-related activities (recreational fishing, whale watching). Coastal development intensifies the use of coastal resources through dune and nearshore habitat loss and disturbance, point and nonpoint source water pollution, entrainment in outflows, and air quality degradation.	X	X	X

Notes: DoD = Department of Defense, EIS = Environmental Impact Statement, OEIS = Overseas Environmental Impact Statement, ESA = Endangered Species Act, KPGO = Kokee Park Geophysical Observatory, MMPA = Marine Mammal Protection Act, NASA = National Aeronautics and Space Administration, PMRF = Pacific Missile Range Facility

4.4 Cumulative Impact Analysis

Cumulative impacts were assessed using quantifiable data where feasible; however, for many of the resources included for analysis, quantifiable data is not available and a qualitative analysis was undertaken. In addition, where the analysis of potential environmental impacts of future actions has not yet been completed, assumptions regarding cumulative impacts related to this EA were made where possible. The analytical methodology presented in Chapter 3 (Affected Environment and Environmental Consequences), which was used to determine potential impacts on the various resources analyzed in this document, was also considered to determine cumulative impacts.

4.4.1 Air Quality

4.4.1.1 Description of Geographic Area of Analysis

The area of analysis for cumulative impacts related to air quality are areas downwind of proposed training and testing activities over land or within 3 nautical miles from the Kauai coastline, which are in attainment for all criteria pollutants.

4.4.1.2 Past, Present, and Reasonably Foreseeable Future Actions

Past, present, and reasonably foreseeable future actions that may contribute to cumulative impacts on air quality within the area of analysis include project numbers 1, 2, 3, 4, 5, 6, 8, and 9 listed in Table 4.3-1.

4.4.1.3 Cumulative Impacts Analysis

Criteria pollutants and HAP emissions would be generated during launch activities and while using systems, vehicles, generators, and other necessary equipment during training and testing activities. There would be no permanent or continuously emitting sources of criteria pollutant emissions associated with the Proposed Action. Proposed activities are consistent with the type of training and testing events that have historically occurred at PMRF and have been analyzed in previous documentation (see Table 1.6-1). Although the continuation of these activities would occur at increased numbers depending on activity, there would not be a substantial increase in the emission of air pollutants.

Emission sources associated with the Naval Special Operations (NSO) Training action include the use of aircraft, watercraft, and ground transportation. Criteria pollutants and HAP emissions from this action are distributed and dispersed across the state of Hawaii; therefore, pollutants are not accumulated over localized areas. The 2018 HSTT EIS/OEIS analysis indicated no measurable impact on air quality in land areas because most training and testing activities are conducted 3 NM and beyond from shore. Although there would be increased emissions associated with the implementation of 2025 Hawaii-California Training and Testing EIS/OEIS, proposed training and testing activities would not be expected to have a measurable impact on air quality due to distance of activities from shore and the pollutant dispersion resulting from regional meteorological conditions. Construction activities associated with actions listed in Section 4.4.1.2 (Past, Present, and Reasonably Foreseeable Future Actions) may increase criteria air pollutants in the area of analysis; however, emissions would likely be intermittent and short term, lasting only until construction is complete. Increases in criteria pollutants and HAPs associated with the other actions listed above were determined to have less than significant impacts on air quality within the area of analysis. As a result, the incremental additive impacts from the Proposed Action's combined criteria pollutant emissions occurring in the atmosphere would be minor, localized, intermittent, and unlikely to contribute to future degradation of the atmosphere in a way that would harm ecosystems or

communities. Thus, based on the analysis presented in Section 3.1 (Air Quality) and the limited quantities of expected emissions from the Proposed Action, it is anticipated that the incremental contribution of criteria air pollutant emissions added to the impacts of all other past, present, and reasonably foreseeable actions would not result in significant impacts on air quality within the area of analysis.

4.4.2 Climate Change and Greenhouse Gases

4.4.2.1 Description of Geographic Area of Analysis

The area of analysis for cumulative impacts related to climate change and greenhouse gases is the global atmosphere.

4.4.2.2 Past, Present, and Reasonably Foreseeable Future Actions

Past, present, and reasonably foreseeable future actions that may contribute to cumulative impacts on climate change and greenhouse gases within the area of analysis include project numbers 1, 2, 3, 4, 5, 6, 8, and 9 listed in Table 4.3-1.

4.4.2.3 Cumulative Impacts Analysis

Greenhouse gases would be generated during launch activities and while using vehicles, generators, and other necessary equipment during training and testing activities. There would be no stationary or long-term sources of greenhouse gas emissions associated with the Proposed Action. Proposed activities are consistent with the type of training and testing events that have historically occurred at PMRF and have been analyzed in previous documentation (see Table 1.6-1). Although the continuation of these activities would occur at increased numbers depending on activity, a significant increase in greenhouse gas emissions is not expected. Additionally, greenhouse gas emissions that have been released or are expected to be released from actions listed in Section 4.4.2.2 (Past, Present, and Reasonably Foreseeable Future Actions) are not likely to contribute to climate change to any discernable extent.

GHG emissions were estimated for the proposed increase in the tempo or number of events. The Proposed Action would increase GHG emissions by 7,602 MT of CO2e per year as compared to the No Action Alternative. The increase in GHG emissions is conservatively estimated assuming all activities would occur within the same year at their highest average tempo and maximum number of personnel. This increase in GHG emissions from implementing the Proposed Action would be relatively minor, and is not expected to incrementally contribute to climate change and future degradation of the atmosphere. Thus, it is anticipated that the incremental contribution of increase in greenhouse gas emissions added to the impacts of all other past, present, and reasonably foreseeable actions would not result in significant climate impacts within the area of analysis.

4.4.3 Noise

4.4.3.1 Description of Geographic Area of Analysis

The area of analysis for cumulative impacts related to noise is PMRF and off-installation areas that are exposed to noise resulting from the Proposed Action.

4.4.3.2 Past, Present, and Reasonably Foreseeable Future Actions

Past, present, and reasonably foreseeable future actions that may contribute to cumulative impacts on noise within the area of analysis include project numbers 4, 5, 6, and 8 listed in Table 4.3-1.

4.4.3.3 Cumulative Impacts Analysis

The primary sources of noise include airfield and range operations, and missile, rocket, and drone launches, as defined in Section 3.3 (Noise). Although there would be increases in the annual number of activities associated with the Proposed Action, noise resulting from the type of training and testing activities are consistent with activities that have historically occurred at PMRF and have been analyzed in previous documentation (see Table 1.6-1). Noise from airfield operations is considered to be continuous; however, airfield noise zones and SOPs have been established to safeguard the public and PMRF personnel from significant noise impacts. The 2020 AICUZ Study analyzed future airfield operations at PMRF and associated noise generated. The study found that, since the 1979 AICUZ, noise contours represent a smaller extent, largely due to modernization/changes in types aircraft (Naval Facilities Engineering Command Southwest, 2020). As such, noise generated by the Proposed Action would not produce significant noise levels and would be intermittent and short term, with a large spatial distribution dependent on the time and location of proposed training and testing activities.

The closest off-base residential area to Barking Sands is Kekaha, with the nearest point being approximately 2 mi. from the south launch sites. Proposed activities, except for launch activities, would not be audible in this residential area. Although noise from launches is considered high intensity and intrusive, it is of short duration and would not have a significant impact on the overall noise levels in the residential area of Kekaha. Additionally, areas at Barking Sands accessible to the public and in proximity to launch areas would be closed during a launch activity to protect the public from exposure to increased noise levels.

Construction activities associated with projects listed in Section 4.4.3.2 (Past, Present, and Reasonably Foreseeable Future Actions) would add noise to the environment on a short-term, intermittent basis lasting for the duration of construction. Additionally, training activities associated with projects listed in Section 4.4.3.2 (Past, Present, and Reasonably Foreseeable Future Actions) would contribute to the noise environment; however, noise would likely be short term and intermittent, lasting for the duration of the training event. Therefore, cumulative impacts of past, present, and other reasonably foreseeable actions combined with the Proposed Action could impact the acoustic environment in the area of analysis; however, increases in noise levels would be short term and not expected to exceed applicable standards. Additionally, the implementation of SOPs associated with the projects listed above would reduce the likelihood of significant impacts on the acoustic environment. As a result, the Proposed Action is not anticipated to significantly contribute to cumulative impacts of noise within the area of analysis.

4.4.4 Public Health and Safety

4.4.4.1 Description of Geographic Area of Analysis

The area of analysis for cumulative impacts related to public health and safety is the island of Kauai, including local communities.

4.4.4.2 Past, Present, and Reasonably Foreseeable Future Actions

Past, present, and reasonably foreseeable future actions that may contribute to cumulative impacts on public health and safety within the area of analysis include project numbers 4, 5, 6, 7, 8, and 9 listed in Table 4.3-1.

4.4.4.3 Cumulative Impacts Analysis

Activities analyzed in this EA are consistent with the type of training and testing events that have historically occurred at PMRF and have been analyzed in previous documentation (see Table 1.6-1). Although the continuation of these activities would occur at increased numbers depending on activity, there would not be a significant increase in health and safety risks to military and civilian personnel at PMRF or the public. All land-based training and operations, and routine base operations and maintenance associated with the Proposed Action and actions listed in Section 4.4.4.2 (Past, Present, and Reasonably Foreseeable Future Actions) occurring at PMRF would continue to be conducted in accordance with established military training and operating procedures and approved SOPs as described in Section 3.4 (Public Health and Safety). Industry SOPs and other procedures would likely be implemented to minimize health and safety risks in accordance with Occupational Safety and Health Administration regulations for actions listed in Section 4.4.4.2 (Past, Present, and Reasonably Foreseeable Future Actions) associated with construction. Therefore, implementation of the Proposed Action, combined with the past, present, and reasonably foreseeable projects, would not result in significant cumulative impacts on public health and safety within the area of analysis.

4.4.5 Terrestrial Biological Resources

4.4.5.1 Description of Geographic Study Area

The area of analysis for cumulative impacts related to terrestrial biological resources is defined as land areas under the authority of PMRF.

4.4.5.2 Past, Present, and Reasonably Foreseeable Future Actions

Past, present, and reasonably foreseeable future actions that may contribute to cumulative impacts on terrestrial biological resources within the area of analysis include project numbers 1 and 6 listed in Table 4.3-1.

4.4.5.3 Cumulative Impacts Analysis

Ongoing military readiness activities as listed in Table 2.1-1 at PMRF have already been consulted on and continue to operate in accordance with SOPs and mitigation developed in accordance with these consultations. A summary of previous consultations is included in Table 1.6-1 (Documents Incorporated by Reference). Proposed activities analyzed in this EA are consistent with the type of training and testing events that have historically occurred at PMRF. Although the continuation of these activities would occur at increased numbers depending on activity, there would not be a significant increase in impacts on terrestrial biological resources. As discussed in Section 3.5 (Terrestrial Biological Resources), damage to vegetation as a result of the Proposed Action would likely not occur since movement is limited to paved or existing routes, and all personnel would be instructed on SOPs for avoidance of vegetation. Although wildfires have the potential to change the ecology of areas within and outside of PMRF, brushfires occurring from gunnery and inert ordnance practices are unlikely to occur and SOPs have been established to minimize impacts. Additionally, there would be no construction on undeveloped lands or ground-disturbing activities impacting vegetation in any undisturbed areas, and therefore the Proposed Action would not contribute to cumulative impacts on vegetation and habitat loss.

Noise, physical disturbances, electromagnetic radiation, and lighting associated with the Proposed Action have the potential to impact wildlife, including ESA-listed species, in the Study Area. Physical disturbances and noise from the movement of personnel, vehicles, helicopters, launches, and landing craft during training and testing activities may temporarily displace species in the area; however, all

proposed events are short in duration, are temporary, and occur within established sites. Additionally, SOPs would be implemented to preclude electromagnetic radiation impacts on terrestrial biological resources in the Study Area. The use of lighting at night would also be required to comply with the Dark Skies policy implemented at PMRF to minimize potential impacts. Furthermore, additional SOPs would be implemented to minimize impacts on wildlife in the Study Area and are presented in Section 3.5 (Terrestrial Biological Resources).

Projects listed in Section 4.4.5.2 (Past, Present, and Reasonably Foreseeable Future Actions) that are associated with construction (e.g., Photovoltaic and Battery Energy Storage Systems) may contribute to habitat degradation and disturbances to terrestrial biological resources.

Activities associated with the NSO Training action introduce similar potential impacts analyzed in this EA (e.g., physical presence, physical disturbance and strike, and acoustic stressors); however, impacts on terrestrial biological resources were considered minor and temporary, without long-term consequences for terrestrial wildlife resources. The cumulative impacts of past, present, and other reasonably foreseeable actions combined with the Proposed Action could have short-term impacts on wildlife in the Study Area; however, impacts on the overall distribution or abundance of populations and habitats, and ecosystem functions and values would be minimized through the implementation of SOPs. Additionally, the implementation of SOPs would also reduce the likelihood of significant or long-term impacts on wildlife and vegetation. As a result, the implementation of the Proposed Action combined with the past, present, and reasonably foreseeable actions would not result in significant cumulative impacts on terrestrial biological resources within the area of analysis.

4.4.6 Cultural Resources

4.4.6.1 Description of Geographic Area of Analysis

The area of analysis for cumulative impacts related to cultural resources is defined as land areas under the authority of PMRF.

4.4.6.2 Past, Present, and Reasonably Foreseeable Future Actions

Past, present, and reasonably foreseeable future actions that may contribute to cumulative impacts on cultural resources within the area of analysis include project number 6 listed in Table 4.3-1.

4.4.6.3 Cumulative Impacts Analysis

Proposed training and testing activities would follow appropriate protocols established under existing approved SOPs and protective measures in place to avoid and minimize the potential to impact archaeological resources at Barking Sands, as discussed in Section 4.4.6 (Cultural Resources). Additionally, proposed activities associated with the NSO Training action would also be expected to follow the appropriate protocols established under existing approved SOPs and the protective measures that are in place to avoid and minimize the potential for impact on cultural resources.

The Proposed Action does not include construction on undeveloped lands or ground-disturbing activities in any undisturbed areas. Impacts from ground disturbances in disturbed areas would be minimized through SOPs and protective measures described in Section 4.4.6 (Cultural Resources). Other future actions that have the potential to impact cultural resources would require separate review under NEPA and NHPA to resolve any effects to cultural resources and historic properties.

Access to identified cultural resources within Barking Sands would continue to be managed through written requests processed and approved by the PMRF Cultural Resources Manager. Although the increase in the tempo of activities associated with the Proposed Action could the lessen schedule availability, the Action Proponent would continue to provide Native Hawaiians with access to traditional

religious and cultural properties, in accordance with the American Indian Religious Freedom Act and EO 13007, *Indian Sacred Sites*, on a case-by-case basis.

As a result, impacts on cultural resources due to project-related training and testing activities would be considered minimal. Therefore, the implementation of the Proposed Action combined with the past, present, and reasonably foreseeable actions, would not result in significant cumulative impacts on cultural resources within the area of analysis.

5 Other Considerations Required by NEPA

5.1 Consistency with Other Federal, State, and Local Laws, Plans, Policies, and Regulations

In accordance with 40 CFR section 1502.16(a), analysis of environmental consequences must include discussion of possible conflicts between the Proposed Action and the objectives of federal, regional, state, and local land use plans, policies, and controls. Based on the evaluation with respect to consistency and statutory obligations, the Proposed Action does not conflict with the objectives or requirements of federal, state, regional, or local plans, policies, or legal requirements. Table 5.1-1 summarizes environmental compliance requirements considered while preparing this EA.

