Army Mountain Top Experiment

Environmental Assessment

May 1995

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TITLE OF PROPOSED ACTION: Army Mountain Top Experiment

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The Army Mountain Top Experiment would be conducted to demonstrate the ability to detect; track; and engage a cruise missile beyond the line-of-sight of a ground-based air-defense system radar. The proposed action would take place at the Pacific Missile Range Facility (PRMF)-Barking Sands, Kauai, Hawaii, to take advantage of the sensors and target drones being used as part of ongoing Navy exercises. The proposed program would include the temporary deployment of a PATRIOT Fire Unit and about 60 personnel to the PMRF-Barking Sands; launching of target drones to simulate cruise missiles; captive carry tests of a PATRIOT seeker in a C-130 aircraft; and computer simulations. Up to four intercept tests using an unarmed PATRIOT missile may also be conducted as a follow-on activity. Since this follow-on activity is reasonably foreseeable, it has been analyzed in this EA.

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Executive Summary

EXECUTIVE SUMMARY

Introduction

The purpose of this Environmental Assessment (EA) is to analyze the potential environmental consequences of the proposed U.S. Army Mountain Top Experiment (AMTE) program activities in compliance with the National Environmental Policy Act (NEPA); Department of Defense (DOD) Directive 6050.1, *Environmental Effects in the United States of Department of Defense Actions*; Army Regulation (AR) 200-2, *Environmental Effects of Army Actions*, and Chief of Naval Operations Instruction 5090.1B, *Environmental and Natural Resources Program Manual*.

The U.S. Army Program Executive Office Missile Defense is the management office for the AMTE program. The AMTE program would demonstrate the ability to detect, track, and engage a cruise missile beyond the line of sight (BLOS) of a ground-based air-defense system radar. Development of this capability is desirable because the range of ground-based detection and tracking of cruise missiles is limited by interference of geographic terrain and curvature of the earth. The present global trend toward cruise missiles with higher speed, lower flight altitude, and reduced radar cross section has decreased the available time for reaction and engagement of cruise missiles by ground-based air-defense systems.

Test Program Activities

The Army proposes to conduct captive carry tests and virtual engagement simulations at the Pacific Missile Range Facility (PMRF)-Barking Sands, Kauai, Hawaii. The AMTE program would use target acquisition and tracking information from U.S. Navy radars located at the PMRF-Kokee site, approximately 3,800 feet above mean sea level, which would serve as surrogate airborne sensors to demonstrate a BLOS engagement of a target drone to simulate a cruise missile and assess associated system integration issues. These tracking data would be transmitted to a PATRIOT missile Fire Unit located at the Kauai Test Facility.

The initial program activities would consist of captive carry and virtual engagement tests. Captive carry tests would consist of using a target drone flown from the PMRF-Barking Sands to simulate a cruise missile. The Navy radars would acquire and track the target drone. This tracking data would be transmitted to the PATRIOT missile Fire Unit. The Fire Unit would in turn transmit tracking data to a PATRIOT missile seeker in a C-130 aircraft flying over the open ocean about 20 nautical miles from land. The virtual engagement test activities would be similar to the captive carry tests, but the range and Navy radar tracking data would be used as input to computer simulations of missile intercept. The C-130 aircraft would not be required. No live firing of PATRIOT missiles would occur during these initial test activities.

Up to four intercept tests using an unarmed PATRIOT missile, although not currently planned, were analyzed in the AMTE EA because they may be conducted as a follow-on program. These tests would be performed in a similar manner as the captive carry tests,

except the PATRIOT Fire Unit would process the Navy radar tracking data and fire a PATRIOT missile at the target drone. For these tests, the PATRIOT launching station would be located at the Kauai Test Facility within the PMRF-Barking Sands. The PATRIOT system radar would be located a few hundred feet to the east of the launch station or at one of two optional sites south of the Nohili ditch within the PMRF-Barking Sands.

Results

The analyses detailed in Chapter 4 indicated that implementation of the AMTE program would not pose short-term, long-term, or cumulative impacts on these environmental resources at the proposed location.

Air Quality – Program activities would result in exhaust products from target drones, portable generators, and PATRIOT missiles. Missile and drone launches are brief, discrete events, and exhaust products are expected to rapidly disperse.

Airspace – Proposed AMTE activities would take place in existing Special Use Airspace that is cleared of nonparticipating aircraft. No changes in airspace use or existing airspace coordination procedures would be required.

Biological Resources – Birds may flush during sharp, loud noises but return to normal behavior within a short time. Launch noise would be infrequent and of very short duration. Vegetation is sparse at the launch sites, and any ground fire would be quickly extinguished. Birds are not expected to remain in the radar beam long enough to be adversely affected by electromagnetic radiation. Prior to launches, the missile impact areas would be surveyed for the presence of Federally protected marine wildlife, and launch would be delayed if any of these species are observed.

Cultural Resources – The only historic property identified within the PMRF is the Nohili Dune which is located approximately 150 feet from the missile launch pad. Adherence with cultural resource mandates, consultation with applicable agencies, briefing of personnel on the importance of cultural resources, and protecting cultural resources from fire and fire-fighting damage will reduce the potential for adverse effects to non-adverse levels.

Geology and Soils – Small amounts of emission products would be deposited on soil near the PATRIOT missile and target drone launch sites. No measurable increase in aluminum compounds is expected from these emissions. PATRIOT vehicles would park on previously disturbed areas and are not expected to increase soil erosion.

Hazardous Material and Waste – Proposed AMTE activities would create small amounts of hazardous waste. Proper handling, use, and disposal of such waste is routine and addressed in standard operating procedures. In the event of an intercept, jet fuel and lubricants would be released. The fuel and lubricant, if released, would rapidly evaporate and be diluted in sea water. PATRIOT missile and target drone debris is expected to dissolve very slowly and is not expected to affect marine life.

Health and Safety – Existing safety operation manuals and procedures for missile testing would be followed to minimize any risk to personnel health and safety. All flight plans, trajectories, and debris impact areas would be approved by the U.S. Navy prior to testing. A Ground Hazard Area would be established for each launch event to exclude personnel from the area of potential missile debris impact in the event of a launch failure. It is anticipated that the Ground Hazard Area would be within the PMRF-Barking Sands boundary. If the Ground Hazard Area is determined to be outside the PMRF-Barking Sands boundary, additional analysis and documentation would be required. Electromagnetic radiation hazard zones would be established and clearly marked in accordance with the standard operating procedures of the PATRIOT radar to protect workers from any hazardous exposure.

Infrastructure – About 60 temporary personnel would be required to support the AMTE program. The additional intermittent demands on electrical, wastewater, solid waste, and water systems would be negligible and within current capacities of the PMRF-Barking Sands. The addition of 20 vehicles commuting on a temporary basis to the PMRF-Barking Sands would have a minimal impact on transportation routes.

Land Use – AMTE activities would be consistent with existing uses of Federal land on the PMRF-Barking Sands. Existing launch sites would be used for PATRIOT missile and target drone launches. Launches would occur during times when public access to recreation areas is already restricted. The proposed PATRIOT radar sites and electromagnetic radiation hazard areas would not require land use modification.

Noise – Personnel working near generators would wear protective hearing devices as required. During launches, only personnel located in PATRIOT shelters or hardened structures would be inside the Ground Hazard Area. Noise levels outside the Ground Hazard Area would be below regulatory requirements for hearing protection. The nearest noise-sensitive community on base is approximately five miles from the launch site, and the nearest off-base community, Kekaha, is approximately eight miles away.

Socioeconomics – The addition of about 60 temporary personnel is expected to result in a small beneficial effect on the local economy. Program personnel are anticipated to be on Kauai during one to three periods of activity. Each period of activity may last from 1 to 2 months.

Water – The quantity of emission products released to surface water would be minimal and dispersed over a broad area. PATRIOT and target drone debris falling into the ocean is not expected to adversely affect water quality.

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Acronyms and Abbreviations

ACRONYMS AND ABBREVIATIONS

$\mu g/m^3$	microgram(s) per cubic meter
ACGIH	American Conference of Government Industrial Hygienists
ACTD	Advanced Concept Technology Demonstration
AFB	Air Force Base
Al_2O_3	Aluminum oxide
AMTE	Army Mountain Top Experiment
AR	Army Regulation
ASETS	Airborne Seeker Evaluation and Test System
BLOS	Beyond Line of Sight
CCT	Captive Carry Test
CEC	Cooperative Engagement Capability
CFR	Code of Federal Regulations
dB	decibel(s)
dBA	A-weighted decibel(s)
dBC	C-weighted decibel(s)
DOD	Department of Defense
DOT	Department of Transportation
DRMO	Defense Reutilization and Marketing Office
EA	Environmental Assessment
ECS	Engagement Control Station
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency

FAA	Federal Aviation Administration
ft	foot (feet)
HCl	Hydrogen chloride
ICAO	International Civil Aviation Organization
ICC	Information and Coordination Central
IFR	Instrument Flight Rules
JATO	Jet Assisted Takeoff
KTF	Kauai Test Facility
L_{dn}	Day-night Average Sound Level
L_{max}	Maximum Sound Level
NAGPRA	Native American Graves Protection and Repatriation Act
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
OSHA	Occupational Safety and Health Administration
PM-10	Particulate matter with a hydrodynamic diameter less than or equal to 10 microns
PMRF	Pacific Missile Range Facility
ppm	part(s) per million
ROI	Region of Influence
RSTER	Radar Surveillance Technology Experimental Radar
SHPO	State Historic Preservation Officer
SOP	Standard Operating Procedure
SPEGL	Short-term Public Emergency Guidance Level
TLV	Threshold Limit Value

TLV-C	Threshold Limit Value - Ceiling Limit
TLV-TWA	Threshold Limit Value - Time-weighted Average Concentration
VE	Virtual Engagement

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1.0 Purpose of and Need for the Proposed Action

1.0 PURPOSE OF AND NEED FOR THE PROPOSED ACTION

The National Environmental Policy Act (NEPA) of 1969, as amended; the Council on Environmental Quality regulations implementing the NEPA (40 Code of Federal Regulations [CFR] 1500-1508); Department of Defense (DOD) Directive 6050.1, *Environmental Effects in the United States of DOD Actions* (U.S. Department of Defense, 1979); Army Regulation (AR) 200-2, *Environmental Effects of Army Actions* (U.S. Department of the Army, 1991); and Chief of Naval Operations Instruction 5090.1B (U.S. Department of the Navy, 1994), which implements these laws and regulations, direct the DOD and U.S. Army officials to consider environmental consequences when authorizing or approving Federal actions. Accordingly, this Environmental Assessment (EA) analyzes the potential environmental consequences of the U.S. Army Mountain Top Experiment (AMTE) program participation in the U.S. Navy exercises at the Pacific Missile Range Facility (PMRF), Kauai, Hawaii. The environmental resource areas analyzed herein reflect the unique features of the AMTE program and the environmental setting.

1.1 PURPOSE AND NEED

Purpose

The purpose of the AMTE program is to demonstrate the ability to detect, track, and engage a cruise missile beyond the line of sight of a ground-based air-defense system radar. Surrogate airborne sensors located at the PMRF-Kokee site would be used to track a target drone and transmit tracking information to a ground-based air-defense testbed (a system representation consisting partially of developed hardware and/or software and partially of prototype hardware and/or software), that would, in turn, engage the target. The testbed would be located at the Kauai Test Facility (KTF), a tenant within the PMRF-Barking Sands.

Need

The cruise missile threat, which emerged in the late 1960s, has continued to proliferate and evolve in sophistication. Any country or independent interest can potentially obtain cruise missile capability. Current cruise missiles have the potential to challenge existing weapon detection systems by flying low, using terrain-following flight paths, and presenting small radar signatures which are difficult to separate from surface background clutter. These cruise missiles may soon pose a threat to U.S. ground forces and associated infrastructure. The effectiveness of cruise missiles against military targets was reinforced by U.S. success in using cruise missiles during Operation Desert Storm.

Current ground-based defense capabilities are limited to line-of-sight between the weapons system and the target. This severely limits the amount of time available for ground-based air defense systems to respond and intercept the incoming missile. The trend toward

cruise missiles with higher speed, lower altitudes, and stealth technology further increases the threat. Beyond-line-of-sight (BLOS) or over-the-horizon engagement capability would extend the time available for an air defense system to respond to the threat.

1.2 DECISIONS TO BE MADE

The decisions to be made by the U.S. Army and supported by information contained within this EA are:

- Whether to proceed with the AMTE program
- Whether to conduct intercept tests using approximately four PATRIOT missiles without ordnance at the PMRF for the sensors in the AMTE program
- Selection of the location for the PATRIOT radar during up to four launches of an unarmed PATRIOT missile

1.3 RELATED ENVIRONMENTAL DOCUMENTATION

The AMTE program would use data from Navy radars to be installed at the PMRF-Kokee site. The Navy action, which is similar to the actions of this program, has been previously documented in three EAs:

- *Environmental Assessment, Mountaintop Sensor Integration and Test Program* (1993a)
- *Supplemental Environmental Assessment, Mountaintop Sensor Integration and Test Program* (1995a)
- *Environmental Assessment, Advanced Concept Technology Demonstration of the Wide Area Defense Program* (1995b)

Each of these EAs resulted in a Finding of No Significant Impact.

The environmental analysis presented in this EA has been prepared using appropriate information from the following:

- *Final Environmental Impact Statement for the Strategic Target System* (U.S. Army Strategic Defense Command, 1992b)
- *Kauai Test Facility (KTF) Environmental Assessment* (U.S. Department of Energy, 1992)

The Strategic Target System Environmental Impact Statement (EIS) resulted in a Record of Decision to conduct launches of strategic targets from the KTF. The KTF EA, which

analyzed the continued operation of KTF facilities to support rail-launched rockets, vertical launches, and the construction of new facilities, resulted in a Finding of No Significant Impact.

1.4 APPLICABLE REGULATORY REQUIREMENTS AND COORDINATION

All applicable laws and regulations which would be followed are described in Appendix B.

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2.0 Description of Proposed Action and Alternatives

2.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

This chapter describes the proposed action, alternatives considered but eliminated from further study, and the no-action alternative.

2.1 BACKGROUND

The U.S. Navy plans to conduct approximately seven Advanced Concept Technology Demonstration (ACTD) system tests over the next 3 years at the PMRF. The exercises would use facilities on the PMRF and PMRF-Kokee sites, on the island of Kauai, Hawaii (figure 2-1).

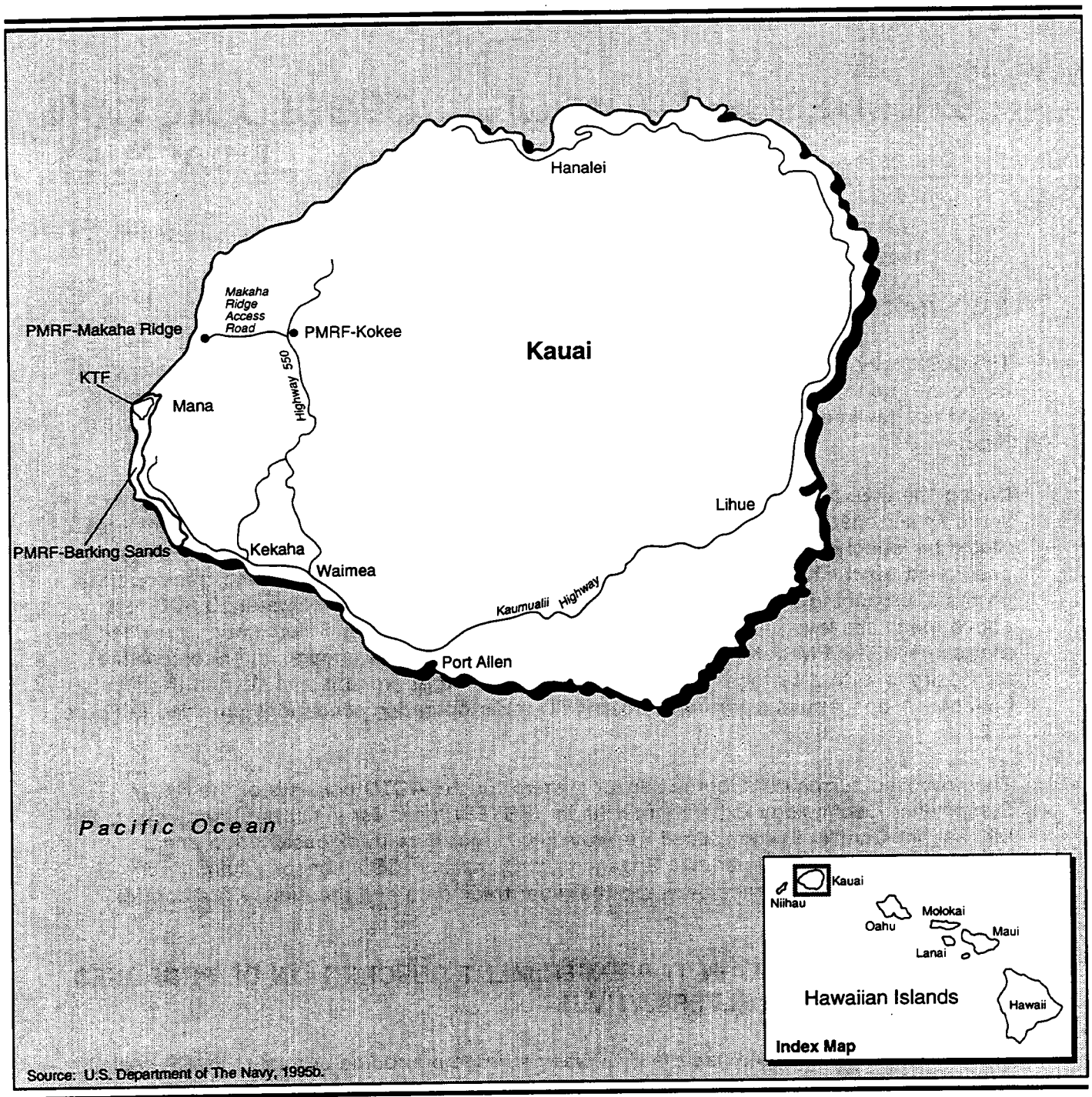
During the U.S. Navy ACTD exercises, sensors located at the PMRF-Kokee site would serve as surrogate airborne sensors. Low-flying target drones simulating cruise missiles would be launched and controlled from the PMRF-Barking Sands. A U.S. Navy ship positioned off the northwest coast of Kauai would receive surveillance and tracking data on the approaching target drone from the PMRF-Kokee site, approximately 3,800 feet above mean sea level. Using the detection and tracking data and illumination provided by the radars at the PMRF-Kokee site, the U.S. Navy ship would engage and intercept the target drone with a surface-to-air missile while the target drone is still beyond the ship's horizon. A conceptual diagram of this ACTD radar operation scenario is provided in figure 2-2.

The proposed surrogate airborne sensor system for the ACTD consists of the Radar Surveillance Technology Experimental Radar (RSTER), used for initial target detection; the MK-74 Fire Control System, used for providing target data track designation and illumination; and the Cooperative Engagement Capability (CEC) sensor data network system that would interface between the radar track data and the missile fire-control computers.

2.2 ARMY MOUNTAIN TOP EXPERIMENT DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

The AMTE program would use the U.S. Navy surrogate airborne sensor at PMRF-Kokee site to demonstrate a BLOS engagement of a cruise missile by an Army ground-based air defense system and assess associated system integration issues. To achieve these objectives, captive carry tests (CCTs) and virtual engagement (VE) simulations would be conducted in conjunction with the U.S. Navy exercises.

The AMTE program at the PMRF-Barking Sands (figure 2-3), would use data from the U.S. Navy's RSTER and the MK-74 fire-control radar located at the PMRF-Kokee site. These elevated sensors function as surrogate airborne sensors, providing BLOS surveillance and tracking of low-altitude target drones. The ground-based air-defense testbed fire-control unit (consisting of PATRIOT Fire Unit components) would be located at the KTF, which is



EXPLANATION

Area Enlarged

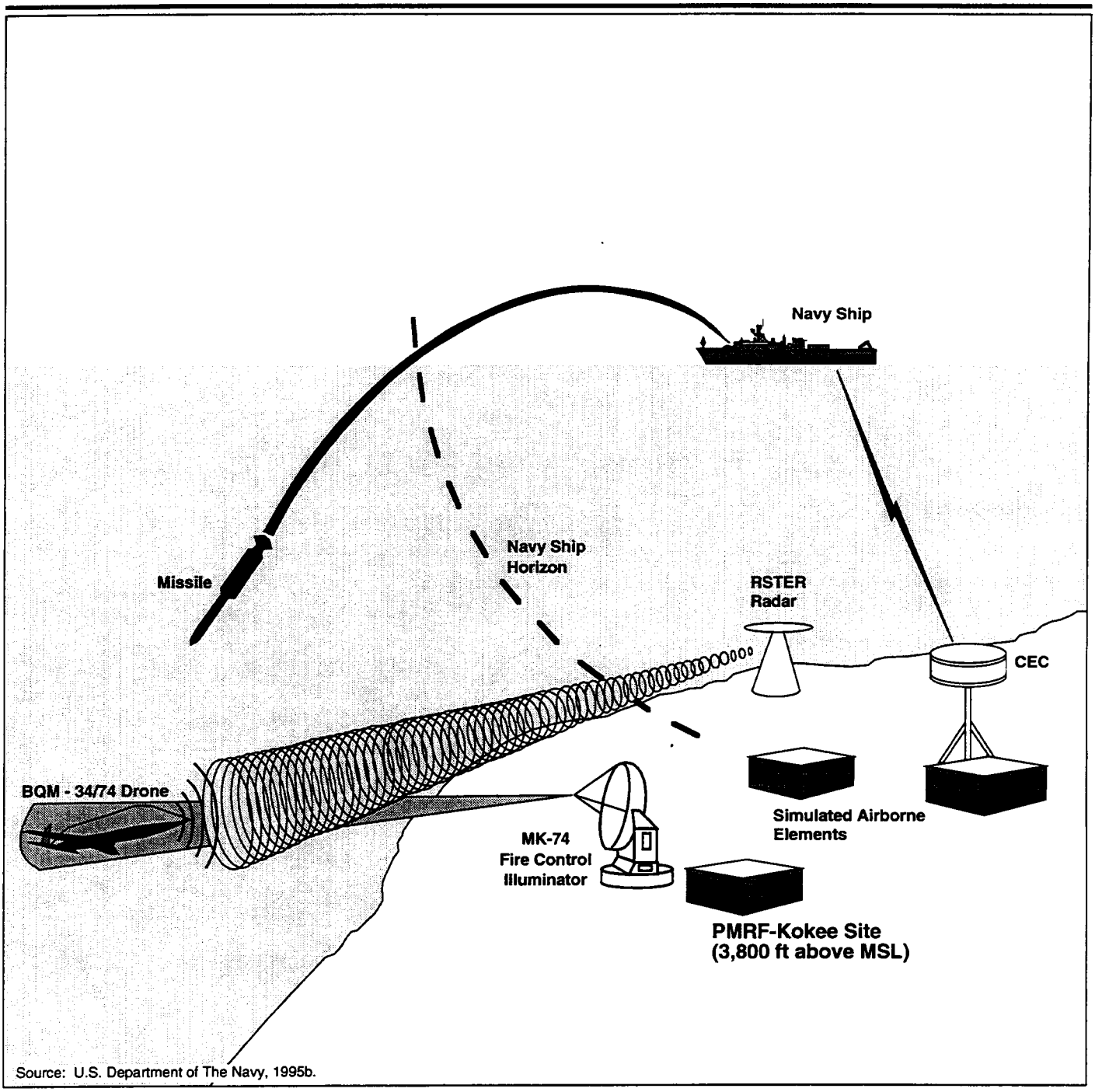
Vicinity Location Map

0 4 8 Kilometers

0 2.5 5 Miles

Kauai, Hawaii

Figure 2-1



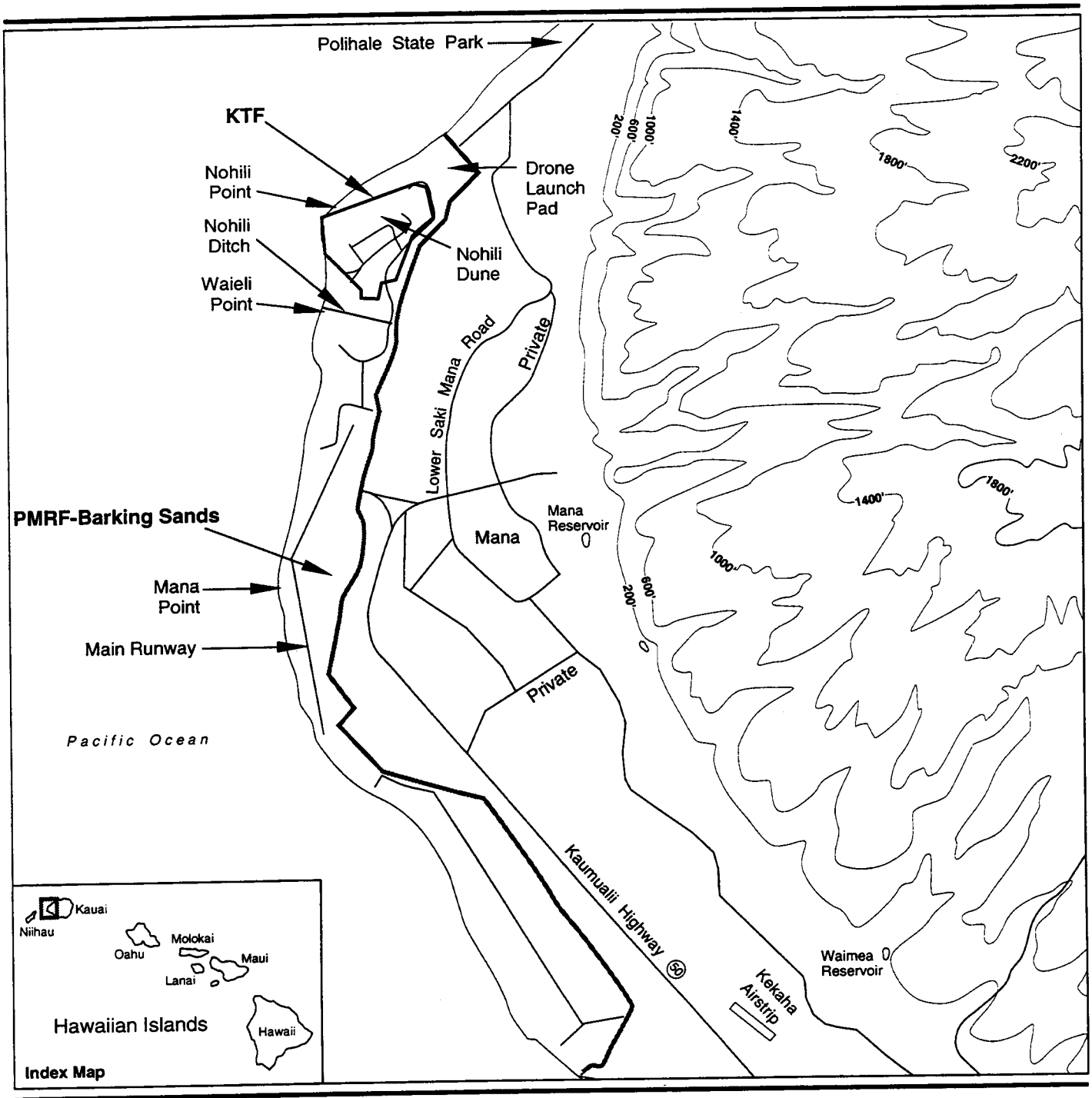
Source: U.S. Department of The Navy, 1995b.