Table 5.1-1: Summary of Environmental Compliance for the Proposed Action

Plans, Policies, and Controls	Status of Compliance
Clean Air Act 42 U.S.C. sections 7401 et seq.) CAA General Conformity Rule (40 CFR part 93[B]) SIP	Criteria pollutant emissions associated with the Proposed Action would not be generated in significant enough quantities to affect the attainment status of the region and would be sufficiently dispersed to not appreciably impact local air quality (see Section 3.1, Air Quality).
Clean Water Act (CWA) (33 U.S.C. 1251 et seq.)	The Proposed Action does not require a permit pursuant to sections 401, 402, or 404 of CWA, as the Proposed Action does not include any activities that would impact water resources.
Coastal Zone Management Act (CZMA) (16 U.S.C. sections 1451–1468)	The Proposed Action would comply with the coastal zone federal consistency process in relation to the Hawaii State Coastal Zone Management Plan for which coastal uses or resources may be affected by the Proposed Action (Section 5.1.1, Coastal Zone Management Act Compliance). The Navy is submitting notification to the Hawaii Office of Planning and Sustainable Development of use of the list of Navy de minimis activities for these training and testing activities.
NEPA of 1969 (42 U.S.C. sections 4321, et seq.); Council on Environmental Quality Regulations for Implementing the Procedural Provisions of NEPA (40 CFR parts 1500–1508); Navy regulations for Implementing NEPA (32 CFR 775)	This EA has been prepared in accordance with NEPA, CEQ regulations implementing NEPA, and Navy NEPA requirements.
Endangered Species Act (ESA) (16 U.S.C. sections 1531 et seq.)	The analysis documented in Terrestrial Biological Resources (see Section 3.5, Terrestrial Biological Resources) indicates that the Proposed Action may affect but is not likely to adversely affect terrestrial ESA listed species. Informal consultation under Section 7 of the ESA is in progress with USFWS. The outcome of the informal consultation will be summarized in the Final EA.
National Historic Preservation Act (36 CFR part 800)	The Navy is fulfilling Section 106 requirements in accordance with the 2012 Programmatic Agreement.

Plans, Policies, and Controls	Status of Compliance
Native American Graves Protection and Repatriation Act (NAGPRA) (25 U.S.C. 3001 et seq.)	In the event human remains, funerary objects, sacred objects, or objects of cultural patrimony are discovered, the Navy would consult with Native Hawaiian Organizations in accordance with the existing NAGPRA Comprehensive Agreement.
Migratory Bird Treaty Act (MTBA) (16 U.S.C. sections 703-712)	Implementation of the Proposed Action is not anticipated to result in significant adverse effects on migratory bird populations and would be in compliance with MBTA regulations (see Section 3.5, Terrestrial Biological Resources).
Marine Mammal Protection Act (MMPA) (16 U.S.C. 1361 et seq.)	Any in-water effects associated with the Proposed Action are analyzed and documented in the 2018 Final HSTT EIS/OEIS and authorized in the 2018 MMPA Letter of Authorization.
EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (58 FR 7269 [February 16, 1994])	The Proposed Action would not result in any disproportionately high and adverse human health or environmental effects on minority or low-income populations and is not analyzed further in this EA (see Chapter 3, Affected Environment and Environmental Consequences).
EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks* (62 FR 19885 [April 23, 1997])	The Proposed Action would not result in environmental health and safety risks that may disproportionately affect children.
EO 12088, *Federal Compliance with Pollution Control Standards*	All necessary actions would be taken for the prevention, control, and abatement of environmental pollution related to the Proposed Action.
EO 13007, *Accommodation of Sacred Sites*	All necessary actions would be taken to avoid impacting the physical integrity of sacred sites in the Study Area, as well as accommodate the use of sacred sites for native populations.
EO 13990, *Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis*	The Proposed Action is consistent with this Executive Order's goals to empower workers and communities, promote and protect public health and the environment, and conserve national treasures and monuments.
EO 14008, *Tackling the Climate Change Crisis at Home and Abroad*	The Proposed Action is consistent with this Executive Order's goal for taking a government-wide approach to tackling the climate crisis.
EO 14096, *Revitalizing Our Nation's Commitment to Environmental Justice for All*	The Proposed Action would not result in any disproportionately high and adverse human health or environmental effects on minority or low-income populations (see Chapter 3, Affected Environment and Environmental Consequences).
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 U.S.C. section 9601 et seq.)	There are no CERCLA-designated sites identified within the Study Area. Therefore, the Proposed Action is in compliance with this regulation.

Plans, Policies, and Controls	Status of Compliance
Emergency Planning and Community Right-to-Know Act (42 U.S.C. sections 11001 et seq.)	All necessary actions would be taken to inform the public of the storage, use, and release of any potential hazardous and toxic chemicals in their communities.
Energy Independence and Security Act of 2007 (42 U.S.C. section 17001 et seq.)	The Proposed Action would be implemented in compliance with this regulation.
Resource Conservation and Recovery Act (42 U.S.C. section 6901 et seq.)	The Proposed Action would be implemented in compliance with this regulation.
Pollution Prevention Act of 1990 (42 U.S.C. section 13101 et seq.)	PMRF spill response and prevention procedures would be in place to prevent and respond to potential spills in the Study Area. All necessary actions would be taken for the prevention, control, and abatement of pollution related to the Proposed Action.
Federal Aviation Act of 1958 (49 U.S.C. 1301 et seq.)	Navy has coordinated with FAA in the establishment of all existing airspace. No new airspace is being designated in this Proposed Action.
Toxic Substances Control Act (15 U.S.C. sections 2601 et seq.)	The Proposed Action would be implemented in compliance with this regulation.

Notes: CFR = Code of Federal Regulations, EIS/OEIS = Environmental Impact Statement/Overseas Environmental Impact Statement, EO = Executive Order, FR = Federal Register, HSTT = Hawaii-Southern California Training and Testing, NEPA = National Environmental Policy Act, SIP = State Implementation Plan, U.S.C. = United States Code

5.1.1 Coastal Zone Management Act Compliance

The Coastal Zone Management Act of 1972 (16 U.S.C. section 1451, et seq.) encourages coastal states to be proactive in managing coastal zone uses and resources. The act established a voluntary coastal planning program and required participating states to submit a Coastal Management Plan to the National Oceanic and Atmospheric Administration for approval. Under the Coastal Zone Management Act, federal actions that affect a coastal use or resource are required to be consistent, to the maximum extent practicable, with the enforceable policies of federally approved Coastal Management Plans.

Hawaii has a federally approved Coastal Zone Management Program (Chapter 205A, Hawaii Revised Statutes), administered by the Hawaii Office of Planning and Sustainable Development. The program meets federal requirements for managing coastal areas and resources, including beaches, fishponds, scenic areas, marinas, wetlands, harbors, recreational areas, historic sites, and marine resources. Hawaii's Coastal Zone Management Program employs a wide variety of regulatory and non-regulatory techniques to address coastal issues and uphold environmental laws. Among these techniques are stewardship, planning, permitting, education, and outreach.

Based on an evaluation of whether there are reasonably foreseeable effects on coastal uses and resources from the Proposed Action, the Navy is submitting notification to the Hawaii Office of Planning and Sustainable Development of use of the list of Navy *de minimis* activities for training and testing activities.

5.2 Irreversible or Irretrievable Commitments 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 non-renewable resources, such as metal and fuel,

and natural or cultural resources. These resources are irretrievable in project use, which would preclude them from being used for other purposes. Human labor is also considered to be destruction of natural resources that could limit the range of potential uses of that environment.

Although the activities at PMRF would result in some irreversible or irretrievable commitment of resources, such as various metallic materials, fuel, and labor, natural and cultural resources are not committed in significant quantities given the frequency and duration of proposed training and testing activities as detailed in Chapter 2 (Description of Proposed Action and Alternatives). As a result, the amount of materials required and energy used during proposed training and testing activities would be minimal. Thus, the Proposed Action would not result in significant irreversible or irretrievable commitment of resources.

5.3 Relationship Between Short-Term Land Use and Long-Term Productivity

In accordance with CEQ regulations (Part 1502), this EA includes an analysis of the relationship between the short-term impacts on the environment and the effects those impacts may have on the maintenance and enhancement of the long-term productivity of the affected environment. This refers to the possibility that using a parcel of land or other resources often eliminates the possibility of other uses at that site.

In the short term, effects on the human environment with implementation of the Proposed Action would be considered minimal. Training and testing activities would generally be consistent with the existing land use at PMRF. The Proposed Action does not include construction on undeveloped lands or permanent ground-disturbing activities over an undisturbed area. As discussed in Chapter 3 (Affected Environment and Environmental Consequences), the implementation of the Proposed Action would result in less than significant impacts on resources analyzed. As a result, the Proposed Action would not significantly impact the long-term natural resource productivity of the area or permanently narrow the range of beneficial uses of the environment.

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Appendix A: Military Readiness Activity Descriptions

Environmental Assessment

Pacific Missile Range Facility

Land-Based Training and Testing

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APPENDIX A Military Readiness Activity Descriptions

A.1 Description of Military Readiness Activities

The Pacific Missile Range Facility (PMRF) land-based military readiness activities associated with the Proposed Action are described in detail below. Some individual activities may be combined (e.g., ground maneuver to a launch area for a missile launch). Training and testing activities may be combined sequentially or accomplished in parallel. The overall study area consists of the land portion of PMRF Barking Sands and Kaula Island (Figure A-1).

Training events are generally progressive in nature and would range between one hour and two weeks, and be episodic in terms of duration in any 24-hour period, as some events may be start-stop and not continuous in any given day, depending on the specific activity. Not all locations within the Study Area may be utilized over a given year period. Training and testing schedules are highly variable, dependent on individual and collective unit readiness requirements, deployment cycles, and resource availability.

In addition, because range users conduct several activities within larger training exercises, descriptions of those larger exercises are included here. These larger exercises are comprised entirely of individual activities. For example, one large exercise may include bivouacking, ground maneuver, several launches, and C5ISRT.

The number of personnel participating in military readiness activities varies depending on the specific activity type, according to the size categories in Table A-1.

Table A-1: Activity Personnel Levels

Activity Size	Number of Personnel
Squad	10–15
Unit	30–40
Medium	Up to 100
Large	Up to 300

This Environmental Assessment analyzes the effects from training and testing activities that are conducted on land at PMRF; however, in some cases, land-based training and testing activities may include or impact an at-sea component or the use of PMRF's airfield. The impact analysis covers when a launch system moves to a launch location on PMRF, or when a unit arrives at PMRF to conduct training or testing activities, and not the entire potential support or logistics chain external to PMRF.

Airfield operations and any effects at sea associated with land-based military readiness activities are considered in other National Environmental Policy Act documents. At-sea and air-based component effects were previously analyzed in the 2008 Hawaiian Range Complex EIS/OEIS and 2018 Final Hawaii-Southern California Training and Testing EIS/OEIS. Additional airfield and landing zone operations connected with specific activities are analyzed in this EA.

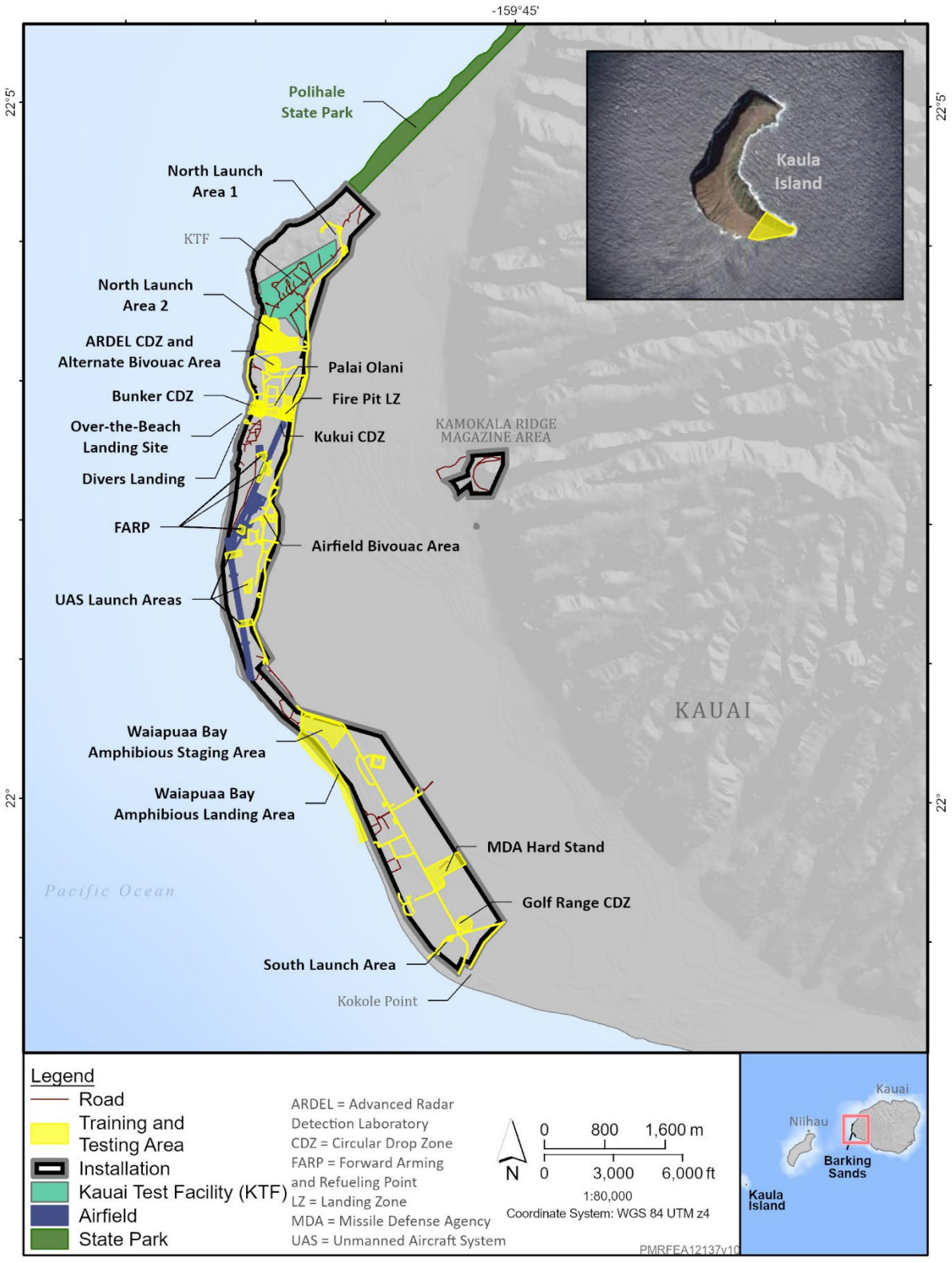

Figure A-1: Site Locations

A.1.1 Missile, Rocket, Aerial Target Drone Launch

Activity Description: Ground-launched missiles and rockets may be required for a variety of training and testing purposes (e.g., offensive and defensive systems, kinetic and non-kinetic intercepts).

Training and testing require an assortment of realistic and challenging targets. Aerial targets are used in training and testing events that involve detecting, tracking, defending against, and attacking enemy missiles and aircraft. Aerial targets include expendable rocket-powered missiles and recoverable radio-controlled drones (e.g., BQM, Airborne Drone Missile Target) used for gunnery and missile exercises. During missile defense Research, Develop, Test, and Evaluation engagements, a ballistic missile target vehicle can be launched from PMRF, a ship, or aircraft and intercepted by a ship- or land-launched missile.

Other missiles launched from PMRF emulate enemy ballistic missile threats for Navy at-sea training exercises. Simulating enemy surface-to-air missile launches, Smokey Sams are fired from North Launch Area 2. These are small, simple rockets made of phenolic paper and Styrofoam fins that produce a highly visible, thick white cloud of smoke when fired. Unguided, they rise to an altitude of 2,000 feet above the terrain. These rockets support aircrew training in Electronic Warfare countermeasures employment. Typically, Smokey Sams are launched in groups of two at one time, up to 20 launches over an hour, during 10 such annual individual training activity periods.

(DSC 1) During a ground-launched missile, rocket, or aerial target drone event, the launchers, some fixed and some mobile, are established within current Barking Sands launch areas and oriented such that the missile, rocket, or aerial target drone head directly toward the open ocean, all within PMRF's restricted airspace. Depending on the missile, rocket, or aerial target drone type, their acceleration and launch elevation are such that they rapidly depart the launch area, producing a brief engine exhaust plume and acoustic load.

Guidance systems and advanced fusing technology ensure that missiles reliably impact on or detonate near their intended target.

Locations:

- North Launch Area 1
- North Launch Area 2

Duration (Day/Night/Frequency): Launches can occur day or night, predominately during the day.

The tempo of these types of activities fluctuate year to year. Larger exercises such as Rim of the Pacific (RIMPAC) Exercise or Large-Scale Exercise may increase the tempo of activities in a given year. Tempo of launches and live-fire activities may also fluctuate during an exercise based on the logistics and purpose of the training or testing exercise. For example, some exercises involve launches of multiple aerial targets, or missiles and rockets, in one day, consecutive days, or spaced out over multiple days based on the requirements and mission of the exercise. Launches can be 30 seconds apart or hours apart; or one target, missile, or rocket may be launched during the day and one at night. Larger-scale exercises may involve 15–17 launches during the exercise with the possibility of four launches in one day. Some exercises include dual launches where multiple targets, missiles, or rockets could be launched at the same time. A missile or rocket activity may include up to two launches per a single launch salvo. An aerial drone target activity may include up to four launches per a single launch salvo. A typical Marine Corps Navy Marine Expeditionary Ship Interdiction System (NMESIS) launching may last for three days,

which includes set-up and pre-launch safety checks, and in general would occur once per year. Army missile/rocket launches would have a similar duration. Missile Defense Agency missile launch activities missions may exceed 40 days in duration, accounting for target buildup, rollout to a launch pad, launching, and equipment tear-down and removal. The annual number of activities is listed in Table 2.1-1.

Typical Components (Systems/Vehicles/Munitions): Many different systems, vehicles, and munitions may be used. Existing fixed systems include the BQM-34, BQM-177, MK-5, and GQM-163 launchers in North Launch Area 1; the 50K Launcher, MDA Vertical Launch System (VLS), and Terminal High Altitude Area Defense (THAAD) launch areas/pads in Northern Launch Area 2. Mobile systems that range users may bring include things like NMESIS, Mid-Range Capability (MRC), and High Mobility Artillery Rocket System (HIMARS). All activities are analyzed using the largest potential system, to be conservative (e.g., heaviest vehicle, loudest launch platform), though in reality some activities may use smaller, less impactful systems.

The NMESIS provides the capability to fire anti-ship missiles from land (Figure A-2). It combines the Naval Strike Missile (NSM) Launcher Unit with the Remote Operated Ground Unmanned Expeditionary (ROGUE) Fires Carrier. The ROGUE Fires Carrier consists of a missile launcher built on top of a joint light tactical vehicle (JLTV).

Army HIMARS (Figure A-3) and BQM-177 or BQM-34 aerial drone target (Figure A-4) launches would follow the similar set-up and launch steps. HIMARS ground support includes up to 15 vehicles, a combination of launch support equipment, trucks, and JLTVs.

Personnel: A single NMESIS section would consist of a squad of Marines and three JLTV vehicles: one leader JLTV vehicle, one command and control JLTV vehicle, and one JLTV launcher vehicles. Army HIMARS launch activities would be supported by a medium-sized personnel group (Table A-1).

Assumptions used for analysis are contained in Table A-2.

Table A-2: Missile, Rocket, Aerial Target Drone Launch

Missile, Rocket, Aerial Target Drone Launch	
Assumptions Used for Analysis	
Generators	Missile Defense Agency: 3 generators Army: 2 generators
Lighting	For night operations, tactical control screens use adjustable brightness settings and red wavelength in order to preserve night vision. Only those lights required for safe operations are used. Units training or testing during certain critical bird activity periods would adhere to PMRF's night lighting policy (Dark Skies).
Ground Disturbance	Stabilizing system (using shovels) requires approximately 18 inches of ground below level to be disturbed. Locations require PMRF approval (dig permit).

Figure A-2: NMESIS Launch

Figure A-3: HIMARS Launch

Figure A-4: BQM-177 (Aerial Target) Drone Launch

A.1.2 Missile, Rocket, Aerial Target Drone Set-up (No Launch)

Activity Description: Similar to the live-fire event described above, a no launch system set-up includes all the same launch system preparation, without the actual launch. In general, this event is designed for launch crew proficiency training, but it also includes exercising the transportation and logistical support elements of missile system deployment. Many types of systems may be used, some of which are vehicle-based and some of which are trailered.

Locations:

- North Launch Area 1
- North Launch Area 2
- South Launch Area

Duration (Day/Night/Frequency): Simulated launch activities may occur day or night. A typical NMESIS launch set up, simulated launch, and pack up may last several hours or up to three days. The annual number of activities is listed in Table 2.1-1.

Typical Components (Systems/Vehicles/Munitions): A No Launch NMESIS training event can consist of up to three five-vehicle sections of JLTVs, 15 vehicles in total. Vehicles would drive to the launch site after departing Barking Sands' amphibious landing area or from a transport aircraft at PMRF's airfield. Once at the notional firing positions, sections would establish communications with other Marine Corps units operating in conjunction, passing information and target data across communication data systems. This simulated target data would be relayed to NMESIS ground forces, who would then simulate firing at a simulated target (i.e., no actual firing of the weapon system would occur). NMESIS training participants would then pack up the equipment and depart via the same mode of travel as arrival.

A similar Army missile system intended for No Launch training activities at PMRF would be supported by an equivalent number and types of vehicles. An MRC battery is to be equipped with multiple large transport vehicles, trailers, generators, cabling, and support vehicles.

Personnel: NMESIS and similar Army No Launch activities would be supported by medium-sized groups of personnel (Table A-1).

Assumptions used for analysis are contained in Table A-3.

Table A-3: Missile, Rocket, Aerial Target Drone Set-up (No Launch)

Missile, Rocket, Aerial Target Drone Set-up (No Launch)	
Assumptions Used for Analysis	
Generators	Missile Defense Agency: 2 generators Army: 2 generators Marine Corps: no separate generators.
Lighting	For night operations, tactical control screens use adjustable brightness settings and red wavelength in order to preserve night vision. Only those lights required for safe operations are used. Units training or testing during certain critical bird activity periods would adhere to PMRF's night lighting policies.
Ground Disturbance	Army: Stabilizing system (using shovels) requires approximately 18 inches of ground below level to be disturbed. Ground-disturbing activities require PMRF approval (dig permit). Marine Corps: none.

A.1.3 Artillery

Activity Description: During an artillery training period, land-based forces fire artillery guns at surface (waterborne) targets. Artillery guns are oriented such that the artillery round heads directly toward the open ocean, all within PMRF's restricted airspace. A typical artillery system is the M777 Howitzer, a mobile live-fire system that fires 155-millimeter (mm) rounds (Figure A-5). Other artillery systems fire smaller 105 mm rounds.

Location:

- North Launch Area 2

Duration (Day/Night/Frequency): Firing can occur day or night. A typical short duration M777 fire mission training period is four hours, firing multiple single rounds and multiple successive rounds (salvo) rounds (all guns firing at the same time). Both Marine Corps and Army training periods are approximately four days. The annual number of activities is listed in Table 2.1-1.

Typical Components (Systems/Vehicles/Munitions): A typical artillery system is the Army M777 Howitzer, firing 155mm artillery rounds (Marine Corps, 220 rounds; or Army, 300 rounds, per a single activity period). The M777 is transported via a 7-ton truck (also carrying munitions), or sling-loaded under a heavy-lift helicopter to a firing location. For ground movement, the Army and Marine Corps uses four 7-ton trucks and two JLTVs. Both Army and Marine Corps firing batteries contain six M777 Howitzers.

Personnel: Both Army and Marine Corps M777 or similar artillery system training would involve unit-sized numbers of personnel (Table A-1).

Assumptions used for analysis are contained in Table A-4.

Table A-4: Artillery

Artillery	
Assumptions Used for Analysis	
Generators	None
Lighting	Flashlights. Units training or testing during certain critical bird activity periods would adhere to PMRF's night lighting policies.
Ground Disturbance	The M777 stabilizing system (using shovels) requires approximately 18 inches below ground level to be disturbed. Ground-disturbing activities require PMRF approval (dig permit).

Figure A-5: M777 Howitzer Firing

A.1.4 Amphibious Warfare Training

Activity Description: Amphibious warfare training ranges from individual, crew, and small unit events to large task force exercises. Individual and crew training include amphibious vehicles and naval gunfire support training. Such training includes shore assaults, boat raids, airfield or port seizures, and reconnaissance. Barking Sands has previously supported training of amphibious raids, small boat landings, and swimmer insertions/extractions. In support of this training, an amphibious staging area ashore is used to provide a location between the amphibious landing area (beach) and inland amphibious objectives, where troops and equipment may be concentrated and synchronized for further movement.

A.1.4.1 Amphibious Raid

During an amphibious raid, unit-sized forces move from amphibious ships at sea; conduct amphibious landing via various vessels/watercraft/vehicles, such as an Amphibious Combat Vehicle or Landing Craft

Air-Cushioned (LCAC) (Figure A-6); and conduct follow-on activities ashore. At completion, ground forces retrograde to amphibious ships at sea.

Figure A-6: Amphibious Combat Vehicle Departing a Landing Craft Air-Cushioned

A.1.4.2 Amphibious Small Boat Landing

During small boat beach landing training (Figure A-7), a unit-sized force using small boats moves from offshore location to a beach landing site, carries the boats to an inland site, conducts reconnaissance, and then returns to the sea via small boats.

Figure A-7: Small Boat Beach Landing Training

A.1.4.3 Amphibious Swimmer Insertion and Extraction

During swimmer over-the-beach landing training (Figure A-8), personnel conduct underwater swimmer insertion and extraction training at Barking Sands' amphibious landing areas.

Figure A-8: Swimmer Over-the-Beach Landing Training

Duration (Day/Night/Frequency): Activities may occur day or night. In general, amphibious raid training occurs as a subset element of a larger exercise such as the RIMPAC exercise. The annual number of activities is listed in Table 2.1-1.

Small boat landing training occurs monthly for a one-day period, and swimmer insertion/extraction training occurs twice yearly for a one-day period.

Locations:

- Amphibious Raid: Waiapuaa Bay
- Small boat landings: Waiapuaa Bay and the Divers Landing area
- Swimmer insertion/extraction only landings: Waiapuaa Bay, Divers Landing area, and the Swimmer Over-the-Beach Landing area

Typical Components (Systems/Vehicles/Munitions): Amphibious raids may use the Amphibious Combat Vehicle, or similar type vehicles, and LCAC for rapid movement from ship at sea to the amphibious landing area. Small boat training entails use of Combat Rubber Raiding Craft (CRRC). Swimmer insertion/extraction may use SCUBA-type equipment.

Personnel: An amphibious raid activity is supported by a unit-sized group. Small boat and swimmer training involves a squad-sized group for both the Marine Corps and Army (Table A-1).

Assumptions used for analysis are contained in Table A-5.

Table A-5: Amphibious Warfare Training

Amphibious Warfare Training	
Assumptions Used for Analysis	
Generators	None
Lighting	Consistent with safe operations and tactical level of training ashore. Units training or testing during certain critical bird activity periods or sea turtle nesting periods would adhere to PMRF's night lighting policies.
Ground Disturbance	Personnel movement over beach, no vehicles. Personnel movements restricted to remain within maintained corridors or pathways approved by PMRF.

A.1.5 Forward Arming and Refueling Point

Activity Description: During Forward Arming and Refueling Point (FARP) activities, a FARP site is established, operated, and disassembled using expeditionary aircraft refueling systems (Figure A-9). Pumps and fuel storage bladders for delivering aircraft fuel are employed, with spill containment capability, at landing zones, which include grounding points to mitigate fire risk, or other suitable aviation support locations.

Duration (Day/Night/Frequency): FARP activities may occur day or night. A FARP site is established and operated from between 1 and 5 days. The number of aircraft refueled per day ranges from 1 to 40. The refueling duration during which aircraft engines are running at ground idle is approximately one half hour. The annual number of activities is listed in Table 2.1-1.

Location:

- Aircraft parking area and adjacent unpaved area (fuel bladder) with established electrical grounding points, within PMRF's airfield boundaries.

Typical Components (Systems/Vehicles/Munitions): The Marine Corps employs two types of fuel delivery systems for FARP operations, the Tactical Airfield Fuel Dispensing Systems (TAFDS) and Helicopter Expedient Refueling System (HERS). The TAFDS is ground based and uses one JLTV-type vehicle and one generator to support the FARP operations. The HERS is ground based but is used to deliver fuel from a CH-53 or KC-130. Aircraft types that may participate in this activity are helicopters and tilt-rotor aircraft (CH-47, AH-64, MV-22), and fixed-wing fighters (FA-18, F-35).

Personnel: A single FARP site is supported by a squad-sized group (Table A-1).

Assumptions used for analysis are contained in Table A-6.

Table A-6: Forward Arming and Refueling Point

Forward Arming and Refueling Point	
Assumptions Used for Analysis	
Generators	Marine Corps and Air Force: One, 8 hours/day. Fuel type is JP-8.
Lighting	Flashlights. Minimal, consistent with the conduct of safe airfield ground operations. Units training or testing during certain critical bird activity periods would adhere to PMRF's night lighting policies.
Ground Disturbance	Grounding locations, provided by PMRF airfield.

Figure A-9: Forward Arming and Refueling Point

A.1.6 Small Unmanned Aircraft Systems and Counter-Small Unmanned Aircraft Systems

Activity Description: During Small Unmanned Aircraft Systems (sUAS) activities personnel launch, operate, and recover sUAS vehicles (Groups 1, 2, and 3), which may be used for support missions such as reconnaissance or airborne communication relay, or as aerial targets. The Department of Defense classifies Unmanned Aircraft Systems (UASs) by group: Group 1, weighs typically less than 20 pounds; Group 2, weighs between 21 and 55 pounds; Group 3, weighs more than 55 but less than 1,320 pounds; Group 4, weighs more than 1,320 pounds, normally operates below 18,000 feet; Class 5, weighs more

than 1,320 pounds, normally operates above 18,000 feet. Groups 4 and 5 activities are not part of this Proposed Action as they are considered airfield operations.