EXPLANATION

MSL - Mean Sea Level

U.S. Navy ACTD Concept

Figure 2-2



EXPLANATION

Area Enlarged

PMRF-Barking Sands Location Map

Kauai, Hawaii

0 2,500 5,000 Feet

0 750 1,500 Meters

Figure 2-3

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operated by the U.S. Department of Energy – Sandia National Laboratories as a tenant to the PMRF. During the AMTE, elevated sensors would pass missile tracking data to the mobile PATRIOT Fire Unit; the Fire Unit would process the data and conduct simulated cruise missile engagements. Actual engagements of target drones may also be conducted. The surrogate cruise missile for the AMTE would be BQM-34 or BQM-74 target drones launched and flown from PMRF-Barking Sands. Intercepts would occur beyond the air-defense testbed radar line of sight, approximately 22 to 43 miles off shore. The AMTE program would utilize existing KTF and PMRF facilities (including the existing PMRF Operational Areas and Special Use Airspace), and mobile test equipment would be placed on an area that has been previously disturbed.

The U.S. Army air-defense testbed would include the PATRIOT Information and Coordination Central that provides battalion-level command, control, and communication computer interface; the Engagement Control Station that performs fire-control calculations and executes launch commands; a PATRIOT radar that transmits updated target drone intercept data to the C-130/Airborne Seeker Evaluation and Test System (ASETS) CCT platform and VE simulations; and a mobile Electric Power Plant. Other associated ground equipment would include the ACTD Wide Area Defense radar and processing sensors which would provide tracking data to the Information and Coordination Central.

During the CCTs, VEs, and up to four launches of an unarmed PATRIOT missile, approximately 60 personnel would be required.

2.2.1 PRETEST ACTIVITIES

Equipment Transportation

Equipment for the AMTE program would be flown from the point of origin to the PMRF-Barking Sands airfield in U.S. Air Force C-5 or C-17 cargo aircraft. These components would be transported following all appropriate and applicable regulatory requirements to ensure their safe transportation. The regulations governing the transportation of hazardous materials consist of the general Federal regulations administered by the U.S. Department of Transportation and more specific safe operating procedures and contingency plans established for hazardous activities by the U.S. Department of Defense.

The Bureau of Explosives Tariff No. BOE-6000-L, *Hazardous Materials Regulations of the Department of Transportation, by Air, Rail, Highway, and Water Including Specifications for Shipping Containers* (Association of American Railroads, 1993), is the Federal document used by the U.S. Department of Transportation to regulate transportation of hazardous materials in the United States as prescribed under the Hazardous Materials Transportation Act. Appropriate safety measures as described in AR 385-64, *Ammunition and Explosives Safety Standards* (U.S. Department of the Army, 1987) would also be used during the transportation of any explosive materials.

From the PMRF-Barking Sands airfield all equipment would be driven or transported to the area of use via on-base roads. The only planned use of public roads during program activities would be for the transportation of project personnel in passenger cars or buses.

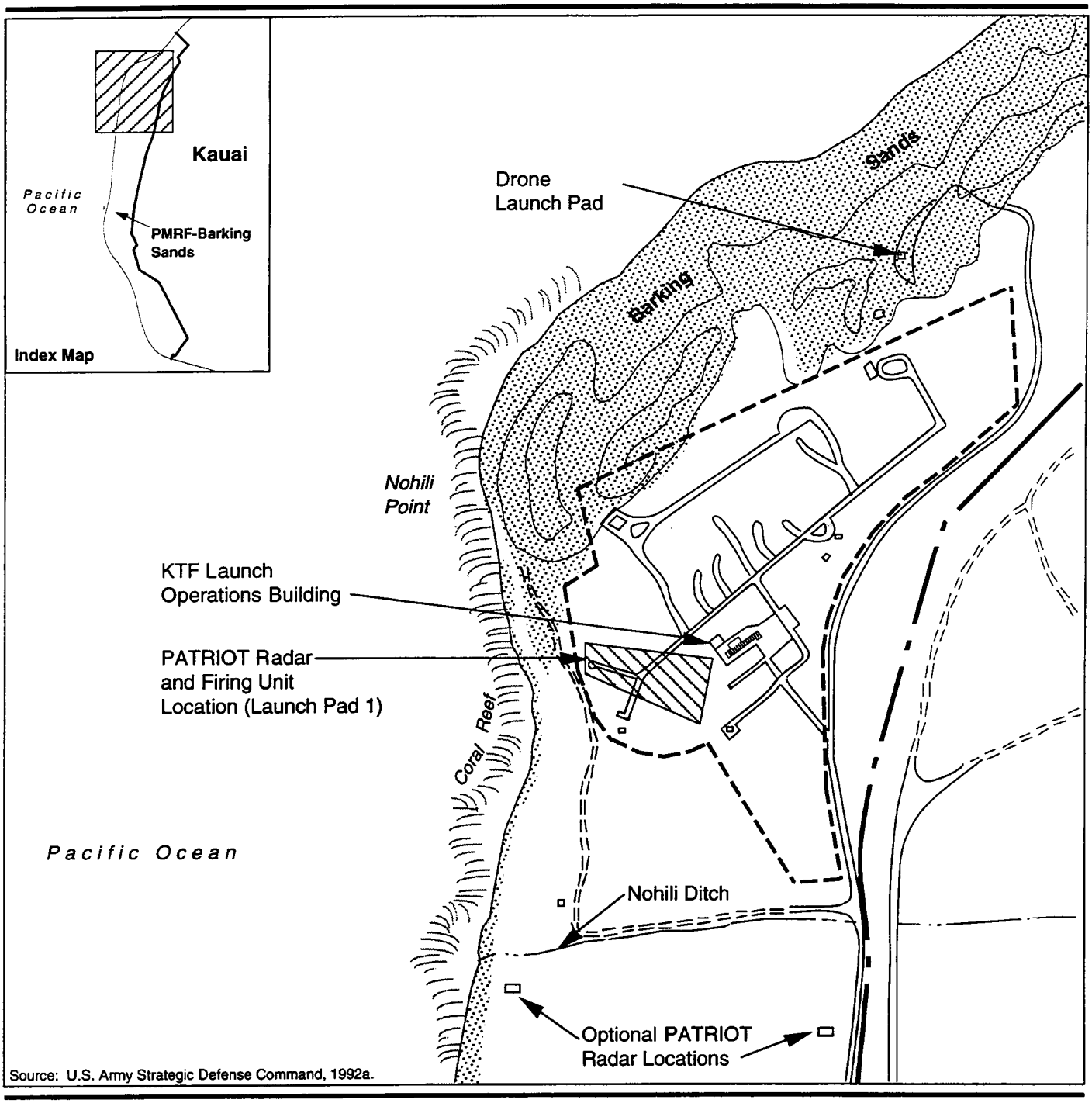
Site Preparation

All PATRIOT system components would be located on or near Launch Pad 1 at the KTF for the CCT and VE activities. The PATRIOT Launching Station and other system components would be located at Pad 1 for up to four launches of an unarmed PATRIOT missile. The PATRIOT radar would be located near Launch Pad 1 or at either of two sites south of the Nohili ditch during PATRIOT up to four launches of an unarmed PATRIOT missile (figure 2-4). Site occupation would take place during one to three periods of program activity over the next 3 years. Each period of activity would last from 1 to 3 months. Site occupation would involve provision of electrical power (commercial and standby), and other physical site modifications as required. These activities would require no ground disturbance or construction, and all equipment is portable. If night lighting is used for security, the U.S. Fish and Wildlife Service design and use recommendations would be applied to minimize potential impacts to the threatened Newell's shearwater.

Existing facilities at the PMRF-Barking Sands would be utilized for office space, storage, and work areas for program personnel. No additional commercial and standby electric power to the sites is anticipated. Power requirements for building services (A/C, lights, test equipment, etc.) shall not exceed 100 kilovolt amperes. Temporary potable water service and portable sanitation facilities could be required to support the optional PATRIOT radar sites shown on figure 2-4.

The PATRIOT hardware and equipment that would be located on site include the following:

- Battalion-level Information and Coordination Central truck
- PATRIOT Fire Unit, comprising an Engagement Control Station, an AN/MPQ-53 multifunction phased-array radar, a heavy expanded mobility tactical truck, a small repair parts trailer, a maintenance center, the PATRIOT Launching Station (only for optional interception), and Electric Power Plant
- Miscellaneous test equipment, including a mobile instrumentation van and portable data recorders
- Maintenance equipment, including the Maintenance Center and Small Repair Parts Transporter
- Optional relay equipment consisting of an Antenna Mast Group, a Communications Relay Group, and a second Electric Power Unit to provide power to the Communications Relay Group. The mobile antenna mast system would be used to carry the amplifiers and antennas associated with the ultra-high-frequency communication equipment. The Communications Relay Group is a multi-routed, secure, two-way relay capability between the Information and Coordination Central and the Fire Unit.
- Although no decision has been made, a Battalion Tactical Operations Center may be present at the test site.



EXPLANATION

- PMRF-Barking Sands Boundary
- KTF Location
- Dune Sand
- Paved Road
- Unpaved Road
- Area Enlarged

* Also represents the area of potential effects for cultural resources

0 525 1,050 Feet

0 160 320 Meters

AMTE Activity Location Map*

Kauai, Hawaii

Figure 2-4

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The PATRIOT Air Defense System that would be used as part of AMTE program activities would have several associated portable generators used to supply electric power. The PATRIOT Engagement Control Station and Radar Set would receive electric power from either the truck-mounted Raytheon Electric Power Plant, which has one 150-kilowatt, 400-hertz diesel powered generator, or the truck-mounted standard PATRIOT Electric Power Plant, which has two 150-kilowatt, 400-hertz diesel-powered generators (one generator is required to power the system; one is maintained as a backup power supply) (Raytheon, 1990). The PATRIOT Information and Coordination Central and Communications Relay Group each have an associated Electric Power Unit, which is a trailer-mounted 30-kilowatt, 400-hertz diesel-powered generator (Raytheon, 1990). The PATRIOT Maintenance Center and Small Repair Parts Transporter together are powered by a trailer-mounted 15-kilowatt, 400-hertz diesel-powered generator. The PATRIOT Launching Station is powered by a 15-kilowatt, 400-hertz diesel-powered generator (Raytheon, 1990). On-site refueling of these generators would be conducted in accordance with existing standard operating procedures.

During CCT and VE activities the Raytheon Electric Power Plant would be used to provide electric power to the Engagement Control Station. The Electric Power Unit would provide electric power to the Information and Coordination Central. The 15-kilowatt generator would provide power to the Maintenance Center and the Small Repair Parts Transporter. If the option of using the Communications Relay Group is chosen, then a second Electric Power Unit would also be run to provide it with electric power.

During intercept activities either the Raytheon Electric Power Plant or the standard PATRIOT Electric Power Plant would be used to provide electric power to the Engagement Control Station. The 15-kilowatt generator would provide electric power to the Launching Station. Other generator use would be the same as during CCT and VE activities.

Technical Support Activities

Technical support requirements include air-to-air, air-to-ground, and ground-to-ground voice communications; a target track console at the Range Control Facility for the display of CCT and target data transmitted by secure microwave or the existing fiber optic cable link; video and still documentary photography using existing cameras; weather observations from balloons, buoys, aircraft, and ships or the PMRF meteorological station; and use of the PMRF-Barking Sands airfield. Diesel, kerosene, gasoline fuels, and lubricants would be needed for vehicles and equipment.

Communications between the Cooperative Engagement Processor at PMRF-Kokee and the PATRIOT Information and Coordination Central at the KTF would be via the existing fiber-optic cable between these two facilities or by ultra low frequency radio transmission. If radio transmission from PMRF-Kokee is used, the radio would be a standard Army model used for the PATRIOT system and would require one operator at the site. This 50-ohm radio has a maximum operating power of 200 watts and an average transmission power of 42 watts. The radio would be located in the main office complex at PMRF-Kokee. The radio antenna would be attached to existing brackets on the side of this building or mounted on an existing telephone-type pole adjacent to the building in place of an antenna that is scheduled to be removed. Either a directional or omnidirectional antenna may be used. The directional antenna is about 4 feet long, 2 feet high, and horn-shaped. The

omnidirectional antenna is about 5 feet long and several inches in diameter. A reflective dish about 3 feet in diameter may be placed behind the omnidirectional antenna. Existing PMRF-Barking Sands ground support equipment would be used for the handling, lifting, and moving of any PATRIOT equipment to program sites. This support may include vehicles, semi-tractors, cranes, and forklifts. Support for transient cargo aircraft, cargo on-load/off-load, and local operation for the C-130 CCT test aircraft would also be provided by the PMRF-Barking Sands. These support activities are not expected to require the procurement of additional equipment, new construction, or modification of existing range facilities.

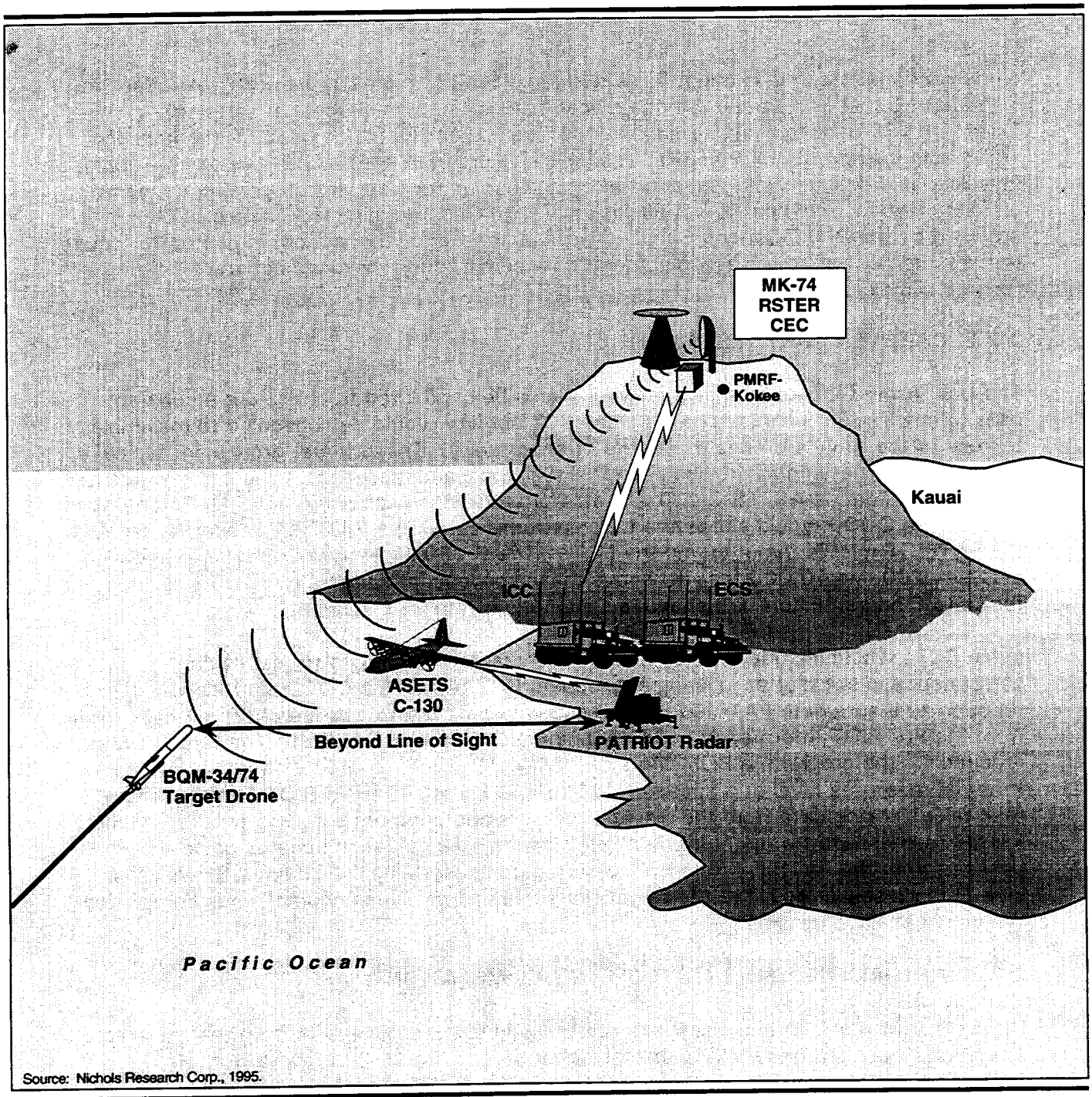
2.2.2 CAPTIVE CARRY TESTS

The U.S. Army CCT activity at the PMRF would be conducted to check-out equipment prior to any live-fire or VE exercises. The CCT activity would be scheduled to maximize the use of the Navy's drones as targets of opportunity. These target drones are typically recovered by boat and refurbished at PMRF-Barking Sands for reuse. The Army would use the U.S. Air Force's ASETS C-130 aircraft from the 46th Test Wing, Eglin Air Force Base (AFB). The C-130 would act as the CCT platform, carrying a PATRIOT seeker, to emulate the PATRIOT missile flyout during the CCTs. The C-130 aircraft would fly at altitudes between 200 and 10,000 feet (ft) above mean sea level at speeds from 100 to 200 knots for up to 6 hours. Figure 2-5 shows a schematic of the CCT concept.

Initial CCTs would include a series of seeker characterization runs to test seeker performance in sea clutter. During subsequent CCT tests, the C-130 aircraft would function as a surrogate PATRIOT missile and would fly out to a range of 60 nautical miles from the PATRIOT Information and Coordination Central and Fire Unit. The target drone required for the program, a BQM-34 and/or BQM-74 drone, would fly between 30 and 100 ft above mean sea level at a speed of 430 to 450 knots. The PATRIOT Fire Unit would then take tracking data from the elevated sensors and compute a course for the PATRIOT missile to intercept the target drone. Midcourse missile guidance updates could be uplinked from the PATRIOT radar to the surrogate missile (the C-130 aircraft) until the interceptor's seeker acquired the target (for simulated missile endgame), thus completing the demonstration mission.

2.2.3 VIRTUAL ENGAGEMENTS (COMPUTER SIMULATIONS)

During the Navy ACTD exercises, the Army would use real-time data from the elevated sensors as input to conduct VEs against target drones (figure 2-6). Data from the surrogate airborne sensors would be transmitted to the VE model, the Mountain Top Simulation, a computer simulation derived from the PATRIOT Advanced Capability Demonstration/Validation phase simulation which includes a radar simulation, a missile simulation, and a PATRIOT seeker simulation. Real-time target data are used as empirical inputs for Mountain Top Simulation and end-game computations. Simulation outputs would be used to assess hand-over accuracy and end-game performance. The simulations would be performed in existing KTF facilities.



Source: Nichols Research Corp., 1995.

EXPLANATION

ICC-PATRIOT Information and Coordination Central

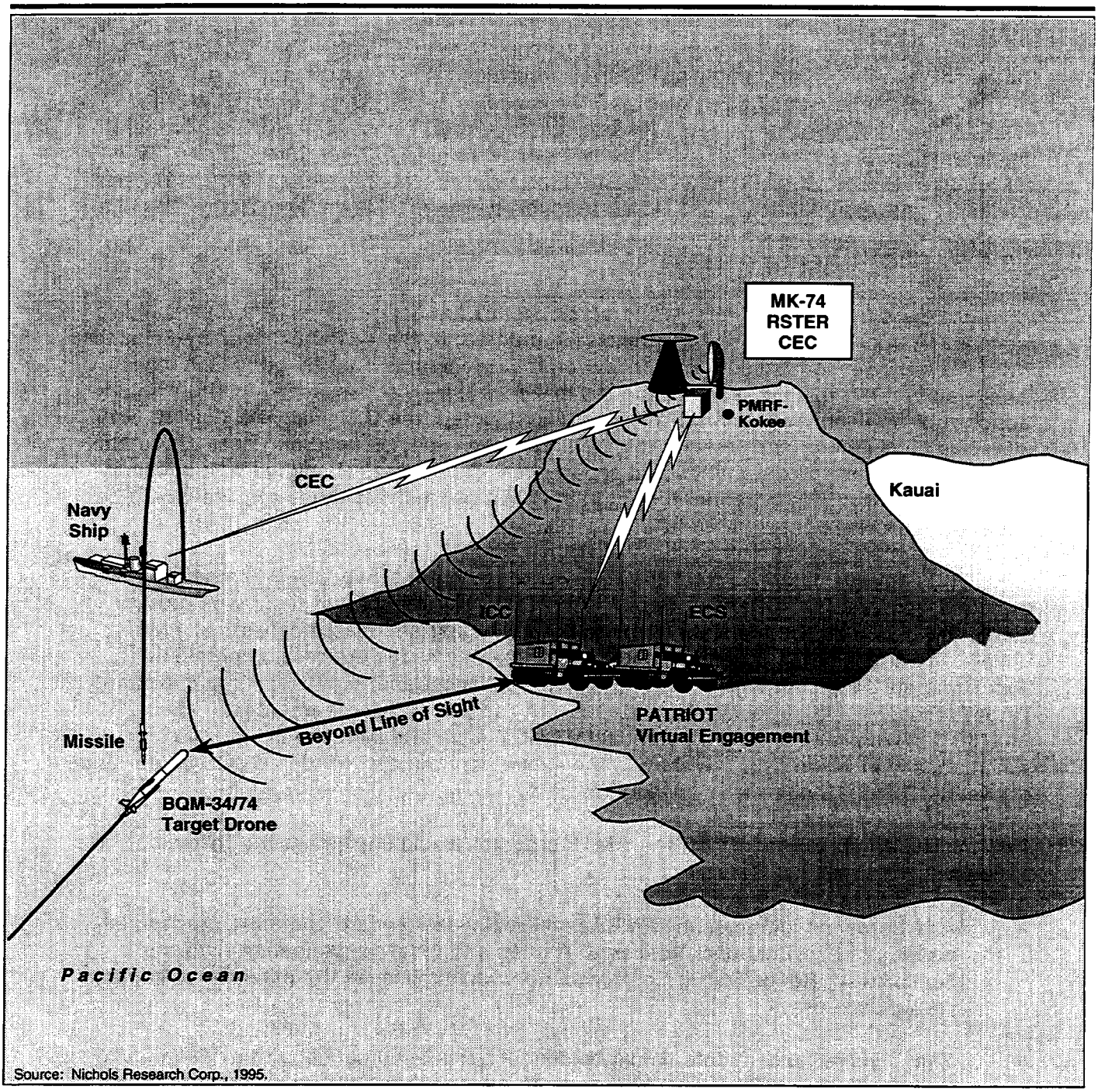
ECS-PATRIOT Engagement Control Station

RSTER-Radar Surveillance Technology Experimental Radar

CEC-Cooperative Engagement Capability

Captive Carry Test Concept

Figure 2-5



Source: Nichols Research Corp., 1995.