During counter sUAS training, a sUAS team launches and controls a counter-UAS system from a terrestrial location. The system defeats UAS through disruption and jamming of position, timing, navigation, command link, and video downlink signals to and from ground command station. The objective includes detection, identification, and defeat of hostile sUAS systems.

Duration (Day/Night/Frequency): sUAS missions may occur day or night, generally lasting up to two hours, with most being one-half to one hour in duration. The annual number of activities is listed in Table 2.1-1.

Location:

- Groups 1 and 2, take-off and landing locations within the PMRF airfield, no kinetic operations over land
- Group 3, take-off and landings at PMRF airfield, no kinetic operations over land

Typical Components (Systems/Vehicles/Munitions): All sUASs have a flight vehicle and a ground control device. Groups 1 and 2 may be hand launched or take off from a small ground area (Figure A-10). Most systems require battery power for flight and control. UAS landing is generally via a hover flight mode to a small ground area, or a catch net. One vehicle, typically a JLTV-sized vehicle, is used for mobility and ground control device power. Group 3 UASs take off may launch next to the runway using a catapult system and land on PMRF's runway or taxiway.

Personnel: sUAS operations involve a squad-sized group (Table A-1).

Assumptions used for analysis are contained in Table A-7.

Table A-7: Small Unmanned Aircraft Systems and Counter-Small Unmanned Aircraft Systems

sUAS and Counter-sUAS	
Assumptions Used for Analysis	
Generators	All Services: one for some events.
Lighting	Consistent with aviation safety of flight (aircraft position lights at night) and tactical lighting of the ground control device. Units training or testing during certain critical bird activity periods would adhere to PMRF's night lighting policies.
Ground Disturbance	Potentially for Group 3 ground control systems. Catch net may use stabilizing tent stakes, with 18-inch length, 5/8-inch diameter. Ground-disturbing activities require PMRF approval (dig permit).

Figure A-10: Small Unmanned Aerial Vehicle Launch

A.1.7 Parachute Operations (Personnel Insertion)

Activity Description: During parachute operations, personnel or equipment land within designated drop zones (Figure A-11).

Duration (Day/Night/Frequency): Parachute operations may occur day or night, with events lasting up to four hours. The annual number of activities is listed in Table 2.1-1.

Locations:

- Four drop zones within PMRF boundaries:
  - ARDEL (Advanced Radar Detection Laboratory) Circular Drop Zone (CDZ)
  - Bunker CDZ (north of Palai Olani Road)
  - Golf Range CDZ
  - Kukui CDZ

Typical Components (Systems/Vehicles/Munitions): Parachute operations do not require vehicles or generators.

Personnel: Parachute operations involve a squad-sized group (Table A-1).

Assumptions used for analysis are contained in Table A-8.

Table A-8: Parachute Operations (Personnel Insertion)

Parachute Operations (Personnel Insertion)	
Assumptions Used for Analysis	
Generators	None
Lighting	During night and low visibility, zones are marked by a specific lighting pattern, visible from above the designated drop zone. Units training or testing during certain critical bird activity periods would adhere to PMRF's night lighting policies.
Ground Disturbance	None

Figure A-11: Parachute Landing (Personnel Insertion)

A.1.8 Command, Control, Computing, Communications, Cyber, Intelligence, Surveillance, Reconnaissance and Targeting

Activity Description: During Command, Control, Computing, Communications, Cyber, Intelligence, Surveillance, Reconnaissance and Targeting (C5ISRT) activities, personnel establish and operate tactical field command post, communication systems, radar tracking and surveillance systems, optical tracking systems, or electronic warfare equipment (Figure A-12). May use existing facilities (at on-going level) or mobile systems (vehicle based, standalone). Likely to be associated with/in support of other concurrent activities.

Duration (Day/Night/Frequency): C5ISRT events may occur day or night. A typical duration is between 3 and 10 days but can be as long as 60 days. The annual number of activities is listed in Table 2.1-1.

Locations:

- North Launch Area 1
- North Launch Area 2
- South Launch Area
- Missile Defense Agency Hard Stand

Typical Components (Systems/Vehicles/Munitions): Communications transmitter/receiver terminals are established to conduct data and voice transfer among participating training entities. Other systems track missiles, aircraft, and ships; detect electromagnetic radiation; or transmit radiation simulating enemy systems.

Personnel: Some events will be squad sized, while others are medium-sized groups (Table A-1).

Assumptions used for analysis are contained in Table A-9.

Table A-9: Command, Control, Computing, Communications, Cyber, Intelligence, Surveillance, Reconnaissance, and Targeting

C5ISRT (to include Command Post Exercise, Communication Relay Exercise)	
Assumptions Used for Analysis	
Generators	Some events may require generator power.
Lighting	Lighting may be required to support night operations. Flashlights. Units training or testing during certain critical bird activity periods would adhere to PMRF's night lighting policies.
Ground Disturbance	Generators, sensors, and other equipment that require grounding. Potential tent poles/stakes. No trenching. Tent stakes, 18-inch length, 5/8-inch diameter. Locations require PMRF approval (dig permit).
Radiation Hazards	Implementation of control measures and safety protocols to address Hazards of Electromagnetic Radiation to Personnel, Fuel, and Ordnance (HERP/HERF/HERO) and restricted to approved training and testing areas.

Figure A-12: Communication Operations

A.1.9 Bivouac

Activity Description: During deployment to Barking Sands to conduct other training or testing, personnel establish and operate expeditionary field lodging (tents) (Figure A-13).

Duration (Day/Night/Frequency): Bivouacking occurs both day and night. Typical bivouac duration is four days, with an extended period up to 10 days. Based on other activities likely to be associated with or in support of other concurrent activities, of which bivouacking supports. The annual number of activities is listed in Table 2.1-1.

Location:

- Airfield Bivouac Area (Bivouac Area 1)
- North Launch Area 2 Bivouac Area
- Palai Olani Bivouac Area
- Missile Defense Agency Hard Stand

Typical Components (Systems/Vehicles/Munitions): The Services have varied bivouac tentage: Marine Corps, two-person; Army, four-person; Air Force, 20-person shelters.

Personnel: Small and short duration events would be supported by squad-sized groups, while some multi-service events would be supported by large groups (up to 300 individuals in support of a RIMPAC exercise) (Table A-1).

Figure A-13: Establishing Bivouac Site

Assumptions used for analysis are contained in Table A-10.

Table A-10: Bivouac

Bivouac	
Assumptions Used for Analysis	
Generators	Air Force: Two generators for large events.
Lighting	Flashlights. Units training or testing during certain critical bird activity periods would adhere to PMRF's night lighting policies.
Ground Disturbance	Tent stakes, 18-inch length, 5/8-inch diameter.

A.1.10 Air-to-Ground Gunnery Exercise

Activity Description: During air-to-ground gunnery training, aircraft crews use guns to attack ground targets, day or night, with the goal of destroying or disabling enemy vehicles, structures, or personnel. No physical targets exist on Kaula; aircrew aim for points within the target area.

Duration (Day/Night/Frequency): Gunnery Exercise may occur day or night. The annual number of activities is listed in Table 2.1-1.

Location (Figure A-14)**:**

- Kaula Island (southern 1,000 feet tip of the island, approximately 10 acres).

Typical Components (Systems/Vehicles/Munitions): Aircraft machine gun systems (e.g., 30mm) and inert 2.75-inch rockets are aircraft-fired/launched inert munitions used within the Kaula Island target area (Figure A-15). Aircraft laser systems are used to provide accurate distance from aircraft to target.

Personnel: Aircrew of fixed-wing (fighter-type jets), helicopters, and rotary-wing aircraft.

Assumptions used for analysis are contained in Table A-11.

Table A-11: Air-to-Ground Gunnery Exercise

Air-to-Ground Gunnery Exercise	
Assumptions Used for Analysis	
Generators	None
Lighting	None
Ground Disturbance	Inert bullet and rocket impacts

A.1.11 Air-to-Ground Bombing Exercise

Activity Description: During air-to-ground bombing training, strike fighter aircraft deliver ordnance against land targets in day or night conditions.

Bombs are unpowered munitions dropped from aircraft on land and water targets. Bombs used during training and testing in the Study Area are non-explosive (inert).

General Purpose (inert) bombs are non-explosive practice munitions containing a spotting (smoke) charge to aid in scoring the accuracy of hitting the target during training and testing activities. These bombs are filled with inert material (steel and concrete) (Figure A-16).

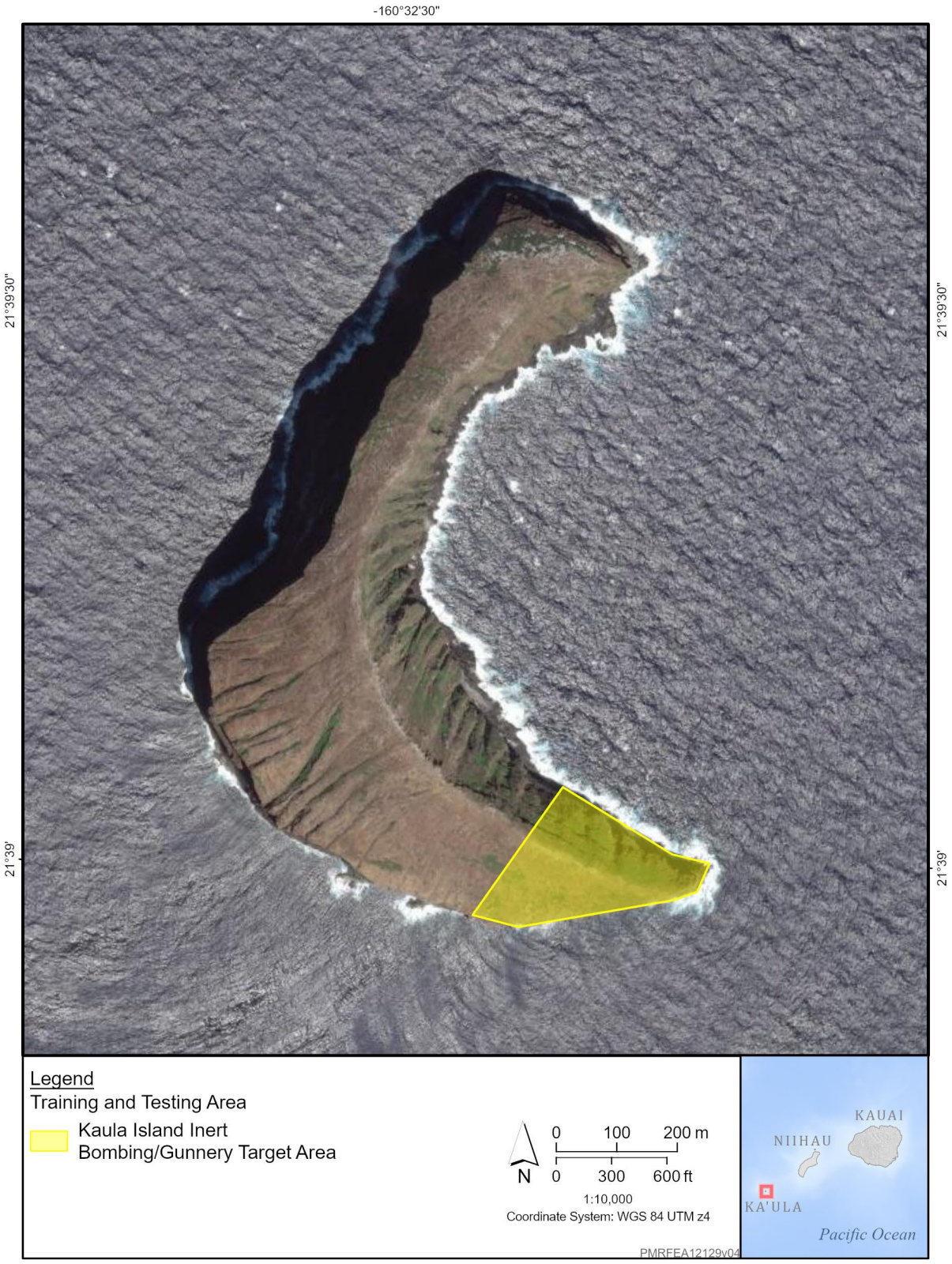

Figure A-14: Kaula Island

Figure A-15: Helicopter Firing Inert Rockets

Figure A-16: Aircraft-Loaded Inert General-Purpose Bombs

Subscale bombs (Figure A-17) are non-explosive practice munitions containing a spotting (smoke) charge to aid in scoring the accuracy of hitting the target during training and testing activities. Common subscale bombs are 25 pounds and less and are steel constructed. Laser-guided training rounds are another variation of a subscale practice bomb. They weigh approximately 100 pounds and are cost-effective, non-explosive weapons used in training aircrew in laser-guided weapons employment.

Figure A-17: Aircraft-Loaded Subscale Inert Bombs

Duration (Day/Night/Frequency): Bombing Exercise may occur day or night. The annual number of activities is listed in Table 2.1-1.

Location:

- Kaula Island (southern 1,000 feet tip of the island, approximately 10 acres).

Typical Components (Systems/Vehicles/Munitions): Inert general-purpose and sub-scale bombs are aircraft-delivered munitions used within the Kaula Island target area. Aircraft laser systems are used to provide accurate distance from aircraft to target.

Personnel: Aircrew of fixed-wing (fighter-type jets) aircraft.

Assumptions used for analysis are contained in Table A-12.

Table A-12: Air-to-Ground Bombing Exercise

Air-to-Ground Bombing Exercise	
Assumptions Used for Analysis	
Generators	None
Lighting	None
Ground Disturbance	Inert bomb impact

A.1.12 Landing Zone Operations

Activity Description: During landing zone training, helicopter or tilt-rotor aircrew deliver and recover personnel or equipment at unimproved landing zone locations.

Duration (Day/Night/Frequency): Landing zone operations may occur day or night and may be eight hours in duration. The annual number of activities is listed in Table 2.1-1.

Location:

- Fire Pit LZ

Typical Components (Systems/Vehicles/Munitions): Helicopters such as the CH-47 (Figure A-18) and CH-53, or tilt-rotor aircraft such as the MV-22.

Personnel Size: LZ ground personnel would be squad sized (Table A-1).

Assumptions used for analysis are contained in Table A-13.

Table A-13: Landing Zone Operations

Landing Zone Operations	
Assumptions Used for Analysis	
Generators	None
Lighting	Potential Landing Zone lighting for night operations. Units training or testing during certain critical bird activity periods would adhere to PMRF's night lighting policies.
Ground Disturbance	Possible surface erosion from helicopter rotor down-wash.

Figure A-18: Helicopter Sling Load of M777 Howitzer

A.1.13 Ground Maneuver

Activity Description: During ground maneuver training, small ground force units move on improved roads, surfaces, or pathways via foot to secure ground objective points (Figure A-19).

Location:

- Ground movement corridor (along designated existing PMRF hard-surfaced and dirt roads, and shoulder areas)

Duration (Day/Night/Frequency): May occur day or night, generally eight hours in duration. The annual number of activities is listed in Table 2.1-1.

Typical Components (Systems/Vehicles/Munitions): Personnel on foot only.

Personnel Size: Squad up to unit-sized groups (Table A-1).

Assumptions used for analysis are contained in Table A-14.

Table A-14: Ground Maneuver

Ground Maneuver Training	
Assumptions Used for Analysis	
Generators	None
Lighting	Flashlights. Units training or testing during certain critical bird activity periods would adhere to PMRF's night lighting policies.
Ground Disturbance	None

Figure A-19: Ground Maneuver

A.1.14 Major Training Exercises

A major training exercise is comprised of several activities conducted by several units operating together while commanded and controlled by a single commander.

A.1.14.1 Rim of the Pacific Exercise

During RIMPAC, units conduct the PMRF-based terrestrial training components (amphibious operations, missile/rocket/target drone launches, artillery firing, C5ISRT) of the biennial multinational training exercise in which navies from Pacific Rim nations and other allies assemble to conduct training throughout the Hawaiian Islands in a number of warfare areas.

A.1.14.2 Large Scale Amphibious Exercise

During large-scale amphibious exercises in the Hawaiian Islands, units conduct the terrestrial training component (e.g., amphibious operations) to secure the battlespace (air, land, and sea), maneuver to and seize the objective, and conduct self-sustaining operations ashore. This exercise may occur once in a two-year period, portions of which may use PMRF terrestrial areas.

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Appendix B: Air Quality Calculations

Environmental Assessment
Pacific Missile Range Facility
Land-Based Training and Testing
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APPENDIX B Air Quality Calculations

B.1 Emission Estimates

B.1.1 Emissions from Vehicle Activities

Vehicle activities associated with the Proposed Action include those related to personnel commuting to the site as well as vehicle operations during the training and testing exercises. The emission estimates assumed there would be no additional fuel deliveries to Pacific Missile Range Facility (PMRF) to support activity increases associated with the Proposed Action. Emission factors, in grams per mile(g/m) from the Air Emissions Guide for Air Force Mobile Sources, Air Force Civil Engineer Center, June 2023, were used to estimate the combustion emissions from vehicles activities. Particulate matter (PM) less than or equal to 10 microns in diameter (PM_{10}) and PM less than or equal to 2.5 microns in diameter ($PM_{2.5}$) are also generated from vehicles activities on paved and unpaved roads. U.S. Environmental Protection Agency AP-42 methodologies were used to estimate the particulate matter emissions from vehicle travel on paved and unpaved roads. It was assumed that water spraying, or other dust suppressants would not be utilized.

Tables B-1 through B-7 present the emission factors and the estimated emissions from vehicle activities.

Table B-1: Assumptions used for Estimating Combustion Emissions from Military Vehicle Operations

Activity			Transport							
Site	Activity	Frequency	Vehicle	Category	Fuel	Number of Vehicles	Number of Miles/Day per activity/per vehicle	Number of Days per Activity	Number of activities per year	Total Miles
North Launch Area 1	Missile, Rocket, and Aerial Drone Target Set-up (No Launch)	Annual	Heavy-Duty Diesel Vehicles (HDDV) – Diesel-powered vehicles (10,001 lbs. to > 60,000 lbs. GVWR)	On-Road Truck	Diesel	15	12	3	5	2700
North Launch Area 1	C5ISRT Exercise	Annual	Heavy-Duty Diesel Vehicles (HDDV) – Diesel-powered vehicles (10,001 lbs. to > 60,000 lbs. GVWR)	On-Road Truck	Diesel	5	10	60	1	3000
North Launch Area 1	C5ISRT Exercise	Annual	Heavy-Duty Diesel Vehicles (HDDV) – Diesel-powered vehicles (10,001 lbs. to > 60,000 lbs. GVWR)	On-Road Truck	Diesel	5	10	10	28	14000
North Launch Area 2	Missile, Rocket, and Aerial Target Drone Launch	Annual	Heavy-Duty Diesel Vehicles (HDDV) – Diesel-powered vehicles (10,001 lbs. to > 60,000 lbs. GVWR)	On-Road Truck	Diesel	15	10	3	10	4500
North Launch Area 2	Missile, Rocket, and Aerial Target Drone Launch	Annual	Heavy-Duty Diesel Vehicles (HDDV) – Diesel-powered vehicles (10,001 lbs. to > 60,000 lbs. GVWR)	On-Road Truck	Diesel	15	10	40	1	6000
North Launch Area 2	Missile, Rocket, and Aerial Drone Target Set-up (No Launch)	Annual	Light-Duty Diesel Vehicles (LDDV) – All diesel-powered passenger cars	On-Road Truck	Diesel	15	10	3	5	2250
North Launch Area 2	Artillery	Annual	Heavy-Duty Diesel Vehicles (HDDV) – Diesel-powered vehicles (10,001 lbs. to > 60,000 lbs. GVWR)	On-Road Truck	Diesel	6	10	4	2	480
North Launch Area 2	C5ISRT Exercise	Annual	Heavy-Duty Diesel Vehicles (HDDV) – Diesel-powered vehicles (10,001 lbs. to > 60,000 lbs. GVWR)	On-Road Truck	Diesel	5	10	60	1	3000
North Launch Area 2	C5ISRT Exercise	Annual	Heavy-Duty Diesel Vehicles (HDDV) – Diesel-powered vehicles (10,001 lbs. to > 60,000 lbs. GVWR)	On-Road Truck	Diesel	5	10	10	6	3000
South Launch Area	Missile, Rocket, and Aerial Drone Target Set-up (No Launch)	Annual	Heavy-Duty Diesel Vehicles (HDDV) – Diesel-powered vehicles (10,001 lbs. to > 60,000 lbs. GVWR)	On-Road Truck	Diesel	15	12	3	5	2700
South Launch Area	C5ISRT Exercise	Annual	Heavy-Duty Diesel Vehicles (HDDV) – Diesel-powered vehicles (10,001 lbs. to > 60,000 lbs. GVWR)	On-Road Truck	Diesel	5	10	60	1	3000
South Launch Area	C5ISRT Exercise	Annual	Heavy-Duty Diesel Vehicles (HDDV) – Diesel-powered vehicles (10,001 lbs. to > 60,000 lbs. GVWR)	On-Road Truck	Diesel	5	10	10	16	8000
MDA Hardstand	C5ISRT Exercise	Annual	Heavy-Duty Diesel Vehicles (HDDV) – Diesel-powered vehicles (10,001 lbs. to > 60,000 lbs. GVWR)	On-Road Truck	Diesel	5	10	60	1	3000
MDA Hardstand	C5ISRT Exercise	Annual	Heavy-Duty Diesel Vehicles (HDDV) – Diesel-powered vehicles (10,001 lbs. to > 60,000 lbs. GVWR)	On-Road Truck	Diesel	5	10	10	7	3500
Waiapuaa Bay	Amphibious Operations - Raid	Annual	Heavy-Duty Diesel Vehicles (HDDV) – Diesel-powered vehicles (10,001 lbs. to > 60,000 lbs. GVWR)	On-Road Truck	Diesel	4	20	3	1	240
Forward Arming and Refueling Point (FARP)	FARP Operations	Annual	Heavy-Duty Diesel Vehicles (HDDV) – Diesel-powered vehicles (10,001 lbs. to > 60,000 lbs. GVWR)	On-Road Truck	Diesel	1	10	10	19	1900
Unmanned Aircraft System Launch Area	sUAS and UAS Operations	Annual	Heavy-Duty Diesel Vehicles (HDDV) – Diesel-powered vehicles (10,001 lbs. to > 60,000 lbs. GVWR)	On-Road Truck	Diesel	1	20	1	43	860

Reference for emission factors: Air Emissions Guide for Air Force Mobile Sources, Air Force Civil Engineer Center, June 2023; Tables 5-20 and 5-25

The Joint Light Tactical Vehicle (JLTV) weighs between 14,000 and 15,639 pounds, depending on the variant and equipment.
The factory curb weight is 16,000 pounds, but when fully equipped, it can weigh up to 21,000 pounds.
The Amphibious Combat Vehicle (ACV) has a gross vehicle weight of 35 tons (77,000 lbs) and a payload of 7,300 lbs.
Used the HDDV category for estimating JLTV and ACV Emissions.
Number of miles per day are per vehicle and per activity.

Table B-2: Emission Factors and Combustion Emissions from Military Vehicle Operations

Activity		Emissions Factors, grams per mile (g/mile)							Emissions, ton/year						Emissions, MT/year
Site	Activity	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$	CO_2	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$	CO_2
North Launch Area 1	Missile, Rocket, and Aerial Drone Target Set-up (No Launch)	1.61	2.30	0.10	0.00	0.04	0.04	1217.63	0.0048	0.0069	0.0003	0.00001	0.0001	0.0001	3.288
North Launch Area 1	C5ISRT Exercise	1.61	2.30	0.10	0.00	0.04	0.04	1217.63	0.0053	0.0076	0.0003	0.00001	0.0001	0.0001	3.653
North Launch Area 1	C5ISRT Exercise	1.61	2.30	0.10	0.00	0.04	0.04	1217.63	0.0248	0.0356	0.0015	0.00006	0.0007	0.0006	17.047
North Launch Area 2	Missile, Rocket, and Aerial Target Drone Launch	1.61	2.30	0.10	0.00	0.04	0.04	1217.63	0.0080	0.0114	0.0005	0.00002	0.0002	0.0002	5.479
North Launch Area 2	Missile, Rocket, and Aerial Target Drone Launch	1.61	2.30	0.10	0.00	0.04	0.04	1217.63	0.0106	0.0152	0.0007	0.00003	0.0003	0.0003	7.306
North Launch Area 2	Missile, Rocket, and Aerial Drone Target Set-up (No Launch)	1.61	2.30	0.10	0.00	0.04	0.04	1217.63	0.0040	0.0057	0.0002	0.00001	0.0001	0.0001	2.740
North Launch Area 2	Artillery	1.61	2.30	0.10	0.00	0.04	0.04	1217.63	0.0009	0.0012	0.0001	0.00000	0.0000	0.0000	0.584
North Launch Area 2	C5ISRT Exercise	1.61	2.30	0.10	0.00	0.04	0.04	1217.63	0.0053	0.0076	0.0003	0.00001	0.0001	0.0001	3.653
North Launch Area 2	C5ISRT Exercise	1.61	2.30	0.10	0.00	0.04	0.04	1217.63	0.0053	0.0076	0.0003	0.00001	0.0001	0.0001	3.653
South Launch Area	Missile, Rocket, and Aerial Drone Target Set-up (No Launch)	1.61	2.30	0.10	0.00	0.04	0.04	1217.63	0.0048	0.0069	0.0003	0.00001	0.0001	0.0001	3.288
South Launch Area	C5ISRT Exercise	1.61	2.30	0.10	0.00	0.04	0.04	1217.63	0.0053	0.0076	0.0003	0.00001	0.0001	0.0001	3.653
South Launch Area	C5ISRT Exercise	1.61	2.30	0.10	0.00	0.04	0.04	1217.63	0.0142	0.0203	0.0009	0.00004	0.0004	0.0004	9.741
MDA Hardstand	C5ISRT Exercise	1.61	2.30	0.10	0.00	0.04	0.04	1217.63	0.0053	0.0076	0.0003	0.00001	0.0001	0.0001	3.653
MDA Hardstand	C5ISRT Exercise	1.61	2.30	0.10	0.00	0.04	0.04	1217.63	0.0062	0.0089	0.0004	0.00002	0.0002	0.0002	4.262
Waiapuaa Bay	Amphibious Operations - Raid	1.61	2.30	0.10	0.00	0.04	0.04	1217.63	0.0004	0.0006	0.0000	0.00000	0.0000	0.0000	0.292
Forward Arming and Refueling Point (FARP)	FARP Operations	1.61	2.30	0.10	0.00	0.04	0.04	1217.63	0.0034	0.0048	0.0002	0.00001	0.0001	0.0001	2.313
Unmanned Aircraft System Launch Area	sUAS and UAS Operations	1.61	2.30	0.10	0.00	0.04	0.04	1217.63	0.0015	0.0022	0.0001	0.00000	0.0000	0.0000	1.047

Table B-3: Methodology for Calculating PM Emissions from Military Vehicle Operations on Unpaved Roads

For vehicles traveling on unpaved surfaces at industrial sites, emissions are estimated from the following equation:

$$E = k\,(s/12)^a(W/3)^b \qquad (1a)$$

where k, a, b, c and d are empirical constants (Reference 6) given below and

E = size-specific emission factor (lb/VMT)
s = surface material silt content (%)
W = mean vehicle weight (tons)

Reference: AP-42 (13.2.2), November 2006, https://www.epa.gov/sites/production/files/2020-10/documents/13.2.2_unpaved_roads.pdf

Pollutant	PM_{10}	$PM_{2.5}$	
k	1.5	0.15	Table 13.2.2-2
s	25.2	25.2	Table 13.2.2-3
a	0.9	0.9	Table 13.2.2-2
b	0.45	0.45	Table 13.2.2-2
S	25	25	
W-empty, tons	8	8	The JLTV weighs between 14,000 and 15,639 pounds, depending on the variant and equipment. The factory curb weight is 16,000 pounds, but when fully equipped, it can weigh up to 21,000 pounds.
W-full, tons	11	11	
e	0	0	

Assumed no control efficiency (water spray or other controls).

Table B-4: PM Emissions from Military Vehicle Operations on Unpaved Roads

Site	VMT, total	PM_{10}, ton/year	$PM_{2.5}$, ton/year
North Launch Area 1	19700	48.4	4.8
North Launch Area 2	19230	47.2	4.7
South Launch Area	13700	33.7	3.4
MDA Hardstand	6500	16.0	1.6
Waiapuaa (Major's) Bay	240	0.6	0.1
Forward Arming and Refueling Point (FARP)	1900	4.7	0.5
Unmanned Aircraft System Launch Area	860	2.1	0.2

Table B-5: Assumptions and Combustion Emissions from Personnel Travel to the Sites

Site	Transport				Emissions Factors, grams per mile (g/mile)							Emissions, ton/year						Emissions, MT/year
	Vehicle	Category	Fuel	Total Miles	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$	CO_2	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$	CO_2
North Launch Area 1	All POV	On-Road Passenger Car	Composite	710000	4.37	0.23	0.32	0.003	0.01	0.01	401.00	3.420	0.180	0.250	0.002	0.005	0.005	285
North Launch Area 2	All POV	On-Road Passenger Car	Composite	896400	4.37	0.23	0.32	0.003	0.01	0.01	401.00	4.318	0.227	0.316	0.003	0.007	0.006	359
South Launch Area	All POV	On-Road Passenger Car	Composite	470000	4.37	0.23	0.32	0.003	0.01	0.01	401.00	2.264	0.119	0.166	0.002	0.004	0.003	188
Palai Olani	All POV	On-Road Passenger Car	Composite	313200	4.37	0.23	0.32	0.003	0.01	0.01	401.00	1.509	0.079	0.110	0.001	0.002	0.002	126
Waiapuaa Bay	All POV	On-Road Passenger Car	Composite	7800	4.37	0.23	0.32	0.003	0.01	0.01	401.00	0.038	0.002	0.003	0.000	0.000	0.000	3
Missile Defense Agency Hard Stand	All POV	On-Road Passenger Car	Composite	440000	4.37	0.23	0.32	0.003	0.01	0.01	401.00	2.119	0.112	0.155	0.001	0.003	0.003	176
Airfield Bivouac Area	All POV	On-Road Passenger Car	Composite	1260000	4.37	0.23	0.32	0.003	0.01	0.01	401.00	6.069	0.319	0.444	0.004	0.010	0.008	505
Alternate Bivouac Area	All POV	On-Road Passenger Car	Composite	60000	4.37	0.23	0.32	0.003	0.01	0.01	401.00	0.289	0.015	0.021	0.000	0.000	0.000	24
Forward Arming and Refueling Point Areas	All POV	On-Road Passenger Car	Composite	57000	4.37	0.23	0.32	0.003	0.01	0.01	401.00	0.275	0.014	0.020	0.000	0.000	0.000	23
Unmanned Aircraft System Launch Area	All POV	On-Road Passenger Car	Composite	12900	4.37	0.23	0.32	0.003	0.01	0.01	401.00	0.062	0.003	0.005	0.000	0.000	0.000	5
Ground Maneuver Area	All POV	On-Road Passenger Car	Composite	16800	4.37	0.23	0.32	0.003	0.01	0.01	401.00	0.081	0.004	0.006	0.000	0.000	0.000	7
Reference for emission factors: Air Emissions Guide for Air Force Mobile Sources, Air Force Civil Engineer Center, June 2023; Table 5-11														1.50				**1,702**

Table B-6: Methodology for Calculating PM Emissions from Personnel Vehicle Operations on Paved Roads

$Ea = (VMT)[(k)(sL)^{0.91}(W)^{1.02}](Ci)(1 - e)$			
	PM_{10}	$PM_{2.5}$	
k	0.0022	0.00054	Default value, AP-42 Table 13.2.1-1
sL	0.6	0.6	AP-42 Table 13.2.1-2 - default for Average Daily Traffic (ADT) <500
W-full, tons	2	2	Average weight of passenger cars
W-empty, tons	2	2	Average weight of passenger cars
e			Assumed no control efficiency (water spray or other controls).