EXPLANATION

ICC-PATRIOT Information and Coordination Central

ECS-PATRIOT Engagement Control Station

RSTER-Radar Surveillance Technology Experimental Radar

CEC-Cooperative Engagement Capability

Virtual Engagement Concept

Figure 2-6

During the AMTE CCTs and VEs at PMRF-Barking Sands there would not be a live PATRIOT missile launched nor present on the island of Kauai. Up to eight BQM-34 and/or BQM-74 target drone flights would be required for the CCT and VE activities. Drone flights in support of Navy exercises may be used as targets of opportunity for AMTE data collection activities, either in addition to or in place of these eight drone flights. These drones are currently launched and flown from PMRF-Barking Sands on existing missions.

2.2.4 PATRIOT INTERCEPT TESTS

Intercept tests by PATRIOT missiles of target drones are not currently in the planning process but may be conducted as a follow-on program to the AMTE CCTs and VEs at the PMRF-Barking Sands. Because this follow-on test program is considered reasonably foreseeable, it is evaluated and included in this environmental assessment. If up to four launches of an unarmed PATRIOT missile are conducted, the U.S. Fish and Wildlife Service would be consulted prior to testing to determine if any species occurring near the test sites had been added to the threatened and endangered species list. If newly listed species occur in the region, the potential for program activities to affect these species would be evaluated.

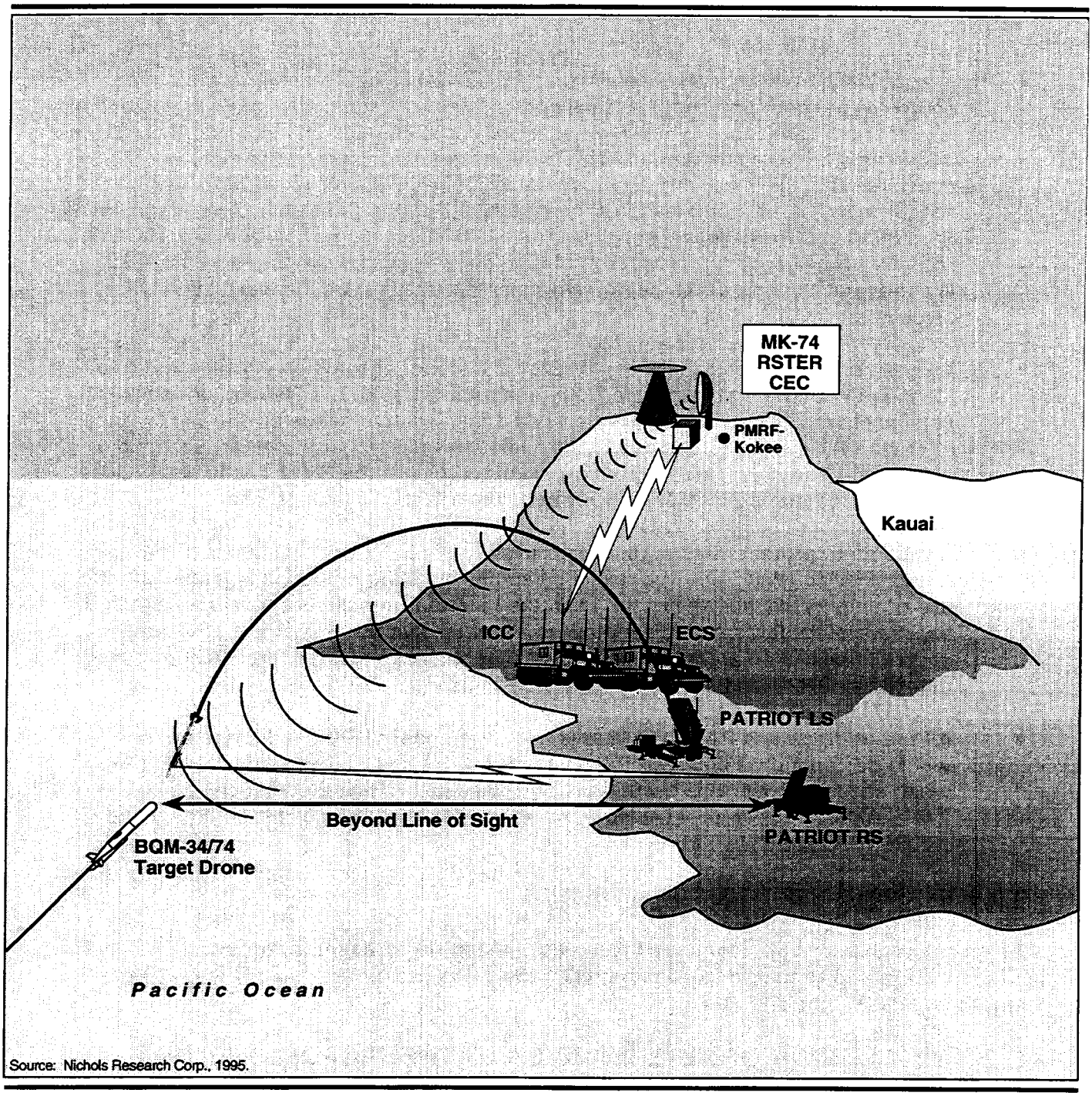
A PATRIOT missile launched from the KTF would intercept a BQM-34/74 target drone launched from the PMRF-Barking Sands. Approximately 4 intercept tests would occur during the 3-year period the Navy plans to have the program related sensors at PMRF-Kokee. These PATRIOT missiles would not contain warheads but would contain an approximately 10-pound charge for the lethality enhancer and flight termination system. Target drones would be recovered and reused if there is no missile intercept. The PATRIOT system elements and potential PATRIOT missile launch site are shown schematically in figure 2-7. As shown, the expected intercept location would be off-shore between 22 and 43 miles from the launch sites.

To minimize any potential effect, the AMTE program would implement the following actions:

- In accordance with existing PMRF-Barking Sands standard operating procedures, issuance of International Notices to Airmen and timely coordination with the Honolulu Air Route Traffic Control Center would minimize the potential of impacts on airspace use.

- Range surveillance flights would be conducted in accordance with existing PMRF-Barking Sands standard operating procedures to verify that the range area is clear of non-mission-related personnel and to locate any marine mammals in the area. If present, launch activities would be delayed until the range was clear.

- Applicable government agencies would be notified in advance of a PATRIOT missile launch.



Source: Nichols Research Corp., 1995.

EXPLANATION

ICC-PATRIOT Information and Coordination Central

ECS-PATRIOT Engagement Control Station

RSTER-Radar Surveillance Technology Experimental Radar

CEC-Cooperative Engagement Capability

LS-Launching Station

RS-Radar Set

PATRIOT Live-Fire Intercept Concept

Figure 2-7

- In accordance with the National Historic Preservation Act (NHPA), if, during the course of program activities, cultural and/or historic materials (particularly human remains) are unexpectedly discovered, work in the immediate vicinity of the cultural materials shall be halted and the Hawaii State Historic Preservation Officer (SHPO) consulted through the PMRF Environmental Office. Subsequent actions would follow guidance provided in 36 CFR Part 800.11 and in the Native American Graves Protection and Repatriation Act (NAGPRA). The U.S. Navy archaeologist, the Hui Malama I Na Kapuna O Hawaii Nei, the Office of Hawaiian Affairs, and the Kauai Island Burial Council would be notified if human remains are inadvertently discovered.

- To ensure the protection of any prehistoric, historic, or traditional resources already identified within the project area from unauthorized artifact collection or vandalism, personnel would be briefed before project activities commence on the significance of these types of resources and the penalties associated with their disturbance or collection. The only historic property identified within the PMRF is the Nohili Dune which is located approximately 150 feet from the missile launch pad.

- Measures to protect cultural resources from fire and fire fighting damage would include having PMRF fire trucks and personnel standing by during launches and the use of a spray nozzle rather than a directed stream to avoid erosional damage and exposure of artifacts within sand dunes. If extensive burning of the dune areas occurs, a post-burn archaeological survey would be conducted in consultation with the Hawaii SHPO and a U.S. Navy archaeologist.

- All target drone and PATRIOT missile launches and PATRIOT radar operations would be conducted between 6:00 a.m. and 4:00 p.m., Monday through Friday, when access through the PMRF-Barking Sands and KTF to Recreation Areas 1 and 2 is normally restricted. Therefore, no additional restriction of beach area access would be required.

2.2.5 EXPERIMENT CONCLUSION ACTIVITIES

At the conclusion of the program, all Army equipment would be removed, and all facilities would be returned to their original unmodified condition except as mutually agreed on among the PMRF, the KTF, and the Army.

2.3 DESCRIPTION OF ALTERNATIVES TO THE PROPOSED ACTION

2.3.1 NO-ACTION ALTERNATIVE

Under the no-action alternative, the AMTE program would not be involved in the Navy ACTD exercises, therefore foregoing the opportunity for testing using the existing Navy surrogate airborne sensors and co-use of target drones to evaluate the effectiveness of the AMTE.

2.3.2 ALTERNATIVES CONSIDERED BUT NOT CARRIED FORWARD

Alternatives for the AMTE program were not considered by the Army because of the duplication of manpower, equipment, and target drone launches that would be required. The opportunity and idea for the AMTE test arose from the fact that all the Navy equipment would be in place. To take advantage of the surrogate airborne sensors and target drones used in the Navy exercises, the AMTE program could only be conducted at the PMRF-Barking Sands and KTF.

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3.0 Affected Environment

3.0 AFFECTED ENVIRONMENT

This section describes the environmental and socioeconomic characteristics that may be affected by the proposed action at the KTF and applicable PMRF sites. In order to provide a baseline point of reference for understanding any potential impacts, the affected environment is concisely described; any components of greater concern are described in greater detail.

Available reference materials, including EAs, EISs, and base master plans, were reviewed. Questions were directed to installation and facility personnel; Federal, state, and local regulatory agencies; and private individuals. Site visits were also conducted to gather the baseline data presented below.

3.1 AIR QUALITY

Air quality in a given location is described by the concentrations of various pollutants in the atmosphere, expressed in units of parts per million (ppm) or micrograms per cubic meter ($\mu g/m^3$). Pollutant concentrations are determined by the type and amount of pollutants emitted into the atmosphere, the size and topography of the air basin, and meteorological conditions related to the prevailing climate.

Region of Influence

Identifying the region of influence (ROI) for an air quality assessment requires knowledge of the pollutant types, source emissions rates and release parameters, proximity relationships of project emission sources to other emission sources, and local and regional meteorological conditions. For inert pollutants (all pollutants other than ozone and its precursors), the ROI is generally limited to an area extending no more than a few tens of miles downwind from the source.

As there is little heavy industry and a relatively small population on the island of Kauai, tropospheric ozone and its precursors are of relatively little concern. Consequently, for the air quality analysis, the ROI for project operational activities is a circular area with a 12-mile radius centered on Launch Pad 1.

Climatological Conditions

The climate at the KTF affects the dispersion of air pollutants and the resulting air quality. Hawaii is located at the edge of the Tropical Zone within the belt of the cooling northeasterly tradewinds. Northeasterly tradewinds prevail over Kauai during all months of the year. The northeasterly tradewinds are split by the island topography so that they flow around both sides of the island. Surface winds at the KTF are generally light and variable in direction as the zone of convergence of the tradewind flow shifts to the north or south of the KTF. (U.S. Department of Energy, 1992)

Regional Air Quality

The air on Kauai meets all ambient air quality standards promulgated by the Environmental Protection Agency (EPA) and the state of Hawaii; therefore, the island of Kauai is in attainment for all criteria pollutants (40 CFR 81.312).

The normal air flow at the KTF is on shore and is not subject to off-site pollutant sources, thus serving to maintain good air quality. During lulls in the tradewinds, air quality may be affected by on-shore pollutant sources. The on-shore pollutant sources immediately east of the KTF are agricultural, primarily from the burning of agricultural wastes, and they affect air quality intermittently. (U.S. Department of Energy, 1992)

The only air sampling station on Kauai is in Lihue, where total suspended particulate matter and particulate matter with a hydrodynamic diameter less than or equal to 10 microns (PM-10) are monitored (U.S. Army Strategic Defense Command, 1992a). The city of Lihue is 26 miles from the KTF and is on the southeast side of the island; thus, air quality measurements there may not be representative of air quality at the KTF.

The main pollutant sources at the KTF are diesel-powered generators and rocket launches (U.S. Department of Energy, 1992).

The air quality at PMRF-Kokee meets all air quality standards promulgated by the Environmental Protection Agency and the State of Hawaii. On-shore pollutant sources are diesel-powered generators.

3.2 AIRSPACE

Airspace, while generally viewed as being unlimited, is finite in nature. It can be defined dimensionally by height, depth, width, and period of use (time). The Federal Aviation Administration (FAA) is charged with the overall management of airspace.

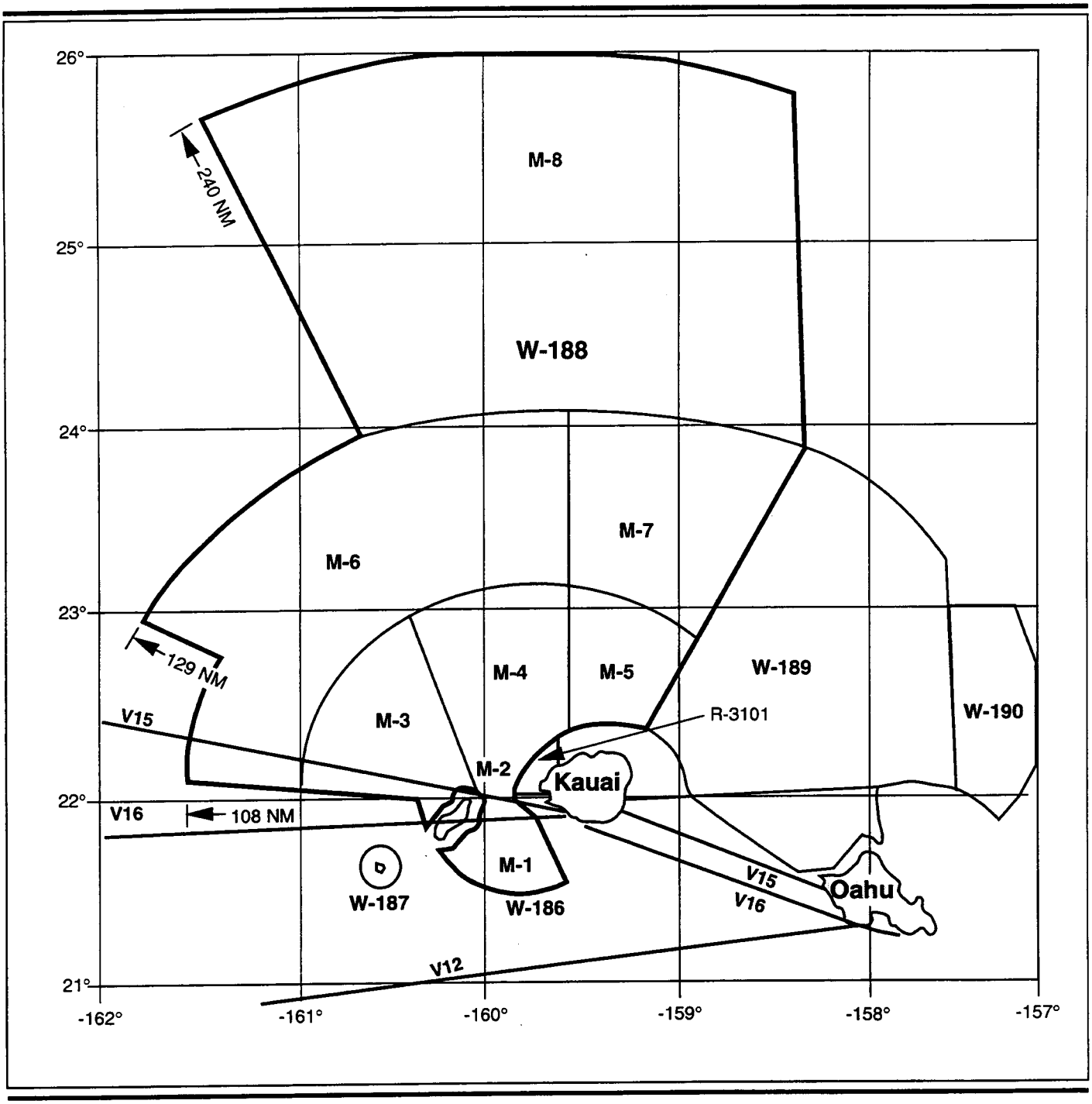
Region of Influence

The ROI for airspace includes the airspace over and surrounding the CCT, VE, and PATRIOT intercept areas. It includes the PMRF Operational Areas, the R-3101 Restricted Area, and surrounding airspace off the western and northwestern coast of Kauai (figure 3-1).

Special Use Airspace

The ROI for airspace is composed of the following Special Use Airspace:

- Restricted Areas are airspace segments within which the flight of nonparticipating aircraft, while not wholly prohibited, is subject to restriction. Restricted Area R-3101 has been established to provide the airspace required for the PMRF to meet its primary missions (figure 3-1).



Special Use Airspace and IFR En Route Low-Altitude Airways

Kauai, Hawaii

0 37 74Kilometers
0 23 46 Miles

Figure 3-1

- Warning Areas are airspace segments which may contain hazards to nonparticipating aircraft in international airspace. Although the activities conducted within Warning Areas may be as hazardous as those in Restricted Areas, Warning Areas cannot be legally designated as Restricted Areas because they are over international waters (Airman's Information Manual, 1992). They include Warning Areas W-186, W-187, W-188, W-189, and W-190 (figure 3-1).

En Route Airways and Jet Routes

Although relatively remote from the majority of jet routes that crisscross the Pacific, the airspace ROI has two Instrument Flight Rules (IFR) en route low-altitude airways used by commercial air traffic that pass through the ROI: V-15, which passes east-west through the southernmost part of the Warning Area W-188, and V-16, which passes east-west through the northern part of Warning Area W-186 (figure 3-1). A count of the number of flights using each airway is not maintained.

The airspace ROI, located to the west and northwest of Kauai, is far removed from the low-altitude airway carrying commercial traffic between Kauai, Oahu, and the other Hawaiian islands, all of which lie to the southeast of Kauai (U.S. Department of Commerce, 1994). There is a high volume of island helicopter sightseeing flights along the Na Pali coastline and over the Waimea Canyon. However, they do not fly over the PMRF-Barking Sands or into Restricted Area R-3101 (U.S. Department of Commerce, 1994).

Airports/Airfields

There are no airports or airfields in the ROI with the exception of the airfield at the PMRF-Barking Sands itself and the Kekaha airstrip approximately 3 miles to the southeast and 2 miles northwest of Kekaha. There is a heliport, used by PMRF personnel, located at the Makaha Ridge Instrumentation Site. The standard instrument approach and departure procedure tracks for the airport at Lihue are all to the east and southeast of Kauai, well-removed from the airspace ROI (U.S. Department of Defense, 1993).

Air Traffic/Range Control

Utilization of the airspace by the FAA and the PMRF is established by a Letter of Agreement between the two agencies. By this agreement the PMRF is required to notify the FAA by 1400 the day before range operations are going to infringe upon the designated airspace. Range Control and the FAA are in direct communication in real time to ensure safety of all aircraft using the airways and the Warning Areas (Pacific Missile Range Facility, 1991). Within the Special Use Airspace, military activities in Warning Areas W-186 and W-188 are under PMRF control. Warning Areas W-189, W-187, and W-190 are scheduled through the Fleet Area Control and Surveillance Facility.

The Warning Areas are located in international airspace. Because they are in international airspace, the procedures of the International Civil Aviation Organization (ICAO), outlined in ICAO Document 444, *Rules of the Air and Air Traffic Services*, are followed (International

Civil Aviation Organization, 1985;1994). The FAA acts as the U.S. agent for aeronautical information to the ICAO, and air traffic in the ROI is managed by the Honolulu Air Route Traffic Control Center.

3.3 BIOLOGICAL RESOURCES

Biological resources include two major categories: vegetation and wildlife. In this analysis, biological resources are further categorized as terrestrial and marine species.

Existing information was reviewed on plant and animal species and habitat types in the vicinity of areas potentially affected by the proposed action. Special emphasis was placed on the presence of any species listed or proposed for listing by Federal, state, or local agencies as rare, threatened, or endangered.

Region of Influence

The ROI for biological resources encompasses the KTF, portions of the PMRF, and affected offshore areas as shown in figure 3-2.