13.2.1.3 Predictive Emission Factor Equations[10,29]

The quantity of particulate emissions from resuspension of loose material on the road surface due to vehicle travel on a dry paved road may be estimated using the following empirical expression:

$$E = k\,(sL)^{0.91} \times (W)^{1.02} \qquad (1)$$

where: E = particulate emission factor (having units matching the units of k),
k = particle size multiplier for particle size range and units of interest (see below),
sL = road surface silt loading (grams per square meter) (g/m^2), and
W = average weight (tons) of the vehicles traveling the road.

Table 13.2.1-1. PARTICLE SIZE MULTIPLIERS FOR PAVED ROAD EQUATION

Size range[a]	Particle Size Multiplier k[b]		
	g/VKT	g/VMT	lb/VMT
PM-2.5[c]	0.15	0.25	0.00054
PM-10	0.62	1.00	0.0022
PM-15	0.77	1.23	0.0027
PM-30[d]	3.23	5.24	0.011

[a] Refers to airborne particulate matter (PM-x) with an aerodynamic diameter equal to or less than x micrometers.

[b] Units shown are grams per vehicle kilometer traveled (g/VKT), grams per vehicle mile traveled (g/VMT), and pounds per vehicle mile traveled (lb/VMT). The multiplier k includes unit conversions to produce emission factors in the units shown for the indicated size range from the mixed units required in Equation 1.

[c] The k-factors for $PM_{2.5}$ were based on the average $PM_{2.5}$:PM_{10} ratio of test runs in Reference 30.

[d] PM-30 is sometimes termed "suspendable particulate" (SP) and is often used as a surrogate for TSP.

Table 13.2.1-2. Ubiquitous Silt Loading Default Values with Hot Spot Contributions from Anti-Skid Abrasives (g/m^2)

ADT Category	< 500	500-5,000	5,000-10,000	> 10,000
Ubiquitous Baseline g/m^2	0.6	0.2	0.06	0.03 0.015 limited access
Ubiquitous Winter Baseline Multiplier during months with frozen precipitation	X4	X3	X2	X1
Initial peak additive contribution from application of antiskid abrasive (g/m^2)	2	2	2	2
Days to return to baseline conditions (assume linear decay)	7	3	1	0.5

Table B-7: Estimated PM Emissions from Personnel Travel to the Sites on Paved Roads

Site	Activity	# personnel	RT miles	days per event	events per year	VMT, total	PM_{10}, ton/year	$PM_{2.5}$, ton/year
North Launch Area 1	Missile, Rocket, and Aerial Target Drone Launch	100	20	3	0	0	-	-
	Missile, Rocket, and Aerial Drone Target Set-up (No Launch)	100	20	3	5	30000	0.04	0.01
	C5ISRT Exercise	100	20	60	1	120000	0.2	0.04
	C5ISRT Exercise	100	20	10	28	560000	0.8	0.19
North Launch Area 1 - Total						**710,000**	**1.0**	**0.2**
North Launch Area 2	Missile, Rocket, and Aerial Target Drone Launch	100	20	3	10	60000	0.1	0.02
	Missile, Rocket, and Aerial Target Drone Launch	100	20	40	1	80000	0.1	0.03
	Missile, Rocket, and Aerial Drone Target Set-up (No Launch)	100	20	3	5	30000	0.04	0.01
	Artillery	40	20	4	2	6400	0.01	0.002
	C5ISRT Exercise	100	20	60	1	120000	0.2	0.04
	C5ISRT Exercise	100	20	10	6	120000	0.2	0.0
	Bivouac	300	20	10	8	480000	0.7	0.2
North Launch Area 2 - Total						**896,400**	**1.3**	**0.3**
South Launch Area	Missile, Rocket, and Aerial Target Drone Launch	100	20	3	2	12000	0.02	0.004
	Missile, Rocket, and Aerial Target Drone Launch	100	20	40	1	80000	0.11	0.028
	Missile, Rocket, and Aerial Drone Target Set-up (No Launch)	100	20	3	5	30000	0.04	0.01
	C5ISRT Exercise	100	20	60	1	120000	0.2	0.04
	C5ISRT Exercise	100	20	10	16	320000	0.4	0.1
South Launch Area - Total						**562,000**	**0.8**	**0.2**
Palai Olani	Parachute Operations (Personnel Insertion)	15	20	1	15	4500	0.006	0.002
	Bivouac (unit, medium, large)	300	20	10	5	300000	0.420	0.103
	Helicopter/Tilt-Rotor Landing Zone (LZ) Operations (off airport surface)	15	20	1	11	3300	0.005	0.001
	Amphibious Operations - Small Boat Operations	15	20	1	17	5100	0.0071	0.0018
	Amphibious Operations - Swimmer Insertion/Extraction)	15	20	1	1	300	0.0004	0.0001
Palai Olani - Total						**313,200**	**0.4**	**0.1**
Waiapuaa Bay	Amphibious Operations - Raid	40	20	3	1	2400	0.003	0.001
	Amphibious Operations - Small Boat Operations	15	20	1	17	5100	0.007	0.002
	Amphibious Operations - Swimmer Insertion/Extraction)	15	20	1	1	300	0.0004	0.0001
Waiapuaa Bay - Total						**7,800**	**0.0**	**0.0**
Missile Defense Agency Hard Stand	C5ISRT Exercise	100	20	60	1	120000	0.168	0.041
	C5ISRT Exercise	100	20	10	7	140000	0.196	0.048
	Bivouac (unit, medium, large)	300	20	10	3	180000	0.252	0.062
MDA Hard Stand - Total						**440,000**	**0.6**	**0.2**
Airfield Bivouac Area	Bivouac (unit, medium, large)	300	20	10	21	1260000	1.8	0.4
Alternate Bivouac Area	Bivouac (unit, medium, large)	300	20	10	1	60000	0.1	0.02
Forward Arming and Refueling Point Areas	Forward Arming and Refueling Point (FARP) Operations	15	20	10	19	57000	0.1	0.02
Unmanned Aircraft System Launch Area	Small Unmanned Aircraft Systems (sUAS) and Counter-Unmanned Aircraft Systems (UAS) Operations	15	20	1	43	12900	0.02	0.004
Ground Maneuver Area	Ground maneuver	40	20	1	21	16800	0.02	0.01

B.1.2 Emissions from Munitions Activities

Available emissions factors (AP-42, *Compilation of Air Pollutant Emission Factors*) or other published sources were used to estimate the emissions. These factors were then multiplied by the net weight of the explosive and the number of items that were used per year. This calculation provides estimates of annual emissions.

$$Emissions = EXP/YR \times EF$$

Where:

Emissions = annual ordnance emissions

EXP/YR = number of explosives, propellants, and pyrotechnics items used per year

EF = air pollutant emissions factor per item

Table B-8 and Table B-9 present the emission factors, references, and the estimated emissions from munition activities.

Table B-8: Munitions Emission Factors and References

Munitions Information				Emission Factor (lb/lb NEW)								Emission Factor (lb/item)						
Munition Type	Munition	Component	Net Explosive Weight (lb NEW)	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	CO_2	Reference	Emission Factor Assumptions and Comments	CO	NO_x	VOC	PM_{10}	$PM_{2.5}$	SO_2	CO_2
BOMB	MK82 INERT	spotting charge	3							Hawaii-Southern California Training and Testing Final EIS/OEIS, October 2018	Assume Spotting Charge	0.26						
LRG PROJ	155MM ILL		6							AP-42 Chapter 15, Table 15.4.1-1 EMISSION FACTORS FOR THE USE OF DODIC D505, M485A2 155-MM ILLUMINATION ROUND (PROJECTILE)		0.026	0.094	0.0015	3		0.0027	1.8
MED PROJ	30MM		0.03							AP 42, Chapter 15, Table 15.2.1-1 EMISSION FACTORS FOR THE USE OF DODIC B129, M789 30-MM HIGH EXPLOSIVE DUAL PURPOSE		8.60E-04	2.00E-04		3.90E-03	2.50E-03	0.00E+00	4.40E-03
SMOKE POT	ABC-M5 30-POUND HC SMOKE POT		1.10	2.50E-02	8.40E-05	1.00E+00	5.60E-01	1.40E-04	1.50E-02	AP 42, Chapter 15, Table 15.7.6-1, EMISSION FACTORS FOR THE USE OF DODIC K866, ABC-M5 30-POUND HC SMOKE POT	Net Explosive Weight for Smokey Sam is from Hazard Classification of United States Military Explosives and Munitions, Revision 15, June 2012	0.0275	0.0000924	0.000594	1.1	0.616	0.000154	0.0165
MISSILE	AGM-84		215	0.021	6.30E-03	2.10E-02	1.50E-02	1.20E-04	6.30E-01	AP 42, Chapter 15, Table 15.9.1-1, DODIC M023, M112 Demolition Block Charge	Assume similar to C-4 emissions. Net Explosive Weight for AGM -84 is from Hazard Classification of United States Military Explosives and Munitions, Revision 15, June 2012	4.515	1.3545		4.515	3.225	0.0258	135.45
Rocket	2.75" RKT Inert	INERT Warhead	Neg.	5.60E-02	7.10E-03	6.10E-02	3.80E-02			Hawaii-Southern California Training and Testing Final EIS/OEIS, October		Negligible emissions						

Table B-9: Estimated Munitions Emissions

Site	Activity	Munition Type	Number per Activity	Activity/Year	Total items per year	Emissions Factors in tons/Year						
						NO_x	SO_x	CO	VOC	PM_{10}	$PM_{2.5}$	CO_2e (MT/year)
North Launch Area 2	Missile, Rocket, and Aerial Target Drone Launch	Missile	17	10	170	0.1151325	0.002193	0.383775		0.38	0.27	10.445
North Launch Area 2	Missile, Rocket, and Aerial Target Drone Launch	Smokey Sam Launches			400	1.848E-05	3.08E-05	0.0055	0.000003	0.22	0.1232	0.003
North Launch Area 2	Artillery	155-millimeter (mm) projectiles	300	2	600	0.0282	0.00081	0.0078	0.00045	0.90	0.00	0.490
South Launch Area	Missile, Rocket, and Aerial Target Drone Launch	Missile	17	2	34	0.0230265	0.000439	0.076755		0.08	0.05	2.089
Kaula Island	Air-to-Ground Gunnery Exercise (GUNEX)	30 mm projectiles	800	10	8000	0.0008	0.0000	0.0034		0.02	0.01	0.02
Kaula Island	Air-to-Ground Gunnery Exercise (GUNEX)	Inert 2.75-inch Rockets										
Kaula Island	Air-to-Ground Bombing Exercise (BOMBEX)	Inert Bomb	1	19	19			0.00247				

B.1.3 Emissions from Vessel Activities

Landing Craft Air-Cushioned (LCAC) emissions were estimated using the Microsoft Access-based Navy and MSC Engine Emissions Calculator, Version April 2024 (Naval Sea Systems Command, 2024). Combat Rubber Raiding Craft (CRRC) emissions were based on the information in the Atlantic Fleet Training and Testing Final EIS/OEIS, September 2018.

Tables B-10 and B-11 and Figure B-1 present the emission factors and estimated vessels emissions.

Table B-10: Vessel Emission Factors and References

Ship/Boat Type	Acronym	Vessel Total Emissions, lb/hour							EF Reference
		NO_x	SO_x	CO	VOC	PM_{10}	$PM_{2.5}$	CO_2	
Landing Craft Air-Cushioned	LCAC	114.64	0.00	17.64	4.41	2.20	2.20	20693	Navy and MSC Marine Engine Fuel Consumption and Emission Calculator (see screenshot)
Combat Rubber Raiding Craft	CRRC	0.9538	0.0005	0.02242	0.0128	0.0289	0.0289	87.23	Atlantic Fleet Training and Testing Final EIS/OEIS, September 2018

Tab I Table 1. Ship and Boat Emission Factors (continued)

Ship/Boat Type	Acronym	Emissions Factors (lb/hr) Propulsion Engines + Generators						Engine model[1]	Engines	Use[1]
		HC	CO	NO_x	SO_x	$PM_{10/2.5}$	CO^2			
Landing Craft Air Cushion	LCAC	0.35	1.23	2.93	0.38	0.25	668	T-62T-60-7	2	80 HP
								TF40B	4	3955 HP
Landing Craft Utility	LCU/LCM	0.52	36.21	44.95	3.11	1.57	1,683.91	2- Detroit 12V-71 Diesel engines, twin shaft, 680 hp sustained, used for both LCU and LCM data		
Amphibious Assault Vehicle	AAV-2	0.82	0.76	6.22	1.25	0.26		Detroit Diesel 8V-53T (P-7), Cummins VT 400 903 (P-7A1)		
Mark V	MK V	6.85	27.20	84.43	10.96	3.81	5,395	2x 2285 HP MTU 12V396 TE94 engines		
Rigid Inflatable Boat (zodiac)	RIB-4	0.06	0.34	9.14	1.44	0.15	1,163.88	Dual Caterpillar 3126 DITA, 6 in-line cylinder diesel, turbocharged, aftercooled.		470 HP x2
Combat Rubber Raiding Craft	CRRC	0.0128	0.2242	0.9538	0.0005	0.0289	87.23	55	HP 2-stroke engine	gas diesel EFs for small craft
High Speed Maneuverable Surface Target	HSMST	203.98	496.660	7.100	0.200	0.300	466.84	200	HP - 2 Mercury Optimax outboards	24.6 lb/hr fuel use jp-5
River Command Boat	RCB	1.12	2.81	27.40	4.08	0.66	1591	850	HP X 2	43.5 lb/hr fuel use diesel
River Assault Boat	RAB	0.58	1.46	14.18	2.11	0.34	838	440	HP X 2	22.9 lb/hr fuel use diesel
River Patrol Boat	RPB	0.58	1.46	14.18	2.11	0.34	838	440	HP X 2	22.9 lb/hr fuel use diesel
SEAARK	PB	0.56	1.39	13.54	2.02	0.33	739	420	HP X 2	20.2 lb/hr fuel use

F470 = CRRC

[1] Data from Navy and MSC Marine Engine Fuel Consumption & Emissions Calculator, US Navy, October 2016

U.S. Navy Vessel Emission Data

Generated on 05/27/2024 at 07:04:19 PM

by Navy and MSC Marine Engine Fuel Consumption and Emission Calculator

Vessel Set Totals

	kg NOx	kg SOx	kg CO	kg CO2	kg HC	kg PM
All Crafts Total	52	0	8	9,386	2	1

	kg NOx	kg SOx	kg CO	kg CO2	kg HC	kg PM
All Boat Total	0	0	0	0	0	0

	kg NOx	kg SOx	kg CO	kg CO2	kg HC	kg PM
All Vessel Set Total	52	0	8	9,386	2	1

Vessel 1 of 1

Craft LCAC 75 **Type** LCAC **Propulsion** Gas Turbine

Description

Name LANDING CRAFT, AIR CUSHION **Status** Active **Service** US Navy **DecommDate** **Homeport** Camp Pendleton, CA **PlanYard** Puget Sound (DET) Boston, Boston, MA **Tycom** PS **SLM** 377, 307H **PeraCode** S/S SDO **Command** Assault Craft Unit Five **OpSponsor** N85 **UIC** 21969

Engine: T-62T-40-7 **HP:** 80 **Cycles:** **Use:** SSGTG **No Engines:** 2

Engine: TF40B **HP:** 3955 **Cycles:** **Use:** MPGT **No Engines:** 4

Analysis Parameters

Hrs Underway 1 **Fuel Sulfur %** 0.0015

Analysis Results

Engine Model	HP	Cycles	Use	No. Eng	GPH/Engine	kg NOx	kg SOx	kg CO	kg CO2	kg HC	kg PM
T-62T-40-7	80		SSGTG	2	14.6	1	0	1	303	0	0
TF40B	3955		MPGT	4	219	51	0	8	9,084	1	1
Vessel Total						52	0	8	9,386	2	1

Figure B-1: Vessel Emission Factors

Table B-11: Estimated Vessel Emissions

Site	Activity	Number of Vessels	Number of Training Hours per day (within 3 NM)	Number of Days per Event	Number of Events per year	Total hours per year	Total Pounds per Year							
							NOx	SOx	CO	VOC	HAPs	PM10	PM2.5	CO2e
Palai Olani	Amphibious Operations - Small Boat Operations	4	8	1	17	544	518.87	0.27	121.96	6.96		15.72	15.72	47,453
Waiapuaa Bay	Amphibious Operations - Raid	4	2	3	1	24	2,751.37	-	423.29	105.82		52.91	52.91	496,622
Waiapuaa Bay	Amphibious Operations - Small Boat Operations	4	8	1	17	544	518.87	0.27	121.96	6.96		15.72	15.72	47,453

		Total tons per Year							
		NOx	SOx	CO	VOC	HAPs	PM10	PM2.5	CO2e (MT)
Palai Olani	Amphibious Operations - Small Boat Operations	0.26	0.00	0.06	0.00	-	0.01	0.01	22
Waiapuaa Bay	Amphibious Operations - Raid	1.38	-	0.21	0.05	-	0.03	0.03	225
Waiapuaa Bay	Amphibious Operations - Small Boat Operations	0.26	0.00	0.06	0.00	-	0.01	0.01	22
					0.06			0.04	**268**

B.1.4 Generator Emissions

Emissions were estimated for 2-kilowatt Mobile Electric Power (MEP)-531A and the 60-kilowatt MEP-1070 Military Diesel Generators. Table B-12, Table B-13, and Table B-14 present the estimated daily emissions for each type of generator and the total generator emissions for each site.

Table B-12: Estimated Emissions – MEP-531A

Engine Specifications - Yanmar L48AE-DEG Diesel engine				
Tier	2			
Horsepower	4.2			
Generator Rating, Kw	2			
kW (engine)	2.2	The generator kW and the engine kW in a generator set are related but not directly equal due to several factors including mechanical and electrical efficiencies. Used an efficiency of 90% to convert generator kW to engine kW.		
Fuel Consumption (gal/hr)	0.33	**From equipment specification**		
Number of Engines	1			
KW to HP	0.7457	kw/hp		
g to lbs	453.592	grams/lb		
Days per year				
Hours per day	24			
Pollutants	**Emission Factor (g/kW-hr)**	**Total Hourly Emissions (lbs)**	**Total Daily Emissions (lbs)**	
NOx	7.1250	0.0349	0.84	
CO	8.0000	0.0392	0.94	
HC	0.3750	0.0018	0.04	
PM	0.8000	0.0039	0.09	
SOx	-	0.0236	0.57	
Emissions are based on Tier 2 Standards - see screenshot				
Equations:				
Pollutant hourly emissions (lb/h	**Emission Factor (g/bhp-hr)*engine horsepower (hp)/453.592(g/lb)**			
Reference for % NOx and HC in NOx+NMHC: Bay Area AQMD Policy, June 28, 2004, CARB Emission Factors for CI Diesel Engines – Percent HC in Relation to NMHC + NOx (https://www.baaqmd.gov/~/media/Files/Engineering/policy_and_procedures/Engines/EmissionFactorsforDieselEngines.ashx)				
Sulfur content				
0.5%	by mass	Diesel	Maximum allowable fuel sulfure content: §11-60.1-38 Sulfur oxides from fuel combustion.	
0.33	Fuel Consumption (gal/hr)			
7.10	Fuel density, lb/gal			
0.0236	lb/hr of SOx	Per engine		
22.58	lb CO_2e/gal diesel	See Tab "GHG Emission Factors"		
180.49	lb CO_2e/day			

Table B-13: Estimated Emissions – – MEP-1070

MEP-1070						
Engine Specifications - Cummins QSB4.5 Tier III						
Tier	3					
Horsepower	109					
Generator Rating, Kw	60					
kW (engine)	66.7	The generator kW and the engine kW in a generator set are related but not directly equal due to several factors including mechanical and electrical efficiencies. Used an efficiency of 90% to convert generator kW to engine kW.				
Fuel Consumption (gal/hr)	3.00	See equipment specification https://www.marcorsyscom.marines.mil/Portals/105/PfM/LCES/ES/Power%20Team/Mobile%20Power/Info%20Sheets/GENERATORSET60KW60HZAMMPSSKIDMOUNTED.pdf?ver=2018-11-13-150411-423				
Number of Engines	1					
KW to HP	0.7457	kw/hr				
g to lbs	453.592	grams/lb				
Days per year						
Hours per day	24					
Pollutants	**Emission Factor (g/kW-hr)**	**Total Hourly Emissions (lbs)**	**Total Daily Emissions (lbs)**			
NOx	3.8000	0.5585	13.40			
CO	5.0000	0.7349	17.64			
HC	0.2000	0.0294	0.71			
PM	0.3000	0.0441	1.06			
SOx	-	0.2130	5.11			
Equations:						
Pollutant hourly emissions (lb/h	**Emission Factor (g/bhp-hr)*engine horsepower (hp)/453.592(g/lb)**					
Reference for % NOx and HC in NOx+NMHC: Bay Area AQMD Policy, June 28, 2004, CARB Emission Factors for CI Diesel Engines – Percent HC in Relation to NMHC + NOx (https://www.baaqmd.gov/~/media/Files/Engineering/policy_and_procedures/Engines/EmissionFactorsforDieselEngines.ashx)						
Sulfur content						
0.5%	by mass	Diesel	Maximum allowable fuel sulfure content: §11-60.1-38 Sulfur oxides from fuel combustion.			
3.00	Fuel Consumption (gal/hr)					
7.10	Fuel density, lb/gal					
0.2130	lb/hr of SOx	Per engine				
22.58	lb CO_2e/gal diesel	See Tab "GHG Emission Factors"				
1626	lb CO_2e/day					

Table B-14: Estimated Generator Emissions for Each Site

Site/Activity	Number of Generator	Number of Days per Activity	Number of Activities per year	Total Generator Emissions, Ton/yr						CO_2 emissions, MT/year	Annual Fuel Consumption, gal/year
				NO_x	SO_x	CO	VOC	PM_{10}	$PM_{2.5}$		
North Launch Area 1 - Missile, Rocket, and Aerial Drone Target Set-up (No Launch)	2	3	5	0.20	0.08	0.26	0.01	0.02	0.02	22	2160
North Launch Area 1 - C5ISRT Exercise	3	60	1	1.21	0.46	1.59	0.06	0.10	0.10	133	12960
North Launch Area 1 - C5ISRT Exercise	3	10	28	5.63	2.15	7.41	0.30	0.44	0.44	620	60480
North Launch Area 2 - Missile, Rocket, and Aerial Target Drone Launch	3	3	10	0.60	0.23	0.79	0.03	0.05	0.05	66	6480
North Launch Area 2 - Missile, Rocket, and Aerial Target Drone Launch	3	40	1	0.80	0.31	1.06	0.04	0.06	0.06	89	8640
North Launch Area 2 - Missile, Rocket, and Aerial Drone Target Set-up (No Launch)	2	3	5	0.20	0.08	0.26	0.01	0.02	0.02	22	2160
North Launch Area 2 - C5ISRT Exercise	3	60	1	1.21	0.46	1.59	0.06	0.10	0.10	133	12960
North Launch Area 2 - C5ISRT Exercise	3	10	6	1.21	0.46	1.59	0.06	0.10	0.10	133	12960
North Launch Area 2 - Bivouac (unit, medium, large)	2	10	8	0.07	0.05	0.08	0.00	0.01	0.01	13	1279
South Launch Area - Missile, Rocket, and Aerial Target Drone Launch	3	3	2	0.12	0.05	0.16	0.01	0.01	0.01	13	1296
South Launch Area - Missile, Rocket, and Aerial Target Drone Launch	3	40	1	0.80	0.31	1.06	0.04	0.06	0.06	89	8640
South Launch Area - Missile, Rocket, and Aerial Drone Target Set-up (No Launch)	2	3	5	0.20	0.08	0.26	0.01	0.02	0.02	22	2160
South Launch Area - C5ISRT Exercise	3	60	1	1.21	0.46	1.59	0.06	0.10	0.10	133	12960
South Launch Area - C5ISRT Exercise	3	10	16	3.22	1.23	4.23	0.17	0.25	0.25	354	34560
Palai Olani - Bivouac (unit, medium, large)	2	10	5	0.67	0.26	0.88	0.04	0.05	0.05	74	7200
MDA Hard Stand - C5ISRT Exercise	3	60	1	1.21	0.46	1.59	0.06	0.10	0.10	133	12960
MDA Hard Stand - C5ISRT Exercise	3	10	7	1.41	0.54	1.85	0.07	0.11	0.11	155	15120
MDA Hard Stand - Bivouac (unit, medium, large)	2	10	3	0.03	0.02	0.03	0.00	0.00	0.00	5	480
Airfield Bivouac Area - Bivouac (unit, medium, large)	2	10	21	0.18	0.12	0.20	0.01	0.02	0.02	34	3357
Alternate Bivouac Area - Bivouac (unit, medium, large)	2	10	1	0.01	0.01	0.01	0.00	0.00	0.00	2	160
Forward Arming and Refueling Point Areas	1	10	19	0.08	0.05	0.09	0.00	0.01	0.01	16	1518
Unmanned Aircraft System Launch Area	1	10	43	0.18	0.12	0.20	0.01	0.02	0.02	35	3437
Total				**20.43**	**7.95**	**26.78**	**1.08**	**1.63**	**1.63**	**2,294**	**223,926**

B.1.5 Aircraft Emissions

Fixed-wing and rotary aircraft emissions were estimated for Forward Arming and Refueling Point, Helicopter/Tilt-Rotor Landing Zone operations, and Air-to-Ground Gunnery and Bombing Exercises. Emission factors for most military engines were obtained from the Navy's Aircraft Environmental Support Office memoranda. For those aircraft for which engine data were unavailable from Aircraft Environmental Support Office, emission factors from Air Emissions Guide for Air Force Mobile Source, June 2023, were used. Tables B-15 through B-19 present the aircraft assumptions for the air quality analysis, aircraft emission factors, and aircraft emissions for each operation.

Table B-15: Aircraft Operational Assumptions

Service	Annual of FARP Exercises	Total FARP Exercise Duration (days)	Aircraft Type	Number of aircraft refueled (by type, per day)	Refueling Duration per single aircraft (hours)	Annual Hours Spent with Engines on Refueling at FARP		Annual Landings Associated with FARP Activities	Annual Takeoffs Associated with FARP Activities
Navy	3	1	P-8	2	0.5	12		6	6
			FA-18/F-35	8	0.5	12		24	24
Marine Corps	4	5	KC-130	1	0.5	10		20	20
			MV-22B	40	0.4	320		800	800
Army	9	2	CH-47	1	0.5	9		18	18
			AH-64	16	0.5	144		288	288
Air Force	4	2	Tanker	1	0.5	4		8	8
			Fighter	8	0.5	32		64	64
						543		1228	1228

Notes:
1. FARP operations per DoD Handbook Aircraft Refueling Handbook for Navy/Marine Corps Aircraft (MIL-HDBK-844A(AS) 30 Dec 2003 and specific aircraft NATOPS
2. FARP location for planning: N22.038/W159.782
3. Assume 2 aircraft refueling at any one time.

PMRF LBT EA Landing Zone Operations (LZ Fire Pit) Assumptions for AQ and Noise Impacts Assessment

Service	Annual of LZ Exercises	Total LZ Exercise Duration (days)	Aircraft Type	Number of aircraft using LZ (by type, per day)	LZ Use Duration per single aircraft (hours)	Annual Hours Spent with Engines on, at (on deck) or above (sling load hover) LZ Fire Pit		Annual Landings Associated with LZ Fire Pit Activities	Annual Takeoffs Associated with LZ Fire Pit Activities
Marine Corps	4	2	MV-22B	4	0.4	12.8		32	32
Army	6	2	CH-47	4	0.4	19.2		48	48
						32		80	80

Notes:
1. LZ Fire Pit operations per MCWP 3-11.4 Helicopterborne Operations and MCRP 4-11.3E, Multiservice Helicopter Sling Load
2. LZ Fire Pit location (center) N22.046/W159.799
3. Assume 1 aircraft in the LZ at any one time.