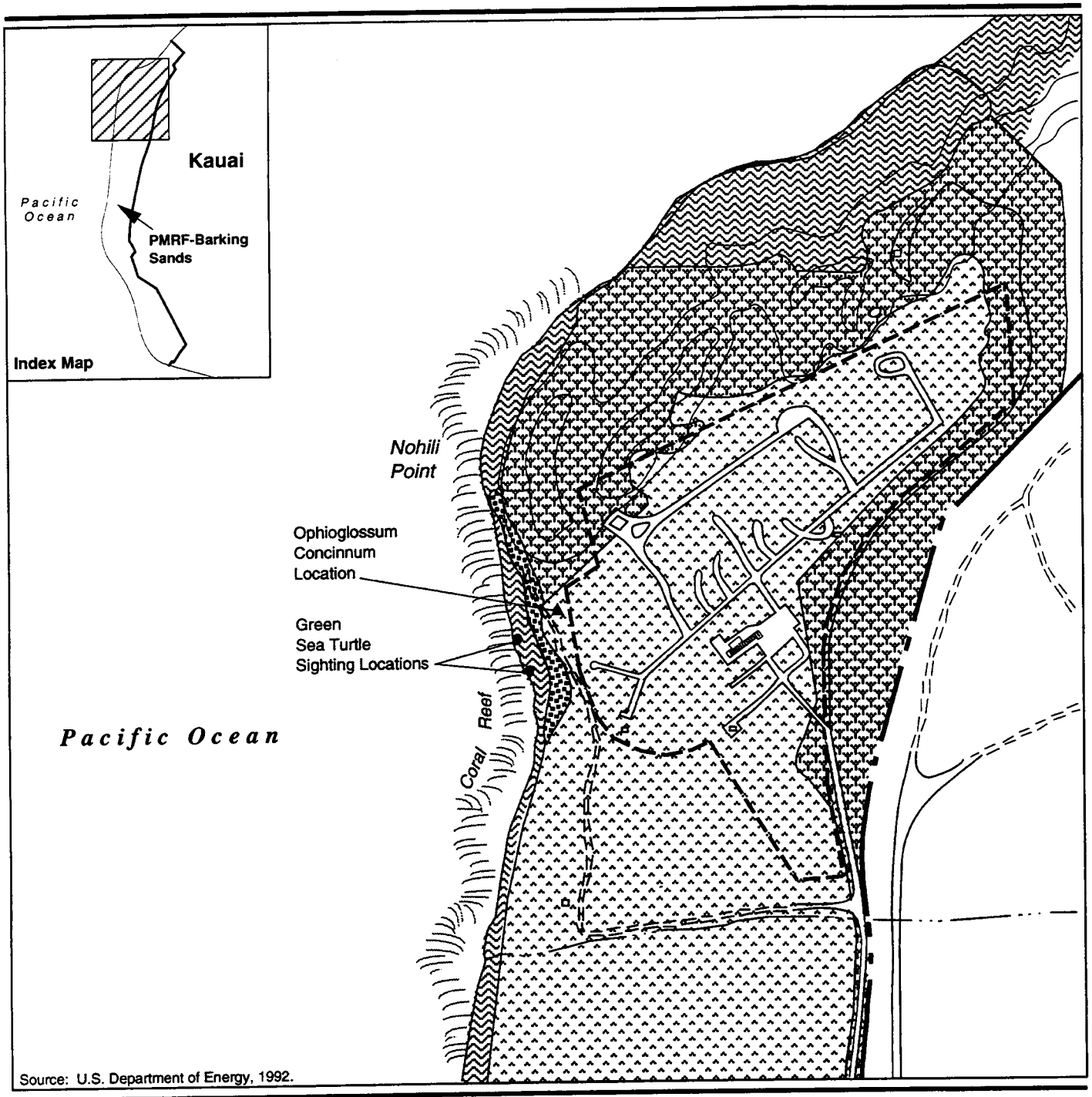
Terrestrial Biological Resources

The vegetation on the KTF is composed of four habitat types: ruderal vegetation, kiawe (*Prosopis pallida*)/koa-haole (*Leucaena leucocephala*) scrub, coastal dune vegetation, and coastal strand vegetation (figure 3-2). The ruderal vegetation on areas of the KTF used for launch operations is mowed regularly. (U.S. Army Strategic Defense Command, 1992a; U.S. Department of Energy, 1992)

One Federally endangered plant species and one Federal Category 1 plant species have been observed or are potentially located on the KTF (table 3-1). The Federally listed endangered Ohai (*Sesbania tomentosa*) is suspected of occurring in or near the coastal area of the KTF. However, this species was not observed during any of the floral surveys conducted within the KTF in 1990. (U.S. Army Strategic Defense Command, 1990a)

Adder's tongue or pololei fern (*Ophioglossum concinnum*) is a Federal Category 1 ephemeral fern usually found one to two weeks after heavy rains. Several colonies of this fern were observed within the KTF during a 1990 survey (figure 3-2). This species has recently been proposed for removal from a proposal by the U.S. Fish and Wildlife Service for the listing of 12 Hawaiian plants as threatened or endangered. The adder's tongue has been determined to be more widely distributed and common than originally believed. However, for this assessment, the adder's tongue is still considered as a Category 1 plant and will be analyzed accordingly. (U.S. Army Strategic Defense Command, 1990a; U.S. Department of the Interior, 1993)

No listed, candidate, threatened, or endangered species are located at PMRF-Kokee. Two non-listed native birds, the Pacific golden plover (*Pluvialis fulva*) and common Amakihi (*Hemignathus virens*), are located in the area. Forty species of birds have been identified at the PMRF-Barking Sands, although not specifically at the KTF, including non-native and migratory birds and species endemic to Hawaii. Non-native bird species on the KTF are



EXPLANATION

- PMRF-Barking Sands Boundary
- KTF Location
- Paved Roads
- Unpaved Roads
- Kiawe/Koa-Haole Scrub
- Coastal Dune
- Ruderal Scrub
- Coastal Strand
- Area Enlarged

0 525 1,050 Feet
0 160 320 Meters

Vegetation Types and Green Sea Turtle Sighting Locations

Figure 3-2

Table 3-1: Sensitive Species that Occur On or Near the Kauai Test Facility

Scientific Name	Common Name	Status	
		Federal	State
Plant Species			
Sesbania tomentosa	'Ohai	Endangered	--
Ophioglossum concinnum	Adder's tongue	Category 1	--
Wildlife Species			
Anas wyvilliana	Hawaiian duck	Endangered	Endangered
Fulica americana ssp. *alai*	American (Hawaiian) coot	Endangered	Endangered
Gallinula chloropus ssp. *sandvicensis*	Common moorhen	Endangered	Endangered
Himantopus mexicanus ssp. *knudseni*	Black-necked stilt	Endangered	Endangered
Pterodrome phaeopygia sandwichensis	Dark-rumped petrel	Endangered	--
Oceanodroma castro cryptoleucura	Band-rumped storm petrel	Category 2	--
Puffinus newelli	Newell's shearwater	Threatened	Threatened
Megaptera novaeangliae	Humpback whale	Endangered	Endangered
Monachus schauinslandi	Hawaiian monk seal	Endangered	Endangered
Physeter macrocephalus	Sperm whale	Endangered	Endangered
Lasiurus cinereus semotus	Hawaiian hoary bat	Endangered	Endangered
Chelonia mydas	Green sea turtle	Threatened	Threatened
Dermochelys coriacea	Leatherback turtle	Endangered	Endangered

Source: U.S. Army Strategic Defense Command, 1992a.

usually common field and urban birds. Several species of migratory waterfowl may be present during some portion of the year. Table 3-2 contains a list of species observed on the KTF during a 1990 survey. (U.S. Department of Energy, 1992)

A wedge-tailed shearwater (*Puffinus pacificus*) colony is located between the area of the PATRIOT launch pad and the drone launch pad (U.S. Department of the Interior, 1995). The Laysan albatross (*Diomedea immutabilis*), a migratory bird protected under the Migratory Bird Treaty Act, uses ruderal vegetation areas for courtship and nesting. Six pairs of Laysan albatross were observed in the KTF area during a field survey for the Strategic Target System program in 1990. The Laysan albatross is being discouraged from nesting at PMRF-Barking Sands to prevent interaction between the species and aircraft using the runway. This is being accomplished under a U.S. Fish and Wildlife Service permit. (U.S. Army Strategic Defense Command, 1990a;1992a)

Seven species of birds which are Federally listed as threatened or endangered are potentially present or confirmed in the KTF area. These species are listed in table 3-1 and discussed as follows. Kauai provides the last Hawaiian habitat for the Federally threatened Newell's shearwater (*Puffinus newelli*). The Newell's shearwater nests from April to November in the interior mountains of Kauai. When nestlings are abandoned by the adults in October and November, they leave the nesting grounds at night and head for the open ocean. Flying near urban areas, they become temporarily blinded by lights and have a tendency to collide with trees, utility lines, buildings, and automobiles (State of Hawaii,

Table 3-2: Bird and Wildlife Species Observed at the Kauai Test Facility

Common Name	Scientific Name	Status
Black-crowned Night-Heron (Auku'u)	*Nycticorax nycticorax hoactli*	Native, Resident
Red Junglefowl	*Gallus gallus*	Introduced, Resident
Ring-necked Pheasant	*Phasianus colchicus*	Introduced, Resident
Spotted Dove	*Streptopelia chinensis*	Introduced, Resident
Zebra Dove	*Geopelia striata*	Introduced, Resident
Japanese White-Eye	*Zosterops japonicus*	Introduced, Resident
Cattle Egret	*Bulbulcus ibis*	Introduced, Resident
Northern Cardinal	*Cardinalis cardinalis*	Introduced, Resident
Red-crested Cardinal	*Paroaria coronata*	Introduced, Resident
Nutmeg Mannikin	*Lonchura punctulata*	Introduced, Resident
Chestnut Mannikin	*Lonchura malacca*	Introduced, Resident
Warbling Silverbill	*Lonchura malabarica*	
Northern Mockingbird	*Mimus polyglottos*	Introduced, Resident
House Finch	*Carpodacus mexicanus*	Introduced, Resident
House Sparrow	*Passer domesticus*	Introduced, Resident
Common Myna	*Acridotheres tristis*	Introduced, Resident
Short-eared Owl	*Asio flammeus*	
Gray Francolin	*Francolinus pondicerianus*	Introduced
Japanese Quail	*Coturnix coturnix*	Introduced
Ruddy Turnstone	*Arenaria interpres*	
Brown Noddy	*Anous stolidus*	
Great Frigate Bird	*Fregata minor*	
House Mouse	*Mus musculus domesticus*	
Feral Dog	*Canis familiaris*	
Feral Cat	*Felis catus*	

Source: U.S. Department of Energy, 1992.

undated). The most critical period for these collisions is one week before and one week after the new moon in October and November. (U.S. Army Strategic Defense Command, 1992a; U.S. Department of Energy, 1992)

The dark-rumped petrel (*Pterodrome phaeopygia sandwichensis*) which is listed as Federally endangered and the band-rumped storm petrel (*Oceanodroma castro cryptoleucura*) which is listed as Category 2 Candidate may traverse the area from their nesting grounds to the sea. Fledging of the dark-rumped petrel occurs in October, slightly earlier than that of the Newell's shearwater. Little is known about the band-rumped storm petrel, but they are usually observed on shore between April and November. (U.S. Department of the Interior, 1995)

The American coot (*Fulica americana alai*), black-necked stilt (*Himantopus mexicanus knudseni*), common moorhen (*Gallinula chloropus sandvicensis*), and Hawaiian duck (*Anas wyvilliana*) are Federal and state endangered species (table 3-1) which have been observed in the drainage ditches and ponds on the PMRF-Barking Sands; however, they are not expected to occur on the KTF because of the lack of wetlands. The native Federally listed endangered Hawaiian hoary bat (*Lasiurus cinereus* spp. *semotus*) has not been observed at the KTF, although it is known to feed offshore and has been observed at the Polihale State Park north of the KTF. (Telfer, 1990a, b; The Traverse Group, Inc., 1988)

Four species of rodents are expected to occur on the KTF: house mouse (*Mus musculus*), Norway rat (*Rattus norvegicus*), roof rat (*Rattus rattus*), and Pacific rat (*Rattus exulans*). Feral dogs (*Canis familiaris*) and cats (*Felis catus*) have been observed at the KTF. (U.S. Army Strategic Defense Command, 1992a)

Marine Biological Resources

Three marine wildlife species which are listed as Federal and state threatened or endangered occur in the area and are listed in table 3-1. The spinner dolphin (*Stenella longirostris*), which is protected under the Marine Mammal Protection Act, is commonly seen in waters adjacent to PMRF-Barking Sands throughout the year and often with young. The Hawaiian monk seal (*Monachus schauinslandi*), a Federal and state endangered species, is an indigenous mammal and has been observed at the PMRF-Barking Sands. No seal pupping has been observed on PMRF beaches. Two or three seals are regularly seen around the island of Kauai but are considered stragglers. The seals require undisturbed sandy beaches to haul out to rest, give birth, and nurse their young. However, all beaches on the PMRF-Barking Sands are frequented by humans, which may discourage use by monk seals. (Naughton, 1990; Nitta, 1990)

During a 1990 survey of the shoreline of the PMRF, approximately 32 green sea turtles (*Chelonia mydas*), a Federal and state threatened species, were observed (figure 3-2) (U.S. Army Strategic Defense Command, 1990a). One turtle nest was discovered on the southern portion of the PMRF-Barking Sands in 1985, but no other use has been documented (The Traverse Group, Inc., 1988).

The migratory humpback whale (*Megaptera novaeangliae*), Federal and state endangered, was observed breaching off the coast of the PMRF-Barking Sands during field surveys in 1990 (U.S. Army Strategic Defense Command, 1990a). The whales are known to use the channel between Kauai and Niihau. The North Pacific Hawaiian humpback whale stock is estimated to be between 2,500 to 3,000 (National Oceanic and Atmospheric Administration, 1994).

Other listed species which may be found within the project area include the Federally endangered sperm whale (*Physeter macrocephalus*) and leatherback turtle (*Dermochelys coriacea*). Critical habitat for these species, however, has not been proposed or designated within the project area. (U.S. Department of Commerce, 1995)

3.4 CULTURAL RESOURCES

Cultural resources are prehistoric and historic sites, structures, districts, artifacts, or any other physical evidence of human activity considered important to a culture, subculture, or community for scientific, traditional, religious, or any other reason. Only those cultural resources determined to be potentially significant under the given legislation are subject to protection from adverse impacts resulting from an undertaking. Additional information on cultural resources is provided in Appendix G. For the purposes of this analysis, cultural resources are also defined to include paleontological resources.

Region of Influence

The ROI for cultural resources for the purpose of this EA (synonymous with the Area of Potential Effect under cultural resources legislation) encompasses the KTF and the northern portion of the PMRF-Barking Sands (see figure 2-4).

Archaeological Resources (Prehistoric and Historic)

No historic, cultural, or archaeological features were found during the 1992 inventory survey of PMRF-Kokee (U.S. Department of the Navy, 1995b). A review of existing archaeological and historical literature, records, and maps indicates that there are numerous recorded and unrecorded archaeological sites within the PMRF and surrounding area, some with subsurface components. Artifacts associated with the sites on the PMRF-Barking Sands include hearths, shell fishing lures, earth ovens, stone adze fragments, and human burials. Of the recorded sites, only one, the Nohili Dune, is eligible for inclusion in the National Register; the site is eligible as a traditional cultural property (Hawaii Department of Land and Natural Resources, State Historic Preservation Division, 1992a;b;c). However, because of the number and dispersed location of sites located within its boundary and the high probability that additional human burials may be present, the entire PMRF-Barking Sands could also be eligible (U.S. Army Strategic Defense Command, 1990b).

Historic Buildings and Structures

All of the existing facilities within the boundary of the PMRF-Barking Sands were constructed between 1942 and 1995. None of these facilities are known to have been evaluated for eligibility for inclusion in the National Register; none are currently listed.

3.5 GEOLOGY AND SOILS

Geology and soils, or natural resources, include those aspects of the natural environment related to the earth which may be affected by the proposed project. To provide background information and context for the impact analysis, the physical resources discussed include physiography, geology, and soil characteristics.

Region of Influence

The ROI for geology and soils includes those portions of the KTF and PMRF-Barking Sands where the mobile PATRIOT equipment would be located and the U.S. Navy drone launch area (see figure 2-4).

Physiography

The PMRF is located in a low-lying, essentially flat coastal plain. Ground elevation over the facility ranges from sea level to about 25 feet except for the Nohili Dune which rises to an elevation of over 80 feet. The Nohili Dune is located on the northern portion of the PMRF-Barking Sands, adjacent to the northwest side of the KTF.

Geology

The PMRF-Barking Sands is located on an extension of the Mana Plain which is made up of a wedge of terrestrial and marine deposits overlying volcanic basement rocks that consist of the Napali Formation of the Waimea volcanic series. The shallowest portion of the volcanic basement under the PMRF-Barking Sands is approximately 200 feet below sea level (Botanical Consultants, 1985). The ground surface typically consists of loose sand covered with scattered vegetation (U.S. Army Strategic Defense Command, 1992a). There are no known economic resources within the ROI.

Soils

Soils which underlay PMRF-Kokee are of the Kokee series, well-drained on Kauai uplands. The soils vary from gently sloping to very steep between 3,400 and 4,200 feet above mean sea level. The dominant soil type within the KTF and the northern portion of the PMRF-Barking Sands has been mapped as Jaucas loamy fine sand with a 0- to 8-percent slope (U.S. Department of Agriculture, 1972). The soils are permeable, and infiltration is rapid. Wind erosion is severe when vegetation has been removed (U.S. Army Strategic Defense Command, 1992a).

A study was conducted by the U.S. Department of Energy (U.S. Department of Energy, 1991) to determine if elevated aluminum concentrations occur at the KTF as a result of rocket emissions. Analysis of background aluminum levels in the region ranged from about 0.2 ounces/pound to 1.1 ounces/pound. KTF soil aluminum values range from 0.09 ounces/pound to 0.7 ounces/pound (U.S. Department of Energy, 1991). This suggests, if there has been an increase in the amount of aluminum in the soil at KTF as a result of rocket emissions, the total amount of aluminum is still less than nearby soils. Aluminum concentration in soil is not regulated. Aluminum oxide (Al_2O_3) resulting from rocket emissions is generally considered a nuisance dust.

3.6 HAZARDOUS MATERIALS AND HAZARDOUS WASTE

As defined by the Department of Transportation (DOT), a hazardous material is a substance or material which is capable of posing an unreasonable risk to health, safety, or property when transported in commerce and has been so designated (49 CFR 171.8).

Waste materials (less commonly referred to as solid waste) are defined in 40 CFR 261.3 as "any discarded material (i.e., abandoned, recycled, or 'inherently waste-like')" that is not specifically excluded. Hazardous waste is further defined in 40 CFR 261.3 as any solid waste not specifically excluded which meets specified concentrations of chemical constituents or has certain toxicity, ignitibility, corrosivity, or reactivity characteristics.

Region of Influence

Since operations at the KTF would be limited to operation of electronic signal equipment (communications signalling equipment, radar units, and computer processors), hazardous materials impacts would be limited to the immediate locations of AMTE equipment. If PATRIOT launches occur as part of the potential intercept testing, the ROI would also include areas immediately surrounding the launch locations. If up to four launches of an unarmed PATRIOT missile are undertaken, the ROI for the flight test corridor would consist of all areas beneath the proposed PATRIOT missile flight trajectory where there is the potential for impact of missile components during planned activities or abnormal flight termination.

Affected Environment

Hazardous Materials – Operations at the KTF involve the use of numerous hazardous materials. The bulk of these hazardous materials has been rocket fuels. Hazardous materials are also used for equipment maintenance (cleaning solvents), and grounds keeping (small amounts of pesticides, etc.). With the introduction of the Strategic Target System program, the KTF has had an increase in the amounts of liquid rocket propellants which are handled and stored (hydrazine and nitrogen tetroxide). While this has increased the amount of hazardous materials at the KTF, the impact has been negligible since these propellants are properly containerized and stored and all handling operations are performed in accordance with standardized propellant transfer procedures (U.S. Army Strategic Defense Command, 1992a;b).

Hazardous Waste – There are no known hazardous wastes at PMRF-Kokee. The KTF has a Small-Quantity Generator's Environmental Protection Agency identification number (HI0000363309). All wastes are collected and containerized at the KTF for direct off-site disposal through the Defense Reutilization and Marketing Office (DRMO) within 90 days. Small amounts of diluted liquid propellants (less than 100 gallons each of fuel and oxidizer) are disposed, along with just a few gallons of other hazardous materials (U.S. Army Strategic Defense Command, 1992a;b). The DRMO provides for the transportation and final disposal of the wastes to the final disposal facility.

3.7 HEALTH AND SAFETY

Health and safety includes consideration of any activities, occurrences, or operations which have the potential to affect the well-being, safety, or health of workers or members of the public.

Region of Influence

The ROI for health and safety of workers includes the immediate work areas, radiation hazard areas, the launch site, and the flight corridor. The ROI for public safety includes the KTF, portions of the PMRF, and any bordering areas which may be affected by AMTE activities or flight failures.

Affected Environment

Department of Energy – Sandia National Laboratories is responsible for ground safety within the KTF, and the PMRF is responsible for range safety for all flights. Standard operating procedures (SOPs) provide for the safe conduct of range operations. The range control office is responsible for implementing these procedures. Ground Hazard Areas which include on-base and, in some cases, off-base areas have been established for the launching of numerous types of missiles (U.S. Army Strategic Defense Command, 1992a; U.S. Department of Energy, 1992). Warning areas over the ocean, as described in section 3.2, have been established for military operations.

PMRF range operations issues notices to airmen and mariners and conducts surveillance flights to ensure that all flight corridors in warning areas are cleared of people before a launch occurs. Missile launches can be terminated by the Missile Flight Safety Officer if debris is expected to fall outside these hazard areas.

Explosive safety quantity-distances, as appropriate, are established when storage of or work on missile components with explosive materials is being accomplished at the KTF launch facilities, missile assembly buildings, and rocket staging areas. (U.S. Army Strategic Defense Command, 1992a)

Ground safety at the KTF is the responsibility of Department of Energy – Sandia National Laboratories which requires that all hazard operations are performed under specific SOPs. Structural fire protection and fire-fighting services are provided by the PMRF. Transportation of hazardous materials is governed by Federal regulations administered by the DOT and the DOD. (U.S. Army Strategic Defense Command, 1992a; U.S. Department of Energy, 1992)

Ground safety considerations at the PMRF include aircraft operations and the operation of radars that pose a potential electromagnetic hazard to aircraft and ground personnel. Operators of these radars have developed SOPs to ensure the safety of aircraft and ground personnel. At the PMRF-Barking Sands, all radars are elevated on pedestals, eliminating the ground hazard to personnel.

3.8 INFRASTRUCTURE

Infrastructure elements include facilities and systems that provide power, water, wastewater treatment, and disposal of solid waste. Transportation routes are also considered part of a facility's infrastructure.

Region of Influence

The ROI for infrastructure analysis encompasses the KTF and portions of the PMRF, including transportation routes to these facilities.

Electricity

Commercial electricity is provided to the KTF and PMRF-Kokee by Kauai Electric Company. Power is supplied to the PMRF by a 12.5-kilovolt power line reduced by a transformer located on the PMRF. The current capacity for the PMRF is 2,100 kilowatts, and the daily demand is 1,350. The KTF operates two 300-kilowatt diesel generators that automatically begin operating when demand exceeds 120 kilowatts. (U.S. Army Strategic Defense Command, 1992a)

Solid Waste

PMRF–Barking Sands and KTF activities currently generate 6,000 to 7,000 pounds per week of domestic refuse. This refuse is collected by the PMRF operations and maintenance contractor and delivered to the new county-operated sanitary landfill. (U.S. Army Strategic Defense Command, 1992a)

Wastewater

Sewage facilities at PMRF-Kokee consist of individual cesspool systems, and sanitation water is supplied by the Kokee State Park water system. The KTF has two septic leach-field systems for sewage disposal which are registered with the Hawaii Department of Health Services Wastewater Branch. Each consists of a septic tank, distribution box, and leach field. The septic tanks are sized to dispose of 625 gallons and 999 gallons of wastewater. No National Pollutant Discharge Elimination System permits are necessary. The systems are inspected periodically by the state, and the tanks are emptied by state-licensed contractors who dispose of the waste according to state regulations. (U.S. Army Strategic Defense Command, 1992a)

Water

Potable water is brought to PMRF-Kokee by personnel and stored on-site. KTF water is supplied by the Kekaha Sugar Company's Mana well. This water is located at Kamokala Ridge and is delivered to two storage tanks. The tanks' total capacity is 1,415,420 gallons, and current demand is 391,322 gallons per day. Current water consumption for the KTF is estimated at 300 gallons per day during periods of inoperation when only maintenance and caretaker functions are performed and 1,200 gallons per day during

operational periods for launches (U.S. Department of Energy, 1992). Water pressure is supplied by a water pump located near the PMRF–Barking Sands aircraft hangar and is adequate to fight fires. (U.S. Army Strategic Defense Command, 1992a)

Transportation

PMRF-Kokee is reached via one of two routes off Kaumualii Highway: Highway 550, a State road with a speed limit of 25 miles per hour, or via Kekaha on a County of Kauai road which intersects Highway 550 7 miles from Waimea. Imiloa Road is a two-laned roadway with a posted speed of 20 miles per hour that provides direct access to the PMRF–Barking Sands. It intersects Kaumualii Highway which is a primary circulation route connecting the PMRF–Barking Sands with Kekaha and Lihue. Kaumualii Highway, in the vicinity of Imiloa Road, is a two-laned road with a posted speed of 50 miles per hour. According to a 1989 state Department of Transportation traffic survey, the average daily traffic volume on Kaumualii Highway is 1,733. (Parsons Brinckerhoff Quade & Douglas, 1990)

3.9 LAND USE

Land use on Kauai is regulated by both the state and Kauai County. The State of Hawaii Land Use Law classifies all lands into four categories: urban, rural, agricultural, and conservation.

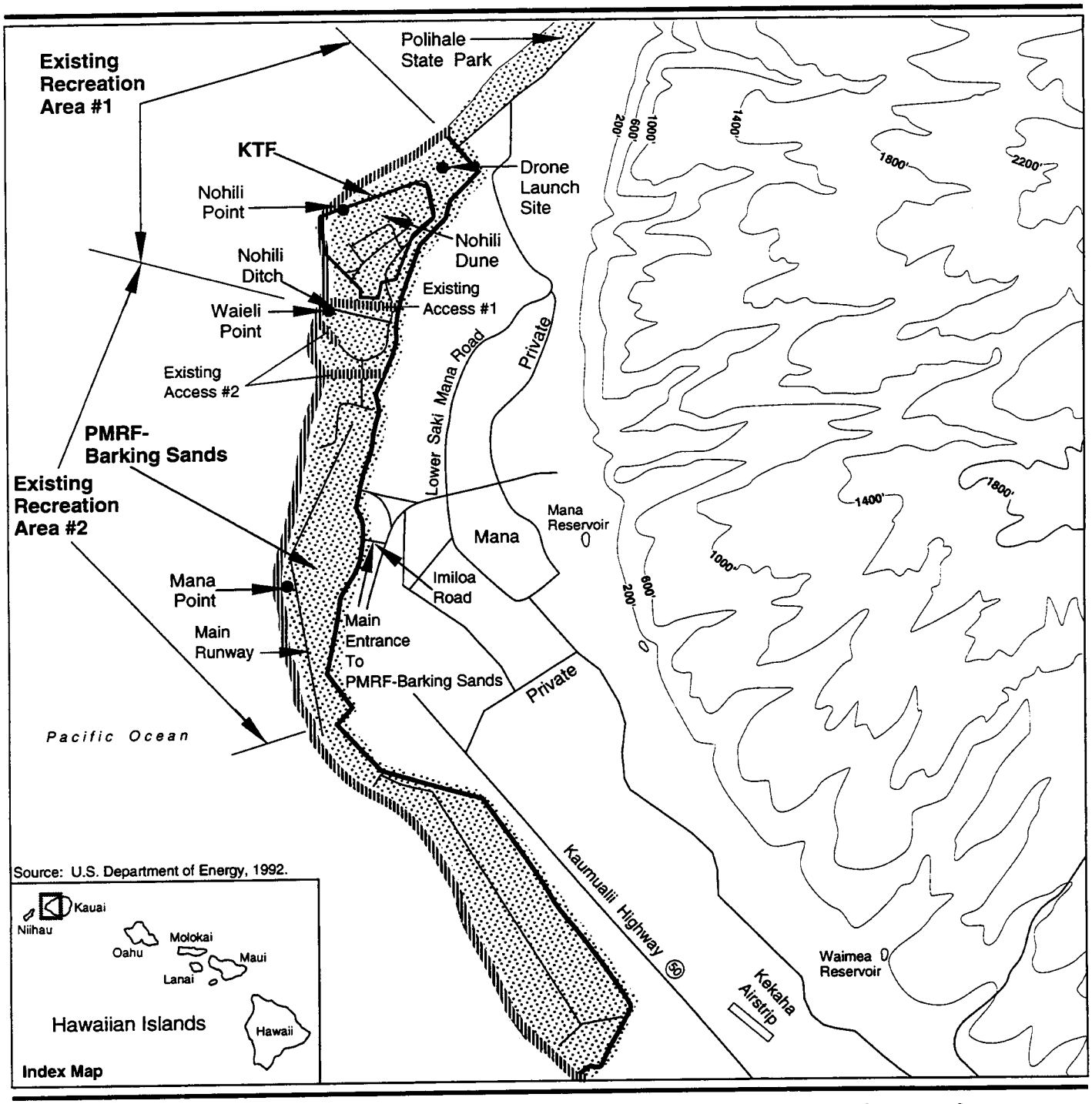
Region of Influence

The ROI for land use analysis encompasses the KTF, portions of the PMRF–Barking Sands, and affected beach areas. The PMRF-Barking Sands is a Federal facility, and its primary land use has been, and still is, missile launching and testing and related military activities.

Affected Environment

According to the Department of the Navy (1986), land north of, as well as on, the PMRF is state-classified as a conservation district (figure 3-3) which includes forest and water reserves, national and state parks, lands with a slope of 20 percent or greater, marine waters, and offshore islands. Conservation districts are managed by the Hawaii Department of Land and Natural Resources. However, the land occupied by the PMRF was transferred to the Federal Government by two State of Hawaii Executive Orders and is exempt from a State of Hawaii Conservation District Use Permit. This transfer requires that public access to the beach only be denied during hours of hazardous operations on the PMRF. The PMRF-Barking Sands is a Federal facility, and its primary land use is missile launching and testing and related military activities. The dune area from Nohili Point to the north boundary of the PMRF–Barking Sands has been designated as a scenic ecological area by Kauai County. (U.S. Department of the Navy, 1986; The Traverse Group, 1988; U.S. Army Space and Strategic Defense Command, 1993a; U.S. Army Space and Strategic Defense Command, 1992a)

Developed land on the KTF contains rocket launch complexes and support facilities. The coastline of the KTF includes Recreation Area Number 1 (figure 3-3) which is open Monday



EXPLANATION

- Public Access to Recreation Areas
- Conservation
- Agriculture and Hawaiian Homelands
- Area Enlarged

0 2,500 5,000 Feet

0 750 1,500 Meters

Land Use and Recreation at the PMRF-Barking Sands and KTF

Kauai, Hawaii

Figure 3-3

through Friday from 4:00 p.m. to 6:00 a.m. and 24 hours a day on weekends and holidays. Recreation Area Number 1 consists of 10 acres (ac) of rocky and sandy beaches and part of the Barking Sands dune area. Recreational uses include fishing, surfing, diving, camping, and general beach use. (U.S. Army Strategic Defense Command, 1992a; U.S. Department of Energy, 1992)

3.10 NOISE

Sound can vary over an extremely large range of amplitudes (figure 3-4). The decibel (dB), a logarithmic unit that accounts for the large variations in amplitude, is the accepted standard unit for the measurement of sound. Sound levels which incorporate frequency-dependent amplitude adjustments established by the American National Standards Institute (American National Standard Institute, 1983) are called weighted sound levels. When measuring typical sources of noise, such as transportation or equipment, to determine their effects on a human population, A-weighted sound levels are often used to account for the frequency response of the human ear. When high-intensity impulsive noise is evaluated to determine its effects on a human population, C-weighted sound levels are used.

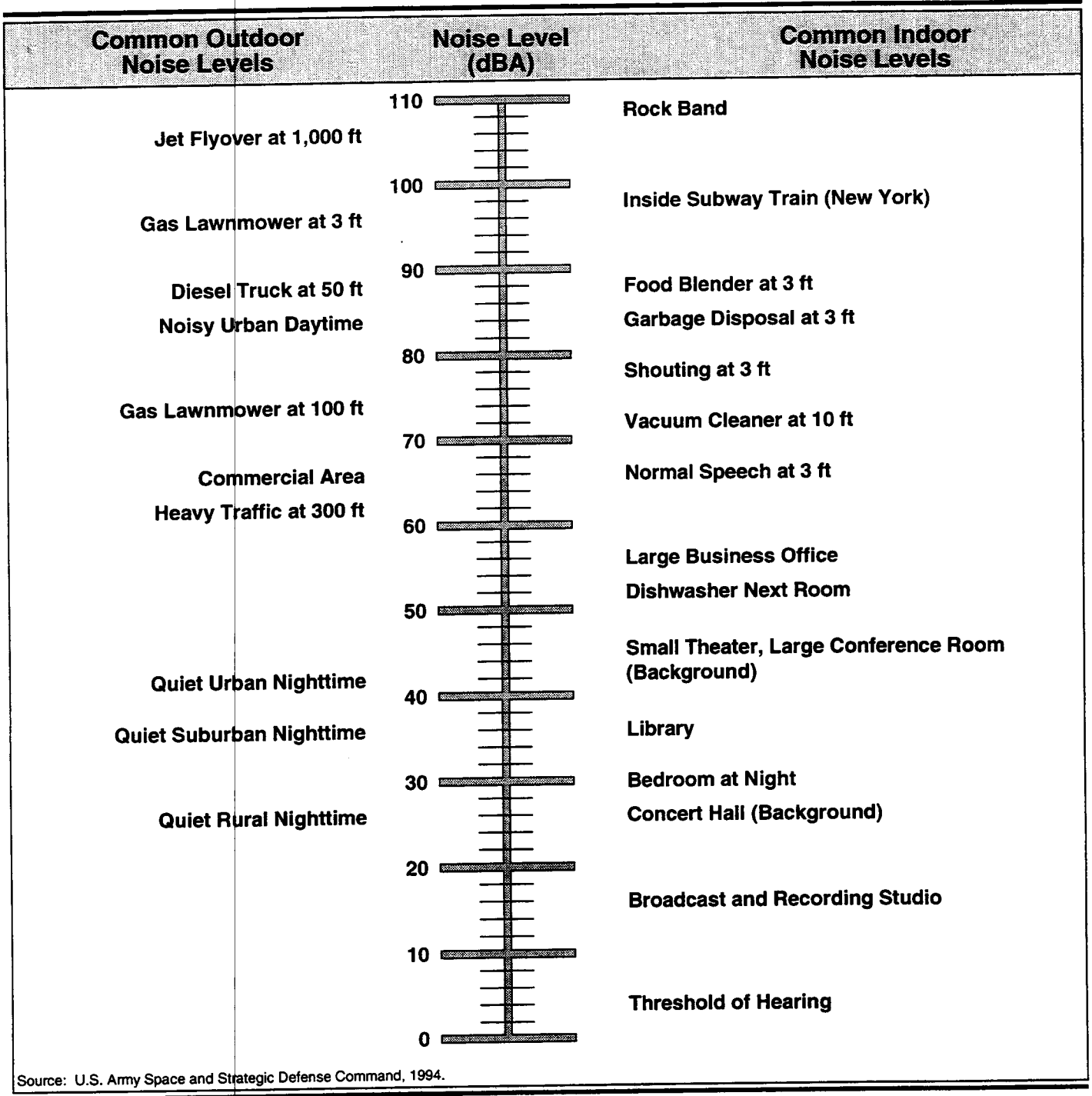
Noise is usually defined as sound that is undesirable because it interferes with speech and hearing, is intense enough to damage hearing, or is otherwise annoying. Noise levels often change with time; therefore, to compare levels over different time periods, several descriptors were developed that take into account this variance. Two common descriptors, which are used in this document, are the annual average day-night sound level (L_{dn}) and maximum sound level (L_{max}).

Region of Influence

Under 29 CFR 1910.95, employers are required to monitor employees whose exposure to hazardous noise could equal or exceed an 8-hour time-weighted average of 85 A-weighted decibels (dBA). For this reason the ROI for noise analysis is the area within the L_{max} = 85 dB contours generated by AMTE program activities.

Affected Environment

Existing noise at PMRF-Kokee results from the operation of electric-power generators and from traffic on nearby Highway 550. Noise sources from the PMRF–Barking Sands and the KTF include target drones, aircraft, helicopters, rocket and missile launches, and daily base operations. Noise levels on the PMRF-Barking Sands near the runway average 75 dBA. Locations on the base away from the runway are typical of a commercial area with noise levels around 65 dBA or less. Infrequent, short-term launch noise from the PMRF-Barking Sands and KTF has come from Strategic Target System, Strypi, and ZEST missile launches. The Strategic Target System noise was measured at 126 dB at 575 ft from the launch pad to 97 dB at the Ground Hazard Area boundary (10,000 ft). The Strypi noise was measured at 120 dB at 1,135 ft from the launch pad to 109 dB at the Ground Hazard Boundary (2,722 ft). Noise associated with the ZEST program was measured at 124.8 dB at 725 ft from the launch pad to 109.0 dB at 2,975 ft. Vandal missiles are regularly launched from PMRF-Barking Sands. Since the Vandal missile uses the same Talos booster as the missiles in the ZEST program, they should generate similar noise



Source: U.S. Army Space and Strategic Defense Command, 1994.

Comparative Sound Levels

Figure 3-4

levels. Noise levels generated from the 320 rocket boosters launched from the KTF from 1962 through 1990 were not monitored. (U.S. Army Space and Strategic Defense Command, 1993a; U.S. Department of Energy, 1992).

The nearest on-base housing area is located approximately 5 miles south of the KTF. The nearest off-base residential area is Kekaha, which is approximately 8 miles south of the KTF (U.S. Army Strategic Defense Command, 1992a). Both of these locations are outside the ROI. The portions of the ROI that extend beyond the boundaries of the PMRF-Barking Sands include sugar cane fields to the east and the ocean to the west.

3.11 SOCIOECONOMICS

Socioeconomics typically comprises the demographic and economic characteristics of a region and its related attributes. This section discusses baseline socioeconomic conditions including population, employment, and housing.

Region of Influence

The ROI for socioeconomics analysis includes the KTF, PMRF-Barking Sands, and nearby communities.

Affected Environment

The population of Kauai in 1990 was 51,177. Most of the central and western portions of the island are relatively unpopulated. Most of the PMRF-Barking Sands military personnel live on the installation. The PMRF-Barking Sands has 15 transient personnel housing units which are usually 100-percent occupied (Inouye, 1995). The majority of civilian employees reside in adjacent communities. According to a recent inventory of lodging properties on Kauai, 123 properties, consisting of 5,870 units, are available for visitor accommodation (Hawaii Visitors Bureau, 1995). (U.S. Army Strategic Defense Command, 1992a)

Kauai's economy consists mainly of tourism, agriculture, and government employment. Sugar is the island's most important agricultural commodity. The island also has a livestock industry and a commercial fishing operation. (U.S. Army Strategic Defense Command, 1992a)

The PMRF is the largest Federal employer on Kauai, employing approximately 864 people directly and indirectly. The KTF employs 14 permanent personnel and 30 to 75 transient personnel during launch operations. (U.S. Army Space and Strategic Defense Command, 1993a)

3.12 WATER RESOURCES

Water resources include those aspects of the natural environment related to the availability and characteristics of water. Water resources include consideration of surface water and groundwater. Surface water includes surface runoff, changes to surface drainage,

floodplains, and surface water quality. Groundwater includes aquifer characteristics, water quality, and water supply.

Region of Influence

The ROI for water resources is the KTF and the northern portion of the PMRF-Barking Sands for terrestrial surface water and groundwater resources and the nearshore area and open ocean for marine water resources.

Surface Water

There are no standing surface water bodies in the ROI. The surficial sand is so permeable that rainfall rapidly infiltrates into the ground, with little runoff except for paved areas. There is no developed surface water drainage system within the KTF. Surface water in the remainder of the northern portion of PMRF-Barking Sands is limited to ditches that drain the Mana plain. Most of the Mana Plain area adjacent to PMRF-Barking Sands is used for agriculture. The waters in the agricultural ponds along the Mana cliffs generally do not meet drinking water standards for chlorides but have near neutral to slightly alkaline pH (U.S. Army Strategic Defense Command, 1992a). Results of a surface water study in the Mana Plain/KTF area do not indicate residual hydrogen chloride (HCl) effects of the past launches at the KTF (U.S. Army Strategic Defense Command, 1991). Because the drainage ditches are designed to move water away from the agricultural fields during irrigation and rainfall and to leach salts from the soils, no residual effects of past launches are expected (U.S. Army Strategic Defense Command, 1992a).

Groundwater

The ROI contains three geologic units: bedrock, alluvium, and sand dunes. These units all contain water and are hydraulically connected. The bedrock unit is composed of highly permeable volcanics containing brackish water that floats on seawater. The overlying alluvial sediments act as a barrier to groundwater movement because of their low permeability. Groundwater in the alluvial sediments is also brackish (The Traverse Group, 1988). Neither of the units is exploited for potable water.

The dune sand aquifer, on which the PMRF-Barking Sands lies, has a moderate hydraulic conductivity and moderate porosity of about 20 percent (Botanical Consultants, 1985). It consists of a lens of brackish groundwater that floats on seawater and is recharged by rainfall and by seepage from the underlying sediments (U.S. Army Strategic Defense Command, 1992a). The only record of an attempt to exploit this groundwater is of a well drilled for the U.S. Navy in 1974, 4 to 5 miles south of the KTF. The well was drilled to a depth of 42 ft and tested at 300 gallons per minute. The water contained a chloride content of about 2,800 parts per million, which is too brackish for plants and animals, so the well is not used (U.S. Army Strategic Defense Command, 1992a).

Marine Water

The marine water along the coast of the PMRF-Barking Sands may be locally affected by runoff from the agricultural drains near the mouths of the drains. However, they are

considered to be clean in areas near the KTF (U.S. Army Strategic Defense Command, 1992a). As a result of remote location away from major urbanized land masses, marine water quality in the ROI is expected to be relatively high. Open ocean waters are typically alkaline, having a pH of greater than 7.0, which allows the buffering of HCl rocket emissions without significant long-term change to water chemistry.

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4.0 Environmental Consequences

4.0 ENVIRONMENTAL CONSEQUENCES

This section of the EA examines potential environmental consequences associated with the proposed action. Potential impacts are assessed by comparing proposed program activities with potentially affected environmental components. The amount of detail presented in each section is proportional to the potential for impacts.

Proposed Actions Excluded from Further Analysis

As part of the proposed action, aircraft operations would be conducted at the PMRF-Barking Sands and a data transmission radio may be installed at the PMRF-Kokee. Aircraft operations would consist of about two C-5 or C-17 cargo aircraft to transport the PATRIOT Fire Unit to the PMRF from White Sands Missile Range, New Mexico. This would also include transport of the PATRIOT missiles. The applicable DOD and DOT regulations for the transport of explosives and the safety procedures developed for PATRIOT system transport would be followed. Also, a U.S. Air Force C-130 aircraft from Eglin AFB, Florida, would be flown to the PMRF and would fly about 12 missions in support of program tests. The PMRF has a 6,000-foot-long asphalt runway that has supported both of these types of aircraft and that routinely conducts aircraft operations. No additional personnel, facilities, or modification of existing facilities would be required to support the increase in aircraft traffic. Kekaha, the closest off-base residential community, is located about 4 miles southeast of the runway; therefore, any noise associated with the additional flights would be minimal. The proposed aircraft operations would require only a relatively minor commitment of irretrievable petroleum resources.

Installation of a radio at the PMRF-Kokee site to provide communication between the Cooperative Engagement Processor and the PATRIOT Information and Coordination Central located at the KTF would not require any new facilities, modification of the existing facilities, or ground disruption. The installation of the radio antenna on the side of the main office complex or on an existing telephone-type pole would be below the height of adjacent trees and is not expected to be visible to the general public. Radio transmissions would not affect public television or radio communications. Tests to determine any effect to other antennas in the area such as the National Aeronautics and Space Administration antenna are scheduled for September 1995. If any interference effects are determined during this test, the AMTE program would schedule around the existing electromagnetic spectrum users. For these reasons, these program actions are not evaluated further in this environmental assessment.

4.1 AIR QUALITY

AMTE program activities at the PMRF-Barking Sands and KTF would include exhaust products from portable generators and target drones and would include combustion products from the PATRIOT missile's rocket motor if these missiles are launched.

Generators

The PATRIOT Air Defense System that would be used as part of AMTE program activities would have several associated portable generators used to supply electric power. The truck-mounted Raytheon Electric Power Plant has one 150-kilowatt, 400-hertz diesel powered generator. The truck-mounted standard PATRIOT Electric Power Plant has two 150-kilowatt, 400-hertz diesel-powered generators, only one of which would ever be running at a time (Raytheon, 1990). One of these two sources would be used to provide electric power to the PATRIOT Engagement Control Station and Radar Set.

The PATRIOT Information and Coordination Central and Communications Relay Group each have an associated Electric Power Unit, which is a trailer-mounted 30-kilowatt, 400-hertz diesel-powered generator (Raytheon, 1990). The PATRIOT Maintenance Center and Small Repair Parts Transporter together are powered by a trailer-mounted 15-kilowatt, 400-hertz diesel-powered generator. The PATRIOT Launching Station is powered by a 15-kilowatt, 400-hertz diesel-powered generator (Raytheon, 1990).

During CCT and VE activities the 150-kilowatt generator of the Raytheon Electric Power Plant would be used to provide electric power to the Engagement Control Station. The 30-kilowatt Electric Power Unit would provide electric power to the Information and Coordination Central. The 15-kilowatt generator would be used to power the Maintenance Center and Small Repair Parts Transporter. If the option of using the Communications Relay Group is chosen, then a second 30-kilowatt Electric Power Unit would also be run to provide electric power to the Communications Relay Group.

As a conservative estimate, it is assumed that these four generators would operate for no more than 256 hours during the time period covering all CCT and VE activities. This estimate comes from assuming *8* hours of operation for each of the 32 working days that would comprise the combined CCT and VE activities. This estimate was used to estimate the air pollution emissions from generators during CCT and VE activities (table 4-1).

During intercept activities either the 150-kilowatt generator of the Raytheon Electric Power Plant or the 150-kilowatt generator of the standard PATRIOT Electric Power Plant would be used to provide electric power to the Engagement Control Station. The 15-kilowatt generator would provide electric power to the Launching Station. Other generator use would be the same as during CCT and VE activities.

As a conservative estimate, it is assumed that during the time period covering all intercept activities the five generators would operate for no more than 256 hours. This estimate comes from assuming 8 hours of operation for each of the 32 working days that would comprise the intercept activities. This estimate was used to estimate the air pollution emissions from generators during intercept activities. Since the air pollutant emission rates for the standard PATRIOT Electric Power Plant are greater than the emission rates for the Raytheon Power Plant, the former were used to estimate the air pollution emissions from generators during intercept activities (table 4-1).

Table **4-1**: Emission Estimates **for PATRIOT** Generators

Pollutant	Rate (pounds/hour)						
	Raytheon Electric Power Plant (150-kilowatt generator)[a]	Electric Power Plant (two 150-kilowatt generators)[b]	Electric Power Unit (30-kilowatt generator)[b]	Maintenance Equipment (15-kilowatt generator)[b]	Launching Station (15-kilowatt generator)[b]	CCT and VE total[c] (tons)	Live-fire total[d] (tons)
Carbon monoxide	1.10	1.34	**0.27**	0.13	0.13	0.23	**0.28**
Nitrogen oxides	**3.23**	**6.22**	**1.24**	0.62	**0.62**	0.81	**1.28**
Sulfur oxides	**0.33**	**0.41**	0.08	**0.04**	**0.04**	***0.07***	0.08
Particulates	0.18	**0.44**	0.09	**0.04**	**0.04**	0.05	0.09
Hydrocarbons	0.04	0.50	0.10	0.05	0.05	0.04	0.10

[a]Raytheon, **1995**
[b]**Derived** from **U.S.** Environmental Protection Agency, 1985a
[c]256 hours of Raytheon Electric Power Plant, two Electric Power Units, and Maintenance Equipment
[d]256 hours of Electric Power Plant, two Electric Power Units, Maintenance Equipment, and Launching Station

Using the manufacturer's emission rate for the Raytheon Electric Power Plant and emissions factors that are generally valid for diesel-fueled industrial engines (U.S. Environmental Protection Agency, 1985a) for the other generators, emission estimates for these generators are shown in table 4-1.

The state of Hawaii first must approve and then monitor all diesel generators for continued compliance with air emission standards (U.S. Army Strategic Defense Command, 1992a; U.S. Department of Energy, 1992). **By** Hawaii Administrative Rules, Chapter 11-60.1, Subchapter 4, all noncovered sources of air pollution with potential emissions equal to or greater than 1.0 ton per year of a criteria pollutant or 0.1 ton per year of a hazardous air pollutant must obtain a noncovered source permit (Yi, 1995). As the portable generators that would be used to supply electrical power have potential emissions of criteria pollutants greater than 1.0 ton per year, a noncovered source permit would be required. However, the emissions from the generators would not be expected to cause any applicable ambient air quality standards to be exceeded.

PATRIOT Missile Launches

The emissions from the launch of PATRIOT missiles are generated in the ground cloud at lift-off and along the launch trajectory. Emissions are associated with the oxidation of fuel. Emission composition is determined by the type and composition of the various propellants. Air quality analysis has been conducted for the launch of a PATRIOT missile. Solid rocket motor exhaust air emissions for a representative PATRIOT missile are given in table 4-2 (U.S. Army Strategic Defense Command, 1991). Details of this analysis are given in Appendix F. If the PATRIOT missile's emissions are of greater amounts than those given in table 4-2, then additional analysis and environmental documentation would be required.

Table **4-2:** PATRIOT Missile **Solid** Rocket Motor Exhaust **Air** Emission Products'

Emission	Pounds
Aluminum Oxide (Al_2O_3)	89.7
Carbon Monoxide (CO)	57.6
Hydrogen Chloride (HCl)	51.8
Nitrogen (N_2)	21.9
Water (H_2O)	**16.8**
Carbon Dioxide (CO_2)	5.9
Hydrogen (H_2)	5.9

Ymissions for the ERINT-1 missile
Source: U.S. Army Strategic Defense Command, 1991

The major emission products from the PATRIOT rocket motors are carbon monoxide, Al_2O_3, and HCl. Carbon monoxide is a criteria pollutant and is compared to the national and Hawaii ambient air quality standards (see Appendix F, table F-1). Al_2O_3 is a naturally occurring mineral that has a very low toxic potential (Lewis, 1993). The Al_2O_3 in the rocket exhaust is a solid dust. Thus, as the most conservative estimate, the Al_2O_3 was assumed to be PM-10 and was then compared to the corresponding national and Hawaii ambient air quality standards. **Also,** the Al_2O_3 concentrations were compared to the 8-hour American Conference of Government Industrial Hygienists (1992) standard for dust.