Table B-16: Aircraft Emission Factors

Aircraft Engine Emissions Indices/Factors and Sources

General information							Emissions Factors (lb/operation)							References
Aircraft	Engine Model	Engines (#)	Fuel Flow (lb/hr) /Engine	Fuel Flow (lb/operation)	Fuel Flow (gal/operation)	Mode	CO	NOx	VOC	SOx	$PM_{2.5}$	PM_{10}	CO_2	Source of Emissions Indices Information
P-8	CFM56-7B27 (2)	2		4672	687	Single P-8 LTO with Straight In Arrival	21.58	68.57	2.44	1.73	1.10	1.10	14,770	AESO Memorandum Report No. 2017-09 April 2017, Table 1
P-8	CFM56-7B27 (2)	2		921	135	Idle (for 30 minutes per refueling operation)	16.49	4.42	1.80	0.34	0.06	0.06	2,911	AESO Memorandum Report No. 2017-09 April 2017, Table 1
FA-18E/F	F414-GE-400 (2)	2		2612	384	Single F/A-18E/F LTO with Straight In Arrival	265.30	31.08	80.16	0.97	18.21	18.21	7,824	AESO Memorandum Report No. 9815 I, June 2017, Table 5
FA-18E/F	F414-GE-400 (2)	2		696	102	Idle (for 30 minutes per refueling operation)	68.33	2.21	52.29	0.26	8.80	8.80	2,069	AESO Memorandum Report No. 9815 I, June 2017, Table 5
FA-18E/F	F414-GE-400 (2)	2		696	102	Approach (used for estimating GHG for	68.33	2.21	52.29	0.26	8.80	8.80	2,069	AESO Memorandum Report No. 9815 I, June 2017, Table 5
KC-130	T56-A-16	4				Single KC-130 LTO	4.97	14.20	1.29	1.83	1.02	1.13	5,497	ACAM Model, one LTO for one Aircraft, No maintenance emissions included
KC-130	T56-A-16	4		1512	222	Idle (for 30 minutes per refueling operation)	8.54	9.60	2.12	0.56	1.13	1.25	4,861	Air Emissions Guide for Air Force Mobile Sources, June 2023, Table 2-9. Aircraft Engine Emission Factors for Criteria Pollutants , Table 2-3. GHG Emission Factors for Aircraft Engines
MV-22B	T406-AD-400 (2)	2		1577	232	Vertical Takeoff (Conversion mode) + Landing w/Break (Airplane mode)	5.52	12.92	0.09	0.58	2.17	2.17	5,078	AESO Memorandum Report No. 9946 Revision G May 2017, Table ES-1 VOC = THC x 1.16 x 1.15
MV-22B	T406-AD-400 (2)	2		288	42	Idle (for 0.4 hour per refueling operation)	2.56	1.18	0.04	0.11	0.45	0.45	928	AESO Memorandum Report No. 9946 Revision G May 2017, Table 1 VOC = THC x 1.16 x 1.15
CH-47 (modeled as H-46)	T58-GE-16 (2)	2		366	54	Single H-46 LTO	21.37	1.07	7.83	0.14	1.36	1.36	1,131	AESO Memorandum Report No. 9816 Revision G December 2015, Table 1
CH-47 (modeled as H-46)	T58-GE-16 (2)	2		167	25	Idle (for 30 minutes per refueling operation)	20.26	0.25	8.76	0.06	0.85	0.85	487	AESO Memorandum Report No. 9816 Revision G December 2015, Table 1
CH-47 (modeled as H-46)	T58-GE-16 (2)	2		630	93	Hover (for one hours for GUNEX)	9.68	2.68	1.56	0.23	1.12	1.12	2,005	AESO Memorandum Report No. 9816 Revision G December 2015, Table 1
AH-64 (modeled as H-60)	T700-GE-401C (2)	2		661	97	Single H-60 LTO	12.31	3.36	1.58	0.24	2.34	2.34	2,110	AESO Memorandum Report No. 9929 Revision D December 2019 , Table S-1
AH-64 (modeled as H-60)	T700-GE-700 (2)	2		134	20	Idle (for 30 minutes per refueling operation)	6.20	0.45	0.07	0.05	0.18	0.20	431	To match engine information, used Air Emissions Guide for Air Force Mobile Sources, June 2023, Table 2-9. Aircraft Engine Emission Factors for Criteria Pollutants , Table 2-3. GHG Emission Factors for Aircraft Engines
Air Force Tanker - Modeled as KC-135	J57-P-22	4				Single KC-135 LTO	90.30	15.93	91.32	3.06	2.30	2.56	9,200	ACAM Model, one LTO for one Aircraft, No maintenance emissions included
Air Force Tanker - Modeled as KC-135	J57-P-22	4		2174	320	Idle (for 30 minutes per refueling operation)	128.81	5.39	128.33	0.80	14.94	16.61	6,989	Air Emissions Guide for Air Force Mobile Sources, June 2023, Table 2-9. Aircraft Engine Emission Factors for Criteria Pollutants , Table 2-3. GHG Emission Factors for Aircraft Engines
Air Force Fighter - Modeled as FA-18E/F	F414-GE-400 (2)	2		2612	384	Single F/A-18E/F LTO with Straight In Arrival	265.30	31.08	80.16	0.97	18.21	18.21	7,824	AESO Memorandum Report No. 9815 I, June 2017, Table 5
Air Force Fighter - Modeled as FA-18E/F	F414-GE-400 (2)	2		696	102	Idle (for 30 minutes per refueling operation)	68.33	2.21	52.29	0.26	8.80	8.80	2,069	AESO Memorandum Report No. 9815 I, June 2017, Table 5

Table B-17: Aircraft Emission - LZ Fire Pit

Aircraft	Annual of FARP Exercises	Total FARP Exercise Duration (days)	Annual LTOs	Number of aircraft refueled (by type, per day)	Emissions (lb/operation) CO	NOx	VOC	SOx	$PM_{2.5}$	PM_{10}	CO_2
MV-22B (LTO)	4	2	32	4	176.64	413.44	2.99	18.67	69.44	69.44	162,492
MV-22B (Operation)	4	2		4	82.0224	37.69344	1.23	3.41	14.47	14.47	29,685
CH-47 (modeled as H-46) (LTO)	6	2	48	4	1025.76	51.36	375.91	6.50	65.28	65.28	54,264
CH-47 (Operation)	6	2		4	972.3408	11.86368	420.27	2.97	40.56	40.56	23,383
				Total, lbs./year	2256.763	514.3571	800.3964	31.54768	189.7501	189.7501	269822.93
				Total, tons/year	1.13	0.26	0.40	0.02	0.09	0.09	
				MT/year							122

Table B-18: Aircraft Emission - FARP

Aircraft	Annual of FARP Exercises	Total FARP Exercise Duration (days)	Annual LTOs	Number of aircraft refueled (by type, per	Emissions (lb/operation) CO	NOx	VOC	SOx	$PM_{2.5}$	PM_{10}	CO_2
P-8 (LTO)	3	1	6	2	129.48	411.42	14.63	10.37	6.60	6.60	88,618
P-8 (Refueling)	3	1		2	98.9154	26.5248	10.80	2.04	0.38	0.38	17,468
FA-18E/F (LTO)	3	1	24	8	6367.2	745.92	1923.72	23.19	437.04	437.04	187,776
FA-18E/F (Refueling)	3	1		8	1639.999	53.11872	1254.96	6.18	211.14	211.14	49,661
KC-130 (LTO)	4	5	20	1	99.36	284.08	25.80	36.60	20.32	22.52	109,944
KC-130 (Refueling)	4	5		1	170.856	192.024	42.34	11.19	22.68	25.10	97,211
MV-22B (LTO)	4	5	800	40	4416	10336	74.70	466.79	1736.00	1736.00	4,062,288
MV-22B (Refueling)	4	5		40	2050.56	942.336	30.74	85.25	361.73	361.73	742,118
CH-47 (modeled as H-46) (LTO)	9	2	18	1	384.66	19.26	140.97	2.44	24.48	24.48	20,349
CH-47 (modeled as H-46) (Refueling)	9	2		1	364.6278	4.44888	157.60	1.11	15.21	15.21	8,769
AH-64 (modeled as H-60) (LTO)	9	2	288	16	3545.28	967.68	453.74	70.44	673.92	673.92	607,579
AH-64 (Refueling)	9	2		16	1784.494	129.6691	19.30	14.28	51.33	57.12	124,059
Air Force Tanker - Modeled as KC-135 (LTO)	4	2	8	1	722.4	127.424	730.59	24.50	18.42	20.46	73,600
Air Force Tanker - Modeled as KC-135 (Refueling)	4	2		1	1030.476	43.13216	1026.65	6.44	119.48	132.87	55,909
Air Force Fighter - Modeled as FA-18E/F (LTO)	4	2	64	8	16979.2	1989.12	5129.92	61.85	1165.44	1165.44	500,735
Air Force Fighter - Modeled as FA-18E/F (Refueling)	4	2		8	4373.33	141.6499	3346.57	16.48	563.04	563.04	132,429
				Total, lbs./year	44156.84	16413.81	14383.03	839.1583	5427.195	5453.043	6878513.4
				Total, tons/year	22.08	8.21	7.19	0.42	2.71	2.73	
				MT/year							3,120

Table B-19: Aircraft Emission - Kaula Island

Aircraft	Annual # of Air-to-Ground Gunnery Exercises (GUNEX)	Annual # of Air-to-Ground Bombing Exercise (BOMBEX)	Annual LTOs	Emissions (lb/operation) CO	NOx	VOC	SOx	$PM_{2.5}$	PM_{10}	CO_2
FA-18E/F (LTO)		19	19	5040.7	590.52	1522.95	18.36	345.99	345.99	148,656
CH-47 (modeled as H-46) (LTO)	10		10	213.7	10.7	78.32	1.35	13.60	13.60	11,305
CH-47 (modeled as H-46) (Hover for one hours for GUNEX)	10			96.831	26.775	15.6492	2.331	11.214	11.214	20,047
			Total, lbs./year	5351.23	628.00	1616.91	22.05	370.80	370.80	180,007
			Total, tons/year	2.68	0.31	0.81	0.01	0.19	0.19	
			MT/year							82

B.1.6 Estimated Emissions for the Proposed Action

Table B-20 presents the estimated emissions for each site. Table B-21 presents the estimated emissions for PMRF Barking Sands and Kaula Island. Table B-22 shows the estimated total Hazardous Air Pollutant Emissions for the Proposed Action.

Table B-20: Estimated Emissions by Site

Site/Emissions	Total Emissions, ton/year						CO_2e
	NO_x	SO_x	CO	VOC	PM_{10}	$PM_{2.5}$	MT/year
North Launch Area 1	7.27	2.69	12.71	0.62	49.95	5.64	1,083
North Launch Area 2	4.51	1.59	10.12	0.53	50.33	5.76	849
South Launch Area	5.77	2.12	10.12	0.49	55.30	6.09	865
Palai Olani	1.27	0.27	3.58	0.55	0.60	0.27	343
Waiapuaa Bay	1.64	0.00	0.31	0.06	0.63	0.10	250
Missile Defense Agency Hard Stand	2.77	1.02	5.60	0.29	16.80	1.96	477
Airfield Bivouac Area	0.50	0.12	6.27	0.45	1.80	0.46	540
Alternate Bivouac Area	0.02	0.01	0.30	0.02	0.09	0.02	26
Forward Arming and Refueling Point Areas	8.31	0.47	22.45	7.22	7.48	3.21	3,161
Unmanned Aircraft System Launch Area	0.19	0.12	0.27	0.01	2.15	0.24	41
Ground Maneuver Area	0.00	0.00	0.08	0.01	0.02	0.01	7
Kaula Island	0.315	0.01	2.68	0.81	0.201	0.20	111

Table B-21: Estimated Emissions for each Location

Site/Emissions	Total Emissions, ton/year						CO_2e
	NO_x	SO_x	CO	VOC	PM_{10}	$PM_{2.5}$	MT/year
PMRF Barking Sands	32.23	8.40	71.80	10.26	185.16	23.75	7,642
Kaula Island	0.31	0.011	2.68	0.81	0.20	0.20	111
Total	**32.55**	**8.41**	**74.48**	**11.07**	**185.36**	**23.95**	**7,753**

Table B-22: Estimated Total HAP Emissions for the Proposed Action

	HAP Emissions, Ton/yr						
Pollutant	Aircraft	Vessel	Military Vehicle	POV	Generators	Total	Main Contributing Activity
1,3 Butadiene	0.00007		0.00011	0.02202	0.00002	0.0222	Personnel Commute
2,2,4-Trimethylpentane		0.0000002	0.00031	0.06179	0.000000	0.0621	Personnel Commute
Acetaldehyde	0.00018	0.0000003	0.00013	0.02508	0.00009	0.0255	Personnel Commute
Acrolein	0.00010	0.0000001	0.00003	0.00612	0.00000	0.0063	Personnel Commute
Benzene	0.00007	0.0000001	0.00046	0.09009	0.00002	0.0906	Personnel Commute
Ethylbenzene	0.00001		0.00020	0.03915	0.00000	0.0394	Personnel Commute
Formaldehyde	0.00052	0.0000013	0.00026	0.05154	0.00019	0.0525	Personnel Commute
Hexane		0.0000001	0.00019	0.03671	0.00000	0.0369	Personnel Commute
Methanol	0.00008					0.00008	Aircraft
Naphthalene	0.00002	0.0000009	0.00001	0.00107	0.00000	0.0011	Personnel Commute
Phenol	0.00003					0.00003	Personnel Commute
Propanal	0.00003	0.0000000	0.00001	0.00168	0.00005	0.0018	Personnel Commute
Styrene	0.00001		0.00016	0.03120	0.00000	0.0314	Personnel Commute
Toluene	0.00003	0.0000001	0.00097	0.19149	0.00001	0.1925	Personnel Commute
Xylenes (Mixed Isomers)	0.00002	0.0000000	0.00078	0.15463	0.00000	0.1554	Personnel Commute

B.1.7 Receptors

Identification of receptors, including sensitive receptors, is important to the air quality impact analysis. Sensitive receptors are individuals in hospitals, schools, daycare facilities, elderly housing convalescent facilities, or other sites who are more susceptible to adverse effects of exposure to air pollutants. Table B-23 presents the location and distance of the closest receptor and closest sensitive receptor relative to each site.

Table B-23: Distances to Closest Receptors

Site	Closest Receptor			Closest Sensitive Receptor		
	Name	Direction	Distance, mile	Name	Direction	Distance, mile
North Launch Area 1	Polihale State Park	N	<0.1	Polihale State Park	N	<0.1
North Launch Area 2	Polihale State Park	NE	1	Polihale State Park	NE	1
South Launch Area	Kokole Point	SW	0.2	Kokole Point	SW	0.2
Palai Olani	Mana Japanese Cemetery	SW	0.7	Kekaha Elementary School	SE	6.7
Waiapuaa Bay	Barking Sand Beach Cottages	NW	0.1	Barking Sand Beach Cottages	NW	0.1
Missile Defense Agency Hard Stand	Shenanigans Restaurant	NW	0.6	Kekaha Elementary School	SE	3.1
Airfield Bivouac Area	Kauai Veteran's Eternal Memorial	NE	0.1	Kekaha Elementary School	SE	6.0
Alternate Bivouac Area	Mana Japanese Cemetery	SW	1.0	Kekaha Elementary School	SE	6.7
Forward Arming and Refueling Point Areas	Mana Japanese Cemetery	SW	0.1	Kekaha Elementary School	SE	6.2
Unmanned Aircraft System Launch Area	Barking Sand Beach Cottages	SE	0.6	Barking Sand Beach Cottages	SE	0.6
Ground Maneuver Area	Polihale State Park	N	<0.1	Polihale State Park	N	<0.1
Kaula Island	No receptor as the island has no human population. It is accessible only with permission from the U.S. Navy.					

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