HCl is not a criteria pollutant but is one of the 189 hazardous air pollutants listed in Title III of the Clean Air Act. Concentrations of HCl are compared to the guidelines from the National Research Council (1987) and the **EPA** (U.S. Environmental Protection Agency, 1992) (table F-2).

Neither the **U.S.** Environmental Protection Agency nor the State of Hawaii has promulgated ambient air quality standards for HCl. The relevant public exposure guidelines for HCl as an indicator of significance is the Short-Term Public Emergency Guidance Level (SPEGL) developed by the National Research Council, Committee on Toxicology (Appendix F, Table F-2).

For hydrogen chloride emissions, the Hawaii Clean Air Branch refers to the American Conference of Government Industrial Hygienists (ACGIH) threshold limit value (TLV) for occupational workplace settings, which is a ceiling limit of 5 ppm (7.5 milligrams per cubic meter). TLVs refer to airborne concentrations of substances and represent conditions under which it is believed that nearly all workers may be repeatedly exposed for a normal 8-hour workday and a 40-hour workweek without adverse effect. A TLV-TWA is a time-weighted average concentration for a normal 8-hour workday and a 40-hour workweek, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect. A TLV-Ceiling Limit (TLV-C) is a concentration that should not be exceeded during any part of the work exposure (American Conference of Governmental Industrial Hygienists, 1990). The State of Hawaii Clean Air Branch interprets the ACGIH TLV-C for hydrogen chloride, 5 ppm, to be an 8-hour time-weighted average. Furthermore, to provide health and safety protection to sensitive members of the public, the Clean Air Branch applies a safety factor of 200 to the ACGIH TLV. The resulting public exposure

guideline used by the Hawaii Clean Air Branch is an 8-hour time-weighted average of 0.025 ppm (U.S. Army Strategic Defense Command, 1992a). This is a reference value to which concentrations of shorter (or longer) exposures can be normalized and compared. It does not mean that an individual will be exposed to a chemical for exactly 8 hours.

The exposure evaluation criteria developed by ACGIH and other agencies serve as guidelines for occupational exposures, not regulatory standards for determining lines between safe and dangerous ambient concentrations. The ACGIH strongly discourages the use of its published exposure values for other than industrial hygiene practices (American Conference of Governmental Industrial Hygienists, 1992). The ACGIH guideline is not directly applicable to exposure of the public to AMTE program emissions.

A more appropriate guideline to compare hydrogen chloride emissions is the SPEGL developed by the National Research Council Committee on Toxicology. To protect sensitive members of the public, such as infants, children, the elderly, and people with respiratory diseases from large quantities of hydrogen chloride, the National Research Council recommended a one-hour SPEGL of 1 ppm (National Research Council, 1987).

The analysis of potential ambient air quality impacts from proposed launch activities considers both normal launch and early flight termination scenarios. It is assumed that during either scenario the only air pollutant emitted is the exhaust from the rocket motor combustion products.

The short-term air quality impacts caused by the launch of an individual PATRIOT missile were modeled with the TSCREEN PUFF computer model developed by the Environmental Protection Agency in 1990. Screening techniques use simplifying assumptions and generate estimates which are generally upper bounds of expected pollutant concentrations. Details of the analysis and computer modeling are given in Appendix F.

The results from the modeling show that for both the normal launch and early flight termination scenarios of a PATRIOT missile, neither the relevant ambient air quality standards nor the HCl guidelines are exceeded for distances greater than 2,400 ft from the pad 1 launch site (table F-2). The PMRF–Barking Sands base boundary closest to the launch site is approximately 2,400 ft to the southeast. Portions of the beach are closer to the launch site than 2,400 ft. As explained in section 2.2.4, all PATRIOT missile launches would take place between 6:00 a.m. and 4:00 p.m. weekdays when access to the beach is normally restricted. Notices to Mariners are issued by PMRF–Barking Sands prior to each launch, and area surveillance is conducted to determine that the area is clear of water craft. Therefore, no members of the public are expected to be on the beach or in the nearby ocean.

Target Drone Flights

The launch and flight of target drones from the site shown in figure 2-4 are regular activities at the PMRF–Barking Sands. Up to eight target drone flights would be required in support of the AMTE program. Control of drone launches for the AMTE would remain the responsibility of the PMRF. The BQM-34's jet engine is capable of 1,920 pounds of thrust, and the BQM-74's jet engine is capable of 240 pounds of thrust. Both target

drones use Jet-A, the variety of fuel used in commercial jet aircraft. Exhaust includes the pollutants carbon monoxide, nitrogen oxides, sulfur oxides, particulates, and volatile organic compounds (U.S. Environmental Protection Agency, 1985b). The target drone flights would occur over the open ocean, and their exhaust is expected to be quickly dispersed. (U.S. Department of the Navy, 1990; 1993b)

The BQM-34 uses one Mark 23 Jet Assisted Takeoff (JATO) rocket motor per launch, and the BQM-74 uses two Mark 117 JATO rocket motors per launch. The Mark 23 contains approximately 110 pounds of solid rocket propellant, and the Mark 117 contains less than 50 pounds of solid rocket propellant. Similar to the combustion products from the PATRIOT missile's rocket motor, the major exhaust products of the Mark 23 and Mark 117 rocket motors are carbon monoxide, HCl, nitrogen, and water. The amount of these pollutants would be very small, less than one-half the amount from a PATRIOT missile launch; therefore, the launch of target drones would not be expected to cause either ambient air quality standards or the SPEGL for HCl to be exceeded. (U.S. Department of the Navy, 1989)

Conformity Determination

Title I of the 1990 Clean Air Act Amendments requires Federal actions to conform to the provisions of the State Implementation Plan. Section 176(c) states that no department, agency or instrumentality of the Federal Government shall engage in, support in any way, provide financial assistance for, license or permit, or approve any activity that does not conform to the applicable approved implementation plan for the area. Specifically, Federal actions must not cause or contribute to any new violations *of* the National Ambient Air Quality Standards; increase the frequency or severity of any existing violation; or delay timely attainment, required interim emission reductions, or other milestones. In accordance with Section 176(c), the U.S. Environmental Protection Agency promulgated the criteria and procedures used to determine conformity. These regulations only pertain to Federal actions having emissions of pollutants that are in nonattainment for the affected area. As none of the counties in the State of Hawaii are in nonattainment, no conformity determination would be required for AMTE program activities.

Cumulative Impacts

Missile launches and launch support equipment are air pollution sources that are brief and discrete events in time. Air pollutants do not accumulate at any of the locations under consideration because winds effectively disperse them between launches.

Furthermore, in the Strategic Target System EIS (U.S. Army Strategic Defense Command, 1992a), no cumulative air quality impacts at the PMRF–Barking Sands or KTF were found for the launch of four Strategic Target System missiles per year from the KTF. The amount of emission from a Strategic Target System missile is more than ten times that from a PATRIOT missile.

No cumulative air quality impacts are anticipated as a result of AMTE program activities in combination with other programs at the PMRF–Barking Sands and KTF.

4.2 AIRSPACE

Potential airspace impacts (i.e., interference with aeronautical operations in the navigable airspace) from implementation of the proposed action arise from two distinct effects: (1) the need to segregate nonparticipating aircraft from the AMTE program activities and (2) the need to advise nonparticipating aircraft to avoid the tracking radar areas and the associated electromagnetic radiation emissions. Potential impacts to Special Use Airspace, en route airways and jet routes, and local airports and airfields are discussed below.

Special Use Airspace

No new special use airspace proposal, or any modification to the existing Special Use Airspace, is contemplated to accommodate AMTE program activities. Program activities, including CCTs, VEs, and PATRIOT intercepts, would continue to utilize the existing over-water Special Use Airspace, namely Restricted Area R-3101 and Warning Area W-188. Although the nature and intensity of utilization varies over time and by individual operational area, the AMTE program activities do not represent a direct adverse impact on Special Use Airspace. Rather, they represent precisely the kinds of activities for which Special Use Airspace was created, to accommodate national security and necessary military activities and to confine or segregate activities considered to be hazardous to nonparticipating aircraft.

En Route Airways **and** Jet Routes

Program activities would not require a change to an existing or planned IFR minimum flight altitude, a published or special instrument procedure, or an IFR departure procedure; neither would they require a visual flight rules operation to change from a regular flight course or altitude. Consequently, no impacts to the surrounding low-altitude airways and/or high-altitude jet routes are identified.

No impacts to the ROI's airways and jet routes are identified because of the required coordination with the FAA. There is a scheduling agency identified for each piece of Special Use Airspace that the PMRF utilizes on a routine basis (most daily, some five days/week, a few on an as-needed basis). Schedules are provided to the FAA facility as agreed between the agencies involved. Priorities are assigned to different events, and evocation of these priorities often leads to last-minute cancellations of lower-priority events, but transmission of the schedule is still made to the controlling Air Route Traffic Control Center. Real-time airspace management involves the release of airspace to the FAA when the airspace is not in use or when extraordinary events occur that require drastic action, such as weather requiring additional airspace.

The program activities, including the CCTs, VEs, and the PATRIOT intercept activities, would be conducted clear of established oceanic air routes or areas of known surface or air activity and in compliance with DOD Directive 4540.1, AR 95-10, AR 385-62, and the policy and operating procedures for firing into airspace over the high seas contained in the general planning book of the DOD flight information publication **(U.S.** Department of the Army, 1988).

The need to advise nonparticipating aircraft to avoid the tracking radar areas and the associated electromagnetic radiation emissions is the second potential airspace use impact on en route airways and jet routes. Operation of the tracking and acquisition radars, or sensors, has the potential for some interference with airborne weather radar systems. Since this has implications for aircraft safety, rather than airspace use as such, it is discussed in more detail in the Health and Safety section below. However, airspace use would still be affected by issuances of Notices to Airmen to advise avoidance of the tracking radar areas during program activities. The tracking radar area is likely to be contained within the W-188 Warning Area.

Airports/Airfields

Program activities, including the CCTs, VEs, and the PATRIOT intercept activities, would continue to utilize the existing Special Use Airspace and would not restrict access to or affect the use of the existing public use airports and airfields. Similarly, existing airfield/airport arrival and departure traffic flows would not be affected. All arriving and departing aircraft to and from the PMRF–Barking Sands airfield and the PMRF–Makaha Ridge instrumentation area heliport and all participating military aircraft are under the control of the PMRF–Barking Sands Radar Control Facility; therefore, there are no airfield and/or airport conflicts in the area. Access to the private Kekaha airstrip would not be affected.

Cumulative Impacts

All AMTE program airspace activities that utilize Special Use Airspace would take place in existing Special Use Airspace that is cleared of nonparticipating aircraft. The W-188 Warning Area Special Use Airspace is also used on an ongoing basis for missile, rocket, and gunnery operational firing. The substantial size of Warning Area W-188 allows the PMRF to schedule simultaneous operations in different subdivisions (figure 3-1). Therefore, adverse cumulative impacts from proposed activities to existing activities can be obviated by range subdivision scheduling.

4.3 BIOLOGICAL RESOURCES

Potential issues related to biological resources include vehicle use during pretest activities, PATRIOT launches and drone flights, fire, missile and drone debris, or electromagnetic radiation. PATRIOT intercepts of target drones could be conducted during the three-year test period. Additional consultation with the U.S. Fish and Wildlife Service would take place prior to testing to determine if any species occurring near the test sites had been added to the list of candidate, threatened, or endangered species. If newly listed species are found to occur in the test area, the potential for program activities to affect these species would be evaluated.

Terrestrial Biological Resources

A small potential for fire exists from PATRIOT missile firings. Vegetation at the launch site consists of sparse ground cover which is routinely mowed, thus making it easier to quickly

extinguish any ground fires. Fire fighting equipment would be available during all launches to quickly extinguish any fires and minimize any effects.

HCl and water are emitted during missile launches, and when combined are known to cause leaf injury to plants as a result of launching very large flight vehicles such as the space shuttle. The environmental monitoring program conducted for the first launch of the Strategic Target System booster included vegetation sampling for prelaunch and postlaunch conditions. Results indicated little effect to vegetation from the launch of this system. The amount of HCl produced by the PATRIOT missile (52 pounds total) is considerably less than the amount produced by the Strategic Target System booster (3,476 pounds, first-stage only); therefore, the potential impact on vegetation, including the adder's tongue, from PATRIOT launches are also expected to be slight. Therefore, no mitigating measures other than those described for fire fighting are necessary. Missile debris impact would occur over the ocean and is not expected to affect vegetation. (U.S. Army Space and Strategic Defense Command, 1993b)

The Newell's shearwater may be disoriented by security lighting. U.S. Fish and Wildlife Service approved lighting would be used during the periods of October and November when young Newell's shearwaters leave their mountain burrows to head out to the ocean. No night launches are expected.

The peak sound pressure level from a PATRIOT launch is 140 dB at a distance of 3 ft. Noise resulting from PATRIOT launches may startle nearby wildlife, such as the Hawaiian hoary bat, and cause flushing behavior in birds including the Hawaiian duck, Hawaiian coot, common moorhen, and black-necked stilt. This startle reaction would be of short duration. Studies indicate that birds may flush when sharp, loud noises such as launches occur, but return to normal behavior within a short time. PATRIOT missile and target drone launches would be infrequent and of short duration, and noise impacts on wildlife are not likely to be long-term.

Other elements of the proposed action are not expected to adversely affect the Hawaiian duck, Hawaiian coot, common moorhen, or black-necked stilt. Habitat for these species does not exist within the immediate launch area or associated facilities on the KTF, but could be located in the Nohili Ditch area near the optional radar locations. Birds, however, are not expected to remain in the radar beam long enough to be adversely affected by electromagnetic radiation. Human activity may temporarily disturb non-listed terrestrial species, but this disturbance is expected to be temporary.

Marine Biological **Resources**

Human activities during site preparation and technical support functions would occur several hundred feet from the ocean. Therefore, no impacts on marine biological resources are expected. Program activities would not disturb green sea turtle nesting habitat which is only located on the southern end of the PMRF–Barking Sands.

Prior to conducting the launch, a surveillance flight would attempt to locate marine mammals. In addition, the Navy's undersea electronic grid would be monitored for marine mammal vocalizations. Should marine mammals be detected in the planned area of

PATRIOT missile or target drone impact, all launch activities would be delayed until they exited. During the initial AMTE program, target drones would fall into the ocean intact and be recovered. If intercept tests of PATRIOT missiles with target drones are conducted, the intercepts would be at a nominal altitude of 50 ft above sea level. Because of the low intercept altitude, intercepts would result in the fragments falling over a relatively small area. For these reasons, the potential for the proposed AMTE program to impact Federally listed species is expected to be very remote.

Cumulative Impacts

No cumulative impacts on biological resources are expected as a result of pretest, CCT, or VE activities. The incremental increase in the number of drone launches and the addition of four unarmed PATRIOT missile launches would represent only a small cumulative increase in noise, launch emissions, and debris impacts into the ocean.

4.4 CULTURAL RESOURCES

Surveys of the PMRF–Barking Sands have identified prehistoric and historic archaeological remains in several locations throughout the installation boundary including the Nohili Dune which is eligible for inclusion in the National Register. The Nohili Dune is located approximately 150 feet from the missile launch pad. As a result, the entire facility is considered to be sensitive for archaeological resources. In addition, several existing PMRF–Barking Sands facilities would be used to support mission activities. None of these facilities has been evaluated for eligibility for inclusion in the National Register. However, because of the nature of the program (described in section 2.0), the majority of AMTE activities are expected to be noninvasive and temporary in nature. No ground-disturbing activities are planned, and there are no requirements for facility modification.

As described in section 2.2.4, intercept tests of PATRIOT missiles with target drones are not currently in the planning process. However, in the event that these activities are initiated, there could be some potential for fire to occur as the result of PATRIOT on-pad launch mishaps or early flight termination and ground disturbance from fire-fighting activities. While this possibility is unlikely, fire damage to archaeological sites could occur. Program policies to protect known archaeological sites and legal requirements regarding the unexpected discovery of cultural remains during program activities are described below. As a result, adverse effects on prehistoric, traditional, and paleontological resources are not expected. Consultation with the Hawaii SHPO is in progress (Appendix C).

- In accordance with the NHPA, if, during the course of program activities, cultural and/or historic materials (particularly human remains) are unexpectedly discovered, work in the immediate vicinity of the cultural materials shall be halted and the Hawaii SHPO consulted through the PMRF Environmental Office. Subsequent actions would follow guidance provided in 36 CFR Part 800.11 and in the Native American Graves Protection and Repatriation Act. The discovery of human remains would also require notification of the U.S. Navy archaeologist, the Hui Malama I Na Kapuna O Hawaii Nei, the Office of Hawaiian Affairs, and the Kauai Island Burial Council.

- To ensure the protection of any prehistoric, historic, or traditional resources already identified within the project area from unauthorized artifact collection or vandalism, personnel would be briefed before project activities commence on the significance of these types of resources and the penalties associated with their disturbance or collection.

- Measures to protect cultural resources from fire and fire fighting damage would include having PMRF fire trucks and personnel standing by during launches and the use of a spray nozzle rather than a directed stream to avoid erosional damage and exposure of artifacts within sand dunes. If extensive burning of the dune areas occurs, a post-burn archaeological survey would be conducted in consultation with the Hawaii SHPO and a U.S. Navy archaeologist.

Cumulative impacts

Due to the non-invasive, temporary nature of program activities, cumulative impacts to cultural resources when reviewed against past, present, and future actions would have no adverse effect.

4.5 GEOLOGY AND SOILS

Some increase in the amount of Al_2O_3 or elemental aluminum in soil may result in the immediate area and down wind of the PATRIOT missile launch site. Any increase in elemental aluminum and aluminum compounds in the ROI resulting from the PATRIOT missile launches is not expected to have any measurable effect on soils properties.

All non-paved areas that may be used for the program have previously been plowed and are covered with vegetation which is mowed as required. The temporary parking of PATRIOT vehicles on unpaved areas is not expected to result in soil alteration. No construction has been proposed for the proposed action. The minimal truck traffic and mobile lighting are not expected to disrupt vegetation to an extent that could result in increased wind-blown soil erosion.

Cumulative Impacts

Previous studies have determined that any increase in aluminum levels in soil at the KTF is well below regulatory action levels suggested at other locations (U.S. Department of Energy, 1992). Any small incremental increase of these missiles and target drone emission products is not expected to produce any degradation of soils.

4.6 HAZARDOUS MATERIALS AND HAZARDOUS WASTE

Kauai Test Facility

Since proposed site activities at KTF would be limited to temporary placement of a PATRIOT Fire Unit at existing facilities, the usage of hazardous materials or generation of hazardous wastes would be minimal. The hazardous materials that may be used and the

wastes of these materials that would be generated are expected to be the same as current materials and waste products at KTF.

If flight test activities occur using PATRIOT missiles to intercept remotely operated target drones, additional hazardous materials usage would be encountered. During set-up and launch of PATRIOT systems the use of hazardous materials would be limited to small amounts of solvent cleaners (acetone, isopropyl alcohol, etc.), and some handling and storage of motor fuels for use by motor vehicle and/or generator systems. The proper handling and use of such materials is routine in many types of military operations, including field exercises at primitive locations. In the case of PATRIOT missile systems, the materials would be employed in tasks addressed under existing operating procedures and routinely conducted on similar systems world-wide.

Small amounts of the hazardous materials to be used may be collected as hazardous wastes. Collected wastes would be accumulated on site in accordance with the KTF standard waste handling procedures. The KTF would contact the Honolulu DRMO to arrange for off-site disposal in accordance with Environmental Protection Agency and State of Hawaii requirements. The DRMO would provide transportation services to the final disposal location. This is in accordance with the established KTF/PMRF policy on hazardous wastes.

Flight Test Corridor

Limited use of hazardous materials (fuels for the target drones) would occur. The use of such fuels is routinely accomplished in a wide variety of military operations. Procurement, storage, and handling of adequate supplies of fuels are easily accomplished, and would present no impact to hazardous materials management at KTF.

In the event of up to four launches of an unarmed PATRIOT missile, debris from defensive missiles and potentially from target drones would be produced. If an in-flight malfunction occurs, the range safety officer may initiate flight termination, resulting in missile/drone debris being deposited beneath the flight path. Normally, all debris impacts would occur within the broad ocean area.

Hazardous materials carried aboard missile systems would include solid propellants. Missile and drone debris are discussed separately.

Missile Debris

The National Aeronautics and Space Administration conducted a thorough evaluation of the effects of missile systems which are deposited in sea waters. This study considered sounding rockets which contain construction materials and solid propellants that are very similar to the PATRIOT missile. It was concluded that the release of hazardous materials aboard missiles into sea waters would be not significant (National Aeronautics and Space Administration, 1973). The study determined that materials would be rapidly diluted and, except for the immediate vicinity of the debris, would not be found at concentrations identified as producing any adverse effects. There would be no harm to marine life, to seafood, or to other uses of the marine environment. It was concluded that eventually, all

hazardous materials falling into the sea would become diluted by the water and would cease to be of any possible concern. Since proposed flight test systems have similar characteristics to the sounding rockets examined in the study, it is considered that impacts of missile debris into the ocean would result in minimal adverse effects. This applies to debris deposited either as a result of successful or unsuccessful intercepts, or due to in-flight malfunction or flight termination along the flight corridor.

Drone Debris

Target drone debris would consist of metal parts, some working fluids, and petroleum fuels. Although all target drones are recovered for reuse whenever possible, drones routinely impact into the test area offshore of PMRF–Barking Sands during Navy training and research and development operations. No adverse environmental effects have been identified as a result of the release of hazardous materials during these operations. Likewise, impacts associated with any proposed PATRIOT intercept operations would also be expected to result in no adverse effects on the marine environment. Section **4.12,** Water Resources, contains additional information on the environmental effects of missiles and target drone debris in the marine environment.

Cumulative Impacts

No cumulative impacts associated with proposed operations or intercept operations have been identified.

4.7 HEALTH AND SAFETY

Potential issues related to health and safety include establishment of designated Ground Hazard Areas, missile debris impacts, elevated noise levels, electromagnetic radiation, and launch emissions as a result of the proposed action. To minimize these hazards, the **AMTE** program would be conducted in accordance with all relevant and appropriate regulations, procedures, and policies including COMPMTCINST 5100.4A, ***Range Safety Policy of the Pacific Missile Test Center;*** COMPMTCINST 5100.16, ***Radiological Safety Manual;*** and PMRFINST 8020.5, ***Explosive Safety Criteria for Range Users Ordnance Operations.***

Pretest activities would include such routine activities as site preparation, technical support, transportation of PATRIOT equipment to program sites, and cargo loading and unloading. If a PATRIOT missile launching station is transported to the KTF, a standard 1,250-foot radius, or smaller if appropriate, explosive safety quantity-distance circle would be established around the launcher. No adverse health and safety consequences to the general public as a result of routine and nonroutine activities at KTF have been identified. All applicable standard operating procedures would be followed. The number of personnel involved in hazardous operations are limited by safety regulations, and practice sessions are held periodically to train and update personnel on the standard operating procedures.

The PATRIOT missile will be equipped with a flight termination system providing the range safety officer with a system to terminate the missile's flight in the event of any failure that could jeopardize life or property. The reliability of the flight termination system is greater than 0.99999 probability of effecting flight termination, indicating an extremely high

reliability of the system (Loral Vought Systems, 1994). Aboard the missile, the flight termination system incorporates the function of the lethality enhancer, in addition to a thrust termination charge mounted on the forward dome of the solid rocket motor. The lethality enhancer provides the added function of severing the missile airframe at approximately midbody while the flight termination system's thrust termination charge cuts an arc in the solid rocket motor dome to asymmetrically vent any propulsive gas, thereby eliminating forward flight. The severed airframe pieces become unstable, slow down quickly, and impact inside a predetermined Ground Hazard Area. As previously stated, the PATRIOT missile would not contain a warhead.

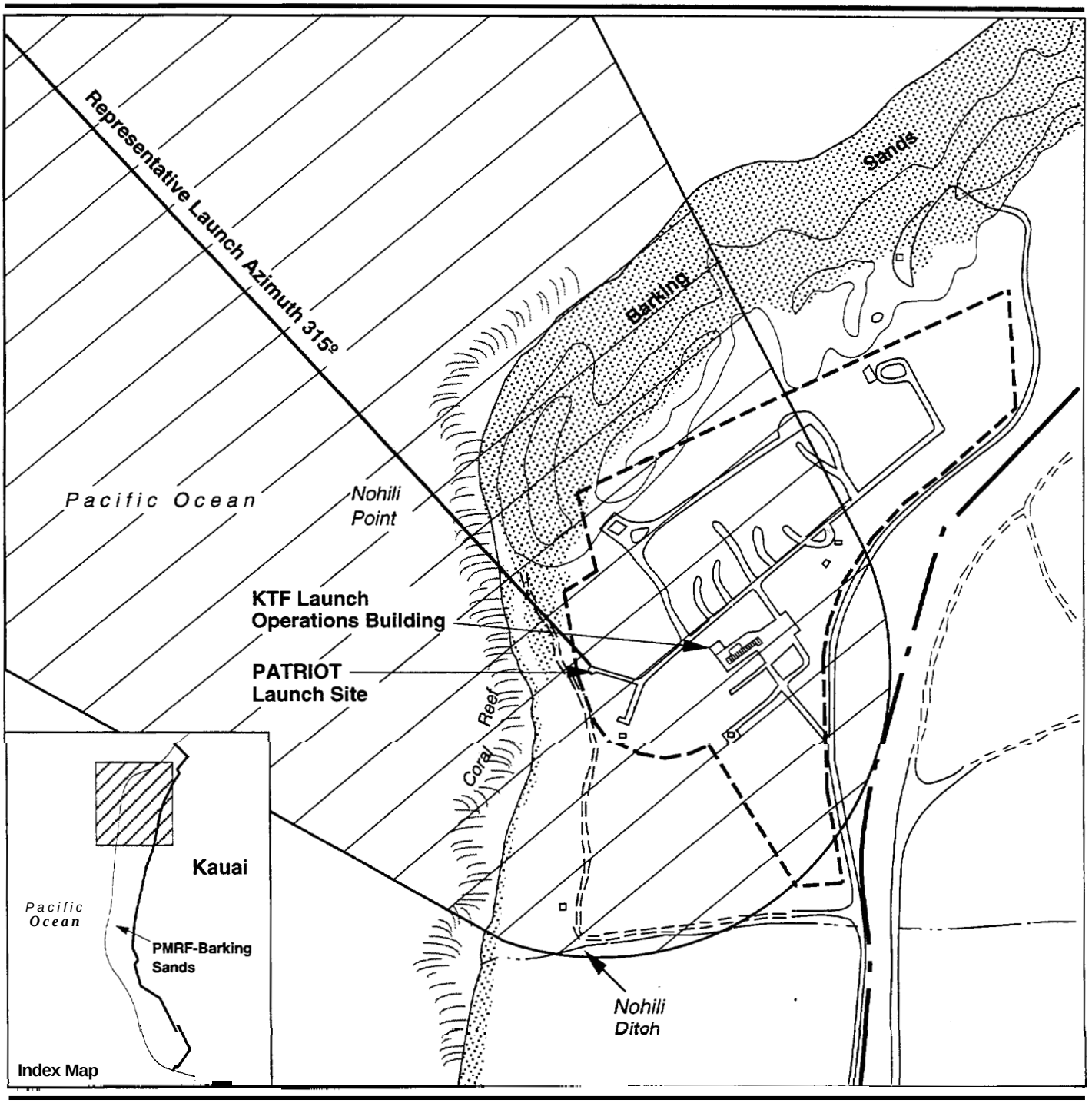
The Ground Hazard Area consists of the area on the ground that would contain the debris and fragments generated by the PATRIOT missile from early flight termination. This area is determined by the missile type, the mission profile, and the average wind velocity at the time of launch. Therefore, the Ground Hazard Area would vary for each test event.

Figure 4-1 shows a representative Ground Hazard Area for the land area around the proposed launch location. As shown, the Ground Hazard Area does not extend beyond the PMRF boundary on the landward side and is not expected to require the closure of public roads or the Polihale State Park. Additional environmental analysis would be conducted if the Ground Hazard Area for any test extends beyond the PMRF-Barking Sands boundary on land. While the over-water portion of the Ground Hazard Area would vary with test and wind conditions, this region is within established Warning Areas and Danger Zones for missile flights from the PMRF-Barking Sands and would be verified clear of non-mission essential personnel and marine mammals by aircraft surveillance flights and range sensors prior to launch.

Prior to firing a missile, the overland Ground Hazard Area would be cleared of all nonessential people. Only those personnel actively engaged in the firing and control of the missile, as specified by the appropriate technical manuals and field manuals, would be permitted within the Ground Hazard Area when the missile is launched. These personnel would be located in PATRIOT shelters (Information and Coordination Central, Engagement Control Station, and Communications Relay Group) and the KTF Launch Operations Building which is hardened to withstand missile debris impact. The PATRIOT equipment shelters would be located a minimum of 296 ft from the missile Launching Station.

Electromagnetic radiation produced by the PATRIOT radar poses a health threat to people within its beam. To obviate this threat, all civilian and base personnel would be excluded from the electromagnetic radiation hazard area during radar operations. Figure 4-2 shows the radiation hazard zone and radiation cut-off zone for personnel that have been established for the PATRIOT radar system. As identified in Army Environmental Hygiene Agency (1987) guidelines, the radiation hazard zone would be indicated by warning signs, and a warning beacon would be illuminated when the radar is operating to keep all personnel out of this area.

An analysis has been conducted to determine any electromagnetic compatibility or interference effects between the PATRIOT system elements and existing transmitters and receivers in the region (Appendix E). The analysis results indicate that no interference with radio and television broadcasts outside the immediate vicinity of the test site would occur.



EXPLANATION

- PMRF-Barking Sands Boundary
- KTF Location
- Area Enlarged
- Representative Ground Hazard Area

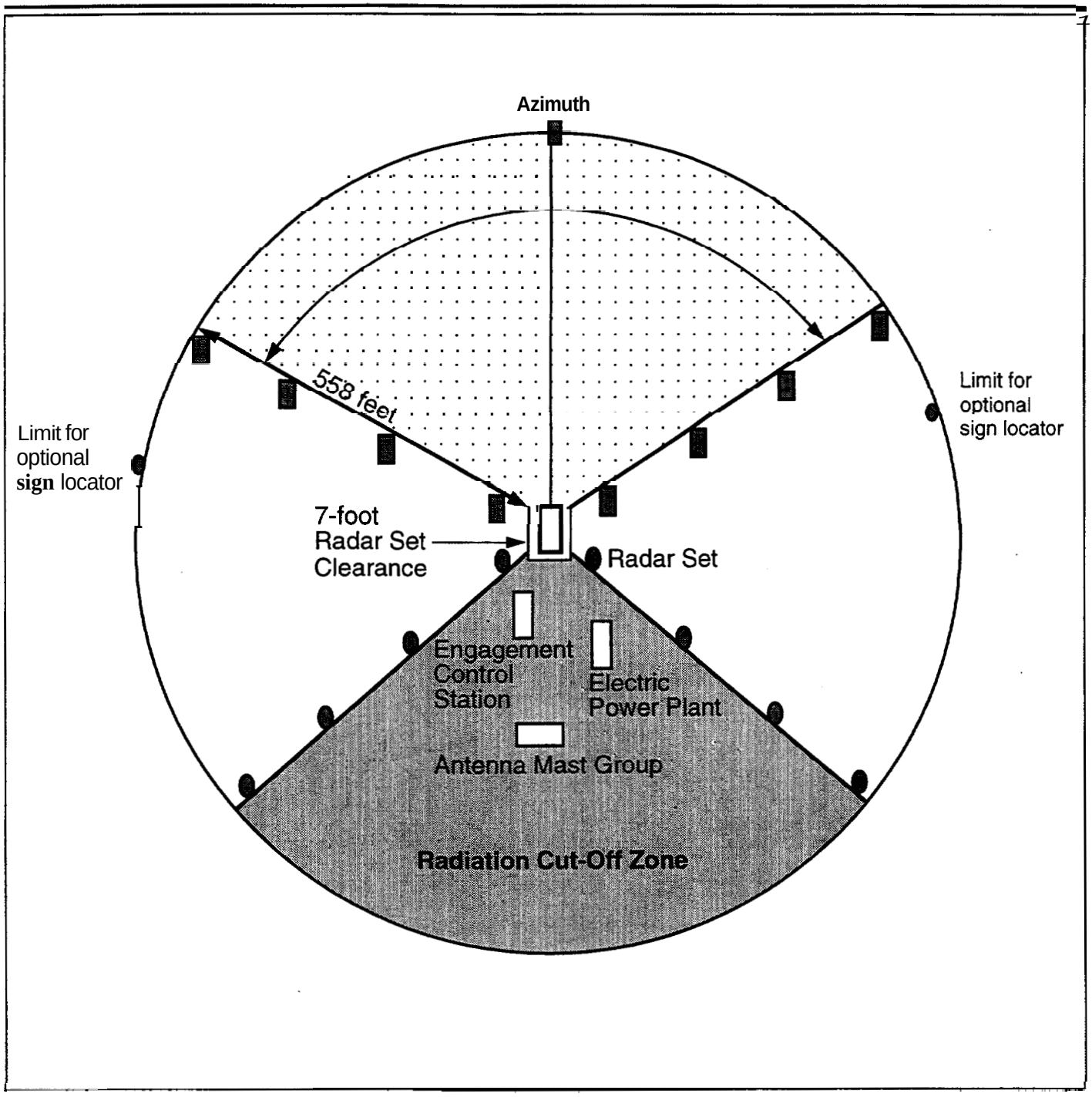
0 525 1,050 Feet

0 160 320 Meters

EDW/MTN TOP/023/mmo-04/15/95

Representative Ground Hazard Area for PATRIOT Launches

Figure 4-1



EXPLANATION

Electromagnetic Radiation Hazard Zone

Sign location for optional Azimuth

Denied occupancy signs

Electromagnetic Radiation Hazard and Radiation Cut-Off Zones

PATRIOT Enhanced Radar

Figure 4-2

There is a potential interference between PATRIOT system elements and PMRF radars which will require deconfliction by the Area Frequency Coordinator, but this would not affect any off-base communication. No other electromagnetic transmitters or receivers would be affected as a result of the proposed action.

Cumulative Impacts

No cumulative impacts to health and safety are expected as a result of the proposed activities.

4.8 INFRASTRUCTURE

Electricity

Existing electric distribution systems would be used for the proposed action. The increased use of electricity resulting from these activities would be slight and within the capacity of the existing systems.

Solid Waste

The solid waste associated with PATRIOT activities would consist of food, paper, beverage containers, and other typical housekeeping wastes. Any additional amount of solid waste generated by approximately 60 temporary personnel would be relatively small and within the capacity of the waste collection system.

Wastewater

Project personnel would use existing sewage facilities where available. The wastewater would be disposed of in existing septic tanks/leach fields. Any additional amounts of wastewater generated by approximately 60 temporary PATRIOT personnel would be relatively small and within the capacity of the current system.

Water

It is anticipated that a temporary personnel force of approximately 60 would require 2,800 gallons of potable water per day. This water requirement is small and within the existing capacity.

Transportation

The 20 vehicles projected to be required for the transient personnel associated with the proposed action on the PMRF would have only nominal traffic impacts on the Kaumualii Highway or Imiloa Road. During a 24-hour period, traffic volume on Kaumualii Highway would only increase by 1 percent. This increase is not expected to be noticeable, even during peak traffic periods.

Cumulative Impacts

No cumulative impacts to infrastructure are expected as a result of the proposed action activities.

4.9 LAND USE

AMTE program activities would be consistent with the existing uses of land on the PMRF-Barking Sands and KTF. All nonessential personnel as well as the public would be cleared from the explosive safety quantity-distance area, Ground Hazard Area, and over-water warning areas. Public access to Recreation Area 1 and a portion of Recreation Area 2 would be restricted. However, launches would occur between 6:00 a.m. and 4:00 p.m. when access to these areas through the PMRF-Barking Sands is already restricted. Therefore, the amount of time beach access to the public is restricted for these areas would not increase.

Applicable government agencies including the County of Kauai Planning Department, State of Hawaii Department of Land and Natural Resources, State Department of Transportation, State Department of Health, and Office of State Planning would be notified in advance of a PATRIOT missile launch.

Cumulative Impacts

No cumulative impacts to land use are expected as a result of the proposed action activities.

4.10 NOISE

There are no legally established national standards for noise outside of the work environment. The Occupational Safety and Health Act of 1970 (Public Law 91-596) was established to "assure safe and healthy working conditions for working men and women." It delegated implementation and enforcement of the law to the Occupational Safety and Health Administration (OSHA) of the United States Department of Labor. Title 29 CFR Section 1910.95 *of* the law pertains to the protection of workers from potentially hazardous occupational noise exposure. OSHA regulations require employees exposed to eight-hour time-weighted average levels of 85 dBA and 90 dBA to be monitored and to be provided hearing protection, respectively. For noise levels greater than 90 dBA, hearing protection is required for exposures of shorter duration (table 4-3). Under OSHA regulations, exposure to impulse or impact noise should never exceed a 140 dB peak sound pressure level.

Potential noise impacts from AMTE program activities at the PMRF and KTF include noise generated by portable generators and noise from the launch and flight of PATRIOT missiles and target drones.

Table **4-3:** Permissible Noise Exposure-

Duration (Hours) Per **Day**	Sound Level dBA **Slow** Response
8	90
6	92
4	95
3	**97**
2	100
1 to 1.5	102
1	105
0.5	110
0.25 or less	115

'Exposure to impulsive or impact noise should not exceed 140 dB peak sound pressure level.
Source: 29 CFR 1910.95, Table G-16

Generators

The PATRIOT Fire Unit has several associated portable generators used to supply electrical power. The PATRIOT truck-mounted Electric Power Plant, which is the prime power source for the Engagement Control Station and the Radar Set, has two 150-kilowatt 400-hertz diesel-powered generators. PATRIOT's Information and Coordination Central and Communications Relay Group units each have an associated Electric Power Unit, which is a trailer-mounted 30-kilowatt 400-hertz diesel-powered generator. The PATRIOT Launching Station is powered by a 15-kilowatt 400-hertz diesel-powered generator. (Raytheon, 1990)

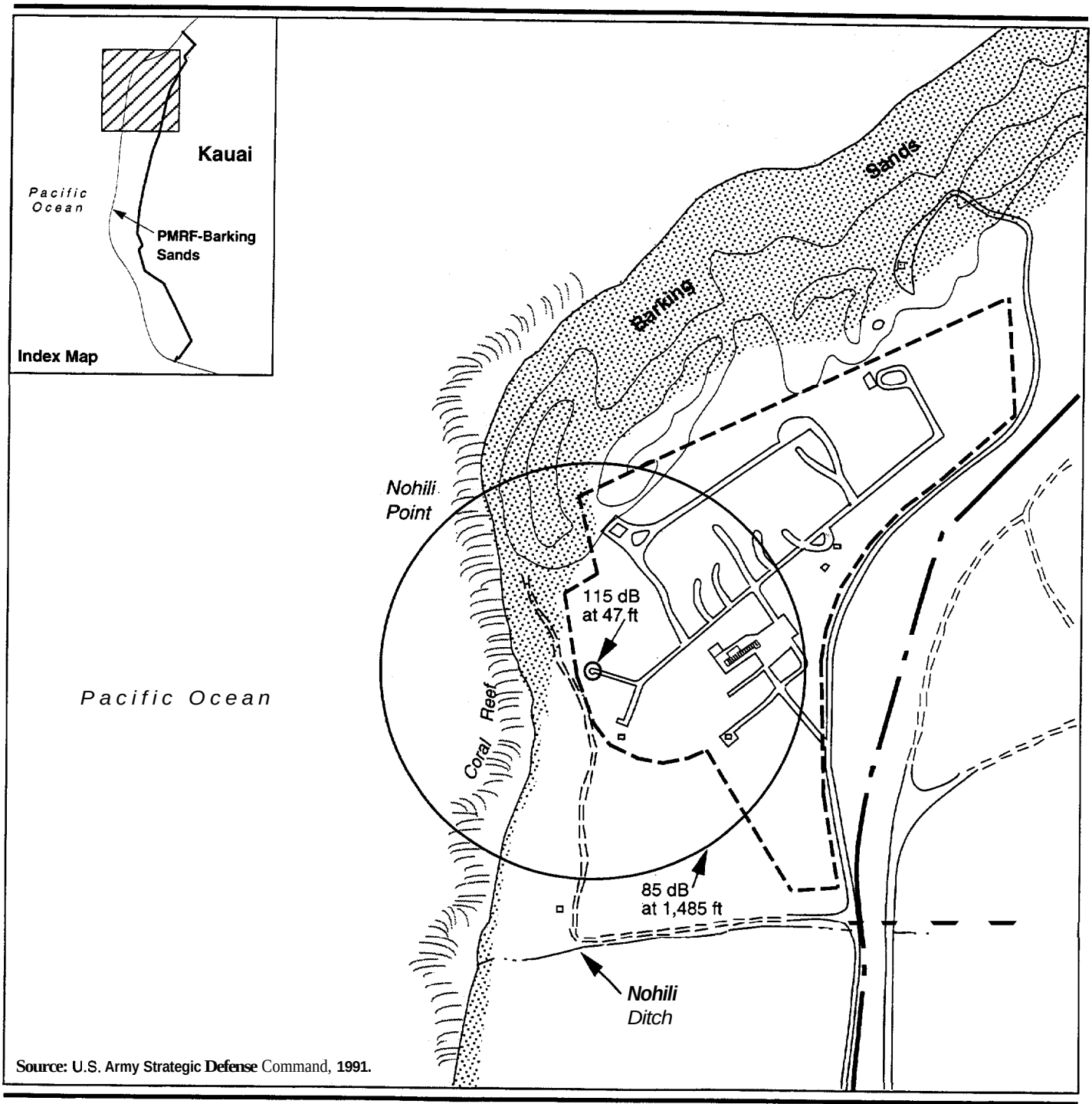
The distances from each PATRIOT equipment unit where noise levels of 85 dBA were measured are 19 ft for the Launching Station, ***8*** ft for the Engagement Control Station, **24** ft for the Radar Set, and 32 ft for the Electric Power Plant.

Personnel who must work close to these units would wear hearing protection which would reduce the noise levels to prescribed health and safety levels.

PATRIOT Missile Launches

For the noise analysis in this document, the ERINT-1 missile is used as a representative PATRIOT missile. Figure 4-3 depicts representative PATRIOT noise level contours. Because no measured noise data are known to be available for the ERINT-1 missile, approximate noise levels, produced from a computer model, are used (U.S. Army Strategic Defense Command, 1991). From the computer model, approximate noise levels of 115 dB and 85 dB at 47 ft and 1,485 ft from the launch site, respectively, have been predicted.

The OSHA limits exposure to a continuous noise of 115 dBA to less than 15 minutes. The 115 dB and 85 dB levels are expected to occur within the boundaries of the PMRF-Barking Sands. Impacts *to* base personnel would be minimized by using personal noise protection



Source: U.S. Army Strategic Defense Command, 1991.

EXPLANATION

- PMRF-Barking Sands Boundary
- KTF Location

Area Enlarged

Representative PATRIOT Noise Level Contours

0 525 1,050 Feet

0 160 320 Meters

Figure 4-3

EDW/MTN TOP/mmo-025.04/15/95

devices and moving necessary launch site personnel into protective structures. Therefore, launch operations would be accomplished in accordance with OSHA standards.

From the computer model, the predicted noise level at the closest base boundary on the landward side of the proposed launch site of the PATRIOT missile is **81** dB. Noise at this level from the launch of a PATRIOT missile would occur for only a few seconds, and noise from the launch would be audible for only a few minutes. Furthermore, launches would be infrequent, with four or less occurring during the entire period of up to four launches of an unarmed PATRIOT missile.

If a PATRIOT missile is used that produces noise levels greater than 85 dB at the KTF boundary, then additional analysis and environmental documentation would be required.

For residential areas, an annual average L_{dn} of less than 65 dBA (or 62 C-weighted decibels [dBC]) is acceptable under AR 200-1. As the annual average L_{dn} is derived by averaging the noise level over an entire year, the four brief occurrences of 81-decibel (or lower) noise that occurs outside of the PMRF boundary from AMTE project activities would not be expected to cause the L_{dn} to be more than 65 dBA (or 62 dBC).

The nearest noise-sensitive community on base is approximately *5* miles from the launch site and off-base is approximately ***8*** miles away at Kekaha. Noise produced by PATRIOT launches at launch pad **1** would be inaudible at these locations.

Potential noise impacts from AMTE program activities also include sonic booms. Sonic booms would occur with each missile launch after the vehicle speed exceeds the speed of sound. The sonic boom would be directed toward the front of the vehicle downrange of the launch site and thus would be located over the Pacific Ocean. No noise-sensitive receptors are known to be located in this area.

Cumulative **Impacts**

Cumulative impacts from the AMTE and other KTF and PMRF–Barking Sands program activities would have the potential to increase noise levels and the frequency of noise events. The PMRF-Barking Sands and the KTF have two major operational noise sources: aircraft operations and rocket launches. Due to safety restrictions, these two operations do not occur simultaneously. (U.S. Department of Energy, 1992)

The sound level generated by each launch is a brief and discrete event, and launches would not be simultaneous with launches from other programs or aircraft operations, thus lowering the potential for cumulative impact.

In both cases existing standard operating procedure would be followed during launches and operation of noise producing equipment, such as the PATRIOT Launching Station, Engagement Control Station, Radar Set, and Electric Power Plant, to provide hearing protection to workers.

4.11 SOCIOECONOMICS

Other than the addition of about 60 temporary personnel, the AMTE program activities would not result in measurable socioeconomic impacts. Program personnel are anticipated to be on Kauai during one to three periods of program activity. Each period of program activity may last from 1 to 2 months. Most personnel would reside in motels and hotels on the south or east coast of Kauai. This is expected to result in a small beneficial effect on the local economy.

Cumulative Impacts

No adverse cumulative impacts on socioeconomics are expected as a result of the proposed action activities.

4.12 WATER RESOURCES

Surface Water

There are no surface water resources within the northern portion of the PMRF-Barking Sands which includes the KTF. As described in Appendix F, Air Quality Model Analysis, the concentration of emission products is expected to be low. The amount of these emissions that could fall in an off-base surface water body would be very small and is not expected to result in any measurable adverse effects.

Ground Water

Hazardous liquids that may be used during program activities primarily include Jet-A and diesel fuels, and cleaning solvents. Any spills of these fluids would be cleaned up according to PMRF's standard operating procedures. Hazardous solid materials associated with program activities are limited to the PATRIOT missile fuel and JATO fuel used to launch the target drones. In the event of a failed launch, it is expected that any fuels that fall to the ground and do not burn would be picked up with no or minimal leaching to the ground water table.

Marine Water

The PATRIOT emission products (see section 4.1, Air Quality) that are expected to fall into the ocean include Al_2O_3 and HCl. Al_2O_3 is expected to slowly fall through the water column because of the very small particle size and is not expected to have any measurable effect on water quality. HCl would be rapidly buffered by the natural alkalinity of the ocean.

In the event that not all of the PATRIOTs solid propellant is burned, the hard rubber-like solid fuel of the missile would dissolve slowly and develop a spongy outer layer that would further reduce the rate at which it dissolves. The small amount of any potentially toxic materials (ammonium and chloride) would be rapidly dispersed to nontoxic levels in the ocean (U.S. Army Strategic Defense Command, 1992a).

Missile hardware would corrode and, thus, contribute various metal ions to the water environment. The majority of missile and target drone hardware consists of aluminum, steel, plastics, fiber-reinforced plastics, and electronic components. A large number of different compounds and elements are used in small amounts in missiles and rocket vehicles and their payloads; for example, lead and tin in soldered electrical connections, silver in silver soldered joints, cadmium from cadmium-plated steel fittings, and copper from wiring. The rate of corrosion of such materials is slow in comparison with the mixing and dilution rates in the water environment, and, hence, concentrations of metal ions toxic to marine life are not expected to result. The miscellaneous materials (e.g., battery electrolytes) are present in such small quantities that only extremely localized and temporary effects would be expected.

The nature of impacts from petroleum products, such as Jet-A fuel and lubricating oil, in the marine environment depends largely on the nature and proportion of the oil's chemical components (e.g., hydrocarbons present) and the changes in this composition as the petroleum products weather. Weathering ("aging") processes, in turn, largely depend on oceanographic and meteorologic factors at the time of the spill.

Weathering involves a number of physical and biochemical processes which change the chemistry and reduce the concentration of oil in the environment. These processes include evaporation, dispersion, dissolution, emulsification, biodegradation, photo-oxidation, and sedimentation. Any or all of these processes can be expected to operate on any petroleum products. Eventually, a tar-like residue would be left which would break up into tar lumps or tar balls.

Cumulative Impacts

No cumulative effects to water resources are anticipated as a result of the proposed action. The effect of any HCI or aluminum compounds from missile launches deposition in the open ocean would be very transient due to the buffering capacity of sea water and is not expected to result in any cumulative effects. Similarly, deposition of oils and drone fuels as a result of impacts with PATRIOT missiles is expected to be transient and not result in any cumulative effects with oil spills from other ocean users such as passing ships.

4.13 INDIRECT EFFECTS OF THE PROPOSED ACTION

No indirect effects are expected as a result of the AMTE program due to the small number of temporary personnel required and limited scope of activities.

4.14 ENVIRONMENTAL CONSEQUENCES OF THE NO-ACTION ALTERNATIVE

If the no-action alternative is selected, no environmental consequences associated with the AMTE are anticipated. Present and other proposed activities would continue. The AMTE would not be able to take advantage of the surrogate airborne sensors and target drones used in the Navy exercises.

4.15 ADVERSE ENVIRONMENTAL EFFECTS THAT CANNOT BE AVOIDED

Adverse environmental effects that cannot be avoided include the release of small amounts of pollutants into the atmosphere and the ocean, and minor noise impacts on wildlife.

4.16 CONFLICTS WITH FEDERAL, STATE, AND LOCAL LAND USE PLANS, POLICIES AND CONTROLS FOR THE AREA CONCERNED

The proposed AMTE program activities at KTF and PMRF-Barking Sands would be consistent with the existing land use. **PMRF** maintains federal jurisdiction for on-base land use; therefore, state and local land use laws are preempted.

4.17 ENERGY REQUIREMENTS AND CONSERVATION POTENTIAL

Anticipated energy requirements of each program activity would be within the energy supply capacity of the installation. Energy use requirements would be subject to any established energy conservation practices.

4.18 IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF RESOURCES

Although the proposed activities would result in some irreversible or irretrievable commitment of resources such as various metallic materials, minerals, fossil fuels, and labor, the amount of materials and energy required for any proposed action-related activities would be small.

4.19 RELATIONSHIP BETWEEN SHORT-TERM USES OF THE HUMAN ENVIRONMENTAL AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The KTF has been dedicated to missile test programs since 1962. The proposed action does not eliminate any options for future use of the environment for the locations under consideration.

4.20 FEDERAL ACTIONS TO ADDRESS ENVIRONMENTAL JUSTICE IN MINORITY POPULATIONS AND LOW-INCOME POPULATIONS (EXECUTIVE ORDER 12898)

The AMTE program would be conducted in a manner that would not substantially affect human health or the environment. The environmental assessment has identified no effects that would result in a disproportionately high or adverse effect on minority or low-income populations in the area. The activities would also be conducted in a manner that would not exclude persons from participation in, deny persons the benefits of, or subject persons to discrimination under the AMTE program because of their race, color, or national origin.

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5.0 LIST OF PREPARERS

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6.0 LIST OF AGENCIES AND PERSONS CONSULTED

Federal Agencies

Defense Evaluation Support Activity

National Marine Fisheries Pacific Area Office

Pacific Missile Range Facility

Sandia National Laboratories

U.S. Fish and Wildlife Service

State Agencies

Department of Land and Natural Resources, Conservation and Environmental Affairs

Department of Land and Natural Resources, Historic Preservation Division

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Appendix A
List of Relevant Environmental Documentation

LIST OF RELEVANT ENVIRONMENTAL DOCUMENTATION

Strategic Defense Initiative Organization and U.S. Army Space and Strategic Defense Command, 1993. *Draft Theater Missile Defense Programmatic Life-Cycle Environmental Impact Statement,* October.

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Appendix B
Applicable Laws and Regulations, and Compliance Requirements

APPLICABLE LAWS AND REGULATIONS, AND COMPLIANCE REQUIREMENTS

The following Federal environmental laws and regulations were reviewed to assist in determining the significance of environmental impacts under the National Environmental Policy Act.

Air Quality – The Clean Air Act seeks to achieve and maintain air quality to protect public health and welfare (42 United States Code [USC] 7401 et seq). To accomplish this, Congress directed the Environmental Protection Agency (EPA) to establish National Ambient Air Quality Standards (NAAQS). Primary standards protect public health; secondary standards protect public welfare (e.g., vegetation, property damage, scenic value). NAAQS address six criteria pollutants: carbon monoxide, nitrogen oxides, lead, sulfur dioxides, ozone, and particulates.

Primary responsibility to implement the Clean Air Act rests with each state. However, each state must submit a state implementation plan (SIP) outlining the strategy for attaining and maintaining the NAAQS within the deadlines established by the act. If the state does not provide a SIP that is acceptable to the EPA, the EPA will provide a SIP which the state is then required to enforce.

The Clean Air Act mandates establishment of performance standards, called New Source Performance Standards, for selected categories of new and modified stationary sources to keep new pollution to a minimum. Under the act, the EPA can establish emission standards for hazardous air pollutants for both new and existing sources. So far, the EPA has set National Emission Standards for Hazardous Air Pollutants (NESHAP) for beryllium, mercury, asbestos, vinyl chloride, and other hazardous materials including radioactive materials.

The Clean Air Act also seeks to prevent significant deterioration of air quality in areas where the air is cleaner than that required by the NAAQS. Areas subject to prevention of significant deterioration regulations have a Class I, II, or III designation. Class I allows the least degradation.

Nonattainment policies also exist. A nonattainment area is one where monitoring data or air quality modeling demonstrates a violation of the NAAQS. The most widespread violation of the NAAQS is related to ozone. For ozone, urban areas are sorted into five categories: marginal, moderate, serious, severe, and extreme. Additionally, stratospheric ozone and climate protection policies have been established. Interim reductions in the phaseout of chlorofluorocarbons, methyl chloroforms, and halons have been mandated. Hydrochlorofluorocarbons must be phased out of production beginning in 2015, with production elimination set for 2030. State and local governments are required to implement policies which prevent construction or modification of any source that will interfere with attainment and maintenance of ambient standards. A new source must demonstrate a net air quality benefit. The source must secure offsets from existing sources to achieve the air quality benefit.

The Clean Air Act Amendments of 1990 represent the first significant revisions to the Clean Air Act in the past 13 years (42 USC 7401 et seq). The amendments strengthen and broaden earlier legislation by setting specific goals and timetables for reducing smog, airborne toxins, acid rain, and stratospheric ozone depletion over the next decade and beyond.

The Clean Air Act Amendments of 1990 contain 11 major titles which address various issues of the National Air Pollution Control Program. Title I, Attainment and Maintenance of National Ambient Air Quality Standards, mandates technology-based emissions control for new and existing major air pollution sources. Title II, Mobile Sources, deals with emissions control for motor vehicles in the form of tailpipe standards, use of clean fuels, and mandatory acquisition of clean-fuel vehicles. Hazardous Air Pollutants, Title III, mainly addresses the control of hazardous air pollutants (HAPs) and contingency planning for the accidental release of hazardous substances. There are 189 HAPs identified in the new amendments. Title IV, Acid Rain, focuses on the reduction of sulfur dioxide and nitrogen oxides in the effort to eliminate acid rain. Permits, Title V, establishes a nationwide permit program for air pollution sources. The permits will clarify operating and control requirements for affected stationary sources. Stratospheric Ozone Protection, Title VI, restricts the production and use of chlorofluorocarbons, halons, and other halogenated solvents which, when released into the atmosphere, contribute to the decomposition of stratospheric ozone. Title VII, Enforcement, describes civil and criminal penalties which may be imposed for the violation of new and existing air pollution control requirements. Title VIII of the 1990 amendments contains various miscellaneous provisions concerning the outer continental shelf, international border areas, grants, secondary standards, renewable energy incentives, and visibility. Information and rules related to clean air research can be found in Title IX. The EPA is to conduct studies on improved methods and techniques for measuring individual air pollutants, health effects associated with exposure to air pollutants, improvements in predictive models and response technology for accidental releases of dense gas, acid precipitation, clean fuels, and improved studies on the ecosystem, among others. Title X requires that a certain percentage of Federal funds, set aside for research required under the act, be made available to disadvantaged businesses. Title XI contains laws pertaining to Clean Air Employment Transition Assistance. Topics covered in this title include the Job Partnership Training Act provisions, funding, benefits, and eligibility requirements.

Airspace – The Federal Aviation Act of 1958 gives the Federal Aviation Administration (FAA) sole responsibility for the safe and efficient management of all airspace within the continental United States, a responsibility that must be executed in a manner that meets the needs of all airspace users, both civil and military. The FAA's policy on airspace is implemented by FAA Order 1000.1A and is stated in FAA Handbook 7400.2C, Procedures for Handling Airspace Matters, as follows:

> The navigable airspace is a limited national resource, the use of which Congress has charged the FAA to administer in the public interest as necessary to insure the safety of aircraft and the efficient utilization of such airspace. Full consideration shall be given to the requirements of national **defense and** of **commercial and general aviation and** to **the public right of** freedom or transit through the airspace. Accordingly, while a sincere effort

shall be made to negotiate equatable solutions to conflicts over its use for non-aviation purposes, preservation of the navigable airspace for aviation must receive primary emphasis.

(FAA Order 7400.2C CHG 4 § 1006, 1991)

The FAA regulates military operations in the National Airspace System (NAS) through the implementation of FAA Handbook 7400.2 and FAA Handbook 7610.46, Special Military Operations. The latter was jointly developed by the Department of Defense (DOD) and FAA to establish policy, criteria, and specific procedures for air traffic control planning, coordination, and services during defense activities and special military operations.

Part 7 of FAA Handbook 7400.2 contains the policy, procedures, and criteria for the assignment, review, modification, and revocation of special use airspace. Special use airspace, including prohibited areas, restricted areas, military operations areas, alert areas, and controlled firing areas, is airspace of defined dimensions wherein activities must be confined because of their nature and/or wherein limitation may be imposed upon aircraft operations that are not a part of those activities (FAA ORDER 7400.2C CHG 4, 1991).

DOD policy on the management of special use airspace is essentially an extension of FAA policy, with additional provisions for planning, coordinating, managing, and 'controlling those areas set aside for military use. Airspace policy issues or interservice problems that must be addressed at the DOD level are handled by the DOD Policy Board on Federal Aviation, a committee composed of senior representatives from each service. However, airspace action within the DOD is decentralized, with each service having its own central office to set policy and oversee airspace matters.

Executive Order 10854 extends the responsibility of the FAA to the overlying airspace of those areas of land or water outside the jurisdiction of the United States. Under this order, airspace actions must be consistent with the requirements of national defense, must not be in conflict with any international treaties or agreements made by the United States, nor be inconsistent with the successful conduct of the foreign relations of the United States. Accordingly, actions concerning airspace beyond U.S. jurisdiction (12 miles) require coordination with the DOD and State Department, both of which have preemptive authority over the FAA (FAA Order 7400.2C CHG 4, § 1009, 1991).

Part 7 of FAA Handbook 7400.2 contains the policy, procedures, and criteria for the assignment, review, modification, and revocation of special use airspace overlying water, namely, warning areas. A warning area is airspace of defined dimensions over international waters that contains activity which may be hazardous to nonparticipating aircraft. Because international agreements do not provide for prohibition of flight in international airspace, no restriction of flight is imposed. The term "warning area" is synonymous with the International Civil Aviation Organization (ICAO) term "danger area" (FAA Order 7400.2C CHG 4, § 7400, 1991).

Biological Resources – The Endangered Species Act declares that it is the policy of Congress that all Federal departments and agencies shall seek to conserve endangered species and threatened species (16 USC 1531 et seq). Further, the act directs Federal agencies to use their authorities in furtherance of the purposes of the act.

Under the Endangered Species Act, the Secretary of the Interior creates lists of endangered and threatened species. The term endangered species means any species which is in danger of extinction throughout all or a significant portion of its range. The act defines a threatened species as any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

A key provision of the Endangered Species Act for Federal activities is Section 7 consultation. Under Section 7 of the act, every Federal agency must consult with the Secretary of the Interior, U.S. Fish and Wildlife Service (USFWS), to ensure that any agency action (authorization, funding, or execution) is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of habitat of such species.

Through the Fish and Wildlife Coordination Act, Congress encourages all Federal departments and agencies to utilize their statutory and administrative authority, to the maximum extent practicable and consistent with each agency's statutory responsibilities, to conserve and promote conservation of nongame fish and wildlife and their habitats (16 USC 2901 et seq). Further, the act encourages each state to develop a conservation plan. The Fish and Wildlife Coordination Act requires a Federal department or agency that proposes or authorizes the modification, control, or impoundment of the waters of any stream or body of water (greater than 4.1 hectares [10 acres]), including wetlands, to first consult with the USFWS. Any such project must make adequate provision for the conservation, maintenance, and management of wildlife resources. The act requires a Federal agency to give full consideration to the recommendations of the USFWS and to any recommendations of a state agency on the wildlife aspects of a project.

The Migratory Bird Treaty Act protects many species of migratory birds (16 USC 703-712). Specifically, the act prohibits the pursuit, hunting, taking, capture, possession, or killing of such species or their nests and eggs. The act further requires that any affected Federal agency or department must consult with the USFWS to evaluate ways to avoid or minimize adverse effects on migratory birds.

The Marine Mammal Protection Act (16 USC 1361 et seq.) establishes a moratorium on the taking and importation of marine mammals and marine mammal products. The act also provides for penalties for the use of fishing methods in contravention of any regulations or limitations enacted by the governmental agencies to achieve the purposes of the Marine Mammal Act. The Marine Mammal Commission, which was established under the act, reviews laws and international conventions, studies world-wide populations, and makes recommendations to Federal officials concerning marine mammals.

The National Marine Sanctuaries Act (16 USC 1431), which is Title III of the Marine Protection, Research, and Sanctuaries Act of 1972, seeks to enhance both public awareness and conservation of the marine environment. The purposes and policies of the

act are to identify areas of national significance, to provide coordinated management of these marine areas, to support scientific research of these areas, to enhance public awareness of the marine environment, and to facilitate public use of marine resources when not in conflict with the other policies.

Cultural **Resources –** The American Indian Religious Freedom Act of 1978 (P. L. 95-341; 92 STAT. 469; 42 U.S.C. 1996) states that it is the policy of the United States to protect and preserve for Native Americans their inherent right of freedom to believe, express, and exercise the traditional religions of the American Indian, including access to sites, use and possession of sacred objects, and the freedom to worship through ceremonial and traditional rites.

The Archaeological Resources Protection Act of 1979 (P.L. 96-95; 93 STAT. 722; 16 U.S.C. 470aa-47011) provides guidelines for dealing with archaeological resources on public and Native American land. It details the permit procedures necessary for excavation and outlines the criminal and civil penalties for the illegal removal of archaeological materials from Federal land.

The Historic Sites Act of 1935 (P.L. 74-292; 49 STAT. 666; 16 U.S.C 461-467) declares it to be "national policy to preserve for public use historic sites, buildings, and objects of national significance for the inspiration and benefit of the people of the United States." It establishes the National Park Service (through the Secretary of the Interior) as the caretaker of the Nation's cultural resources and empowers them to execute the Act's policies, including criminal sanctions. It also establishes a general advisory board, known as the "Advisory Board on National Parks, Historic Sites, Buildings, and Monuments," to advise on any matter relating to national parks, historic and archaeological sites, buildings, and properties.

The National Historic Preservation Act of 1966, amended through 1992 (P.L. 89-665; 80 STAT. 915; 16 U.S.C. 470; 36 CFR ***800)*** establishes a program for the preservation of historic properties throughout the nation. The Act authorizes the Secretary of the Interior to "expand and maintain a national register of districts, sites, buildings, structures, and objects significant in American history, architecture, archaeology, and culture, hereinafter referred to as the National Register. . ." This Act also establishes an independent Agency of the U.S. Government, the Advisory Council on Historic Preservation, to "advise the President and the Congress on matters relating to historic preservation" and to implement and monitor the Historic Preservation Act. The most commonly cited sections of this Act are Section 106 and Section 110:

Section 106 requires each agency to take into account the effects of its actions on historic properties and afford the Advisory Council on Historic Preservation an opportunity to comment on any undertaking.

Section 110 requires that all Federal agencies carry out their programs in accordance with national historic preservation policy, designate historic preservation officers, identify and preserve historic properties under their ownership, and minimize harm to National Historic Landmarks.

The National Natural Landmarks Program (P.L. 74-292; 36 CFR 62) sets forth the processes and criteria used to identify, study, designate, recognize, and monitor National Natural Landmarks.

The Native American Graves Protection And Repatriation Act (1990) (P.L. 101-601; 25 U.S.C. 3001 et seq.) has two main objectives. The first objective is to require any person who wishes to excavate Native American remains and grave goods on Federal land to obtain a permit and to give the Indian tribe most closely associated with those goods the opportunity to reclaim them. The Act also addresses the incidental discovery of such items on Federal land by persons engaged in other activities, such as mining or construction. When one or more of these items are found in this manner, the activity must cease and a reasonable effort made to protect the items. Written notification must be made to the Federal land manager in charge and to the appropriate tribe or organization, who is allowed 30 days in which to make a determination as to the appropriate disposition for these remains. The second objective requires that collections of Native American human remains and grave goods that are currently controlled by Federal agencies and museums inventory such items, attempt to identify them as to geographical and cultural affiliation, notify the appropriate Native American organization, and return the items, if the tribe so desires.

Hazardous Materials and Waste – Under the Resource Conservation and Recovery Act (RCRA), Congress declares the national policy of the United States to be, whenever feasible, the reduction or elimination, as expeditiously as possible, of hazardous waste (42 USC 6901 et seq). Waste that is nevertheless generated should be treated, stored, or disposed of so as to minimize the present and future threat to human health and the environment.

The RCRA defines waste as hazardous through four characteristics: ignitability, corrosivity, reactivity, or toxicity. Once defined as a hazardous waste, the RCRA establishes a comprehensive cradle-to-grave program to regulate hazardous waste from generation through proper disposal or destruction.

The RCRA also establishes a specific permit program for the treatment, storage, and disposal *of* hazardous waste. Both interim status and final status permit programs exist.

Any underground tank containing hazardous waste is also subject to RCRA regulation. Under the act, an underground tank is one with 10 percent or more .of its volume underground. Underground tank regulations include design, construction, installation, and release-detection standards.

The RCRA defines solid waste as any garbage, refuse, or sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility and other discarded material, including solid, liquid, semi-solid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations and from community activities. To regulate solid waste, the RCRA provides for the development of state plans for waste disposal and resource recovery. The RCRA encourages and affords assistance for solid

waste disposal methods that are environmentally sound, maximize the utilization of valuable resources, and encourage resource conservation. The RCRA also regulates mixed wastes. A mixed waste contains both a hazardous waste and radioactive component.

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) — commonly known as Superfund — provides for funding, cleanup, enforcement authority, and emergency response procedures for releases of hazardous substances into the environment (42 USC 9601 et seq).

The CERCLA covers the cleanup of toxic releases at uncontrolled or abandoned hazardous waste sites. By comparison, the principal objective of the RCRA is to regulate active hazardous waste storage, treatment, and disposal sites to avoid new Superfund sites. The RCRA seeks to prevent hazardous releases; a release triggers the CERCLA.

The goal of the CERCLA-mandated program (Superfund) is to clean up sites where releases have occurred or may occur. A trust fund supported, in part, by a tax on petroleum and chemicals supports the Superfund. The Superfund allows the Government to take action now and seek reimbursement later.

The CERCLA also mandates spill-reporting requirements. The act requires immediate reporting of a release of a hazardous substance (other than a Federally permitted release) if the release is greater than or equal to the reportable quantity for that substance.

Title III of the Superfund Amendments and Reauthorization Act (SARA) (42 USC 9601 et seq) is a freestanding legislative program known as the Emergency Planning and Community Right to Know Act of 1986. The act requires immediate notice for accidental releases of hazardous substances and extremely hazardous substances; provision of information to local emergency planning committees for the development of emergency plans; and availability of Material Safety Data Sheets, emergency and hazardous chemical inventory forms, and toxic release forms. (Emergency Planning and Community Right-to-Know Act of 1986, 42 USC 11001 et seq)

The Emergency Planning and Community Right to Know Act (EPCRA) of 1986 requires each state to designate a state emergency response commission. In turn, the state must designate emergency planning districts and local emergency planning commissions (42 USC 11001 et seq). The primary responsibility for emergency planning is at the local level.

The Pollution Prevention Act of 1990 established that pollution should be prevented at the source, recycled or treated in an environmentally safe manner, and disposed of or otherwise released only as last resort. Executive Order 12856, "Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements," commits Federal agency planning, management, and acquisition to the Pollution Prevention Act of 1990. It also requires all Federal facilities to comply with the EPCRA, develop a written pollution prevention strategy emphasizing source reduction, and develop voluntary goals to reduce total releases and off-site transfers of Toxic Release Inventory toxic chemicals by 50 percent by 1999.

The Toxic Substances Control Act (TSCA) authorizes the administrator of the EPA broad authority to regulate chemical substances and mixtures which may present an unreasonable risk of injury to human health or the environment (15 USC 2601 et seq).

Under the TSCA the EPA may regulate a chemical when the administrator finds that there is a reasonable basis to conclude that the manufacture, processing, distribution in commerce, use, or disposal of a chemical substance or mixture poses or will pose an unreasonable risk of injury to health or the environment.

Under the TSCA the EPA administrator, upon a finding of unreasonable risk, has a number of regulatory options or controls. The EPA's authority includes total or partial bans on production, content restrictions, operational constraints, product warning statements, instructions, disposal limits, public notice requirements, and monitoring and testing obligations.

The TSCA Chemical Substance Inventory is a database providing support for assessing human health and environmental risks posed by chemical substances. As such, the inventory is not a list of toxic chemicals. Toxicity is not a criterion used in determining the eligibility of a chemical substance for inclusion on the inventory.

Health and Safety – The purpose of the Occupational Safety and Health Act is to assure, so far as possible, every working man and woman in the nation safe and healthful working conditions and to preserve human resources (29 CFR, Parts 1900-1990, as amended).

The act further provides that each Federal agency has the responsibility to establish and maintain an effective and comprehensive occupational safety and health program that is consistent with national standards. Each agency must:

- Provide safe and healthful conditions and places of employment
- Acquire, maintain, and require use of safety equipment
- Keep records of occupational accidents and illnesses
- Report annually to the Secretary of Labor

Finally, the SARA (42 USC 9601 et seq) requires the Occupational Safety and Health Administration to issue regulations specifically designed to protect workers engaged in hazardous waste operations. The hazardous waste rules include requirements for hazard communication, medical surveillance, health and safety programs, air monitoring, decontamination, and training.

Executive Order 12898 directs Federal actions to address environmental justice in minority and low-income populations. Each Federal agency must conduct its programs, policies, and activities that substantially affect human health or the environment in a manner that ensures that they do not exclude persons from participation or benefit. Persons will also not be discriminated against under such programs, policies, or activities because of their race, color, or national origin.

Land Use – The Coastal Zone Management Act of 1972 (16 USC 1451 et seq.) is designed to preserve and develop the resources of the coastal zone. The act seeks to do so by providing funds to states that develop and implement programs for management of land and water uses consistent with the act's standards. The Hawaii Coastal Zone Management Program is an expression of the state's policy to guide the use, protection, and development of land and ocean resources within Hawaii's coastal zone. The national Coastal Zone Management Act now requires all Federal activities affecting Hawaii's coastal zone to be consistent with the state's Federally approved coastal zone management program.

Noise – The Federal Noise Control Act directs all Federal agencies to the fullest extent within their authority to carry out programs within their control in a manner that furthers the promotion of an environment free from noise that jeopardizes the health or welfare of any American (42 USC 4901 et seq). The act requires a Federal department or agency engaged in any activity resulting in the emission of noise to comply with Federal, state, interstate, and local requirements respecting control and abatement of environmental noise.

Water Quality – The objective of the Clean Water Act is to restore and maintain the chemical, physical, and biological integrity of the nation's waters (33 USC 1251 et seq).

The Clean Water Act prohibits any discharge of pollutants into any public waterway unless authorized by a permit (33 USC 1251 et seq). Under the Clean Water Act the National Pollutant Discharge Elimination System (NPDES) permit establishes precisely defined requirements for water pollution control.

NPDES permit requirements typically include effluent limitations (numerical limits on the quantity of specific pollutants allowed in the discharge); compliance schedules (abatement program completion dates); self-monitoring and reporting requirements; and miscellaneous provisions governing modifications, emergencies, etc.

Under the Clean Water Act the EPA is the principal permitting and enforcement agency for NPDES permits. This authority may be delegated to the states.

The Clean Water Act requires all branches of the Federal government involved in an activity that may result in a point-source discharge or runoff of pollution to U.S. waters to comply with applicable Federal, interstate, state, and local requirements.

The Safe Drinking Water Act sets primary drinking water standards for owners or operators of public water systems and seeks to prevent underground injection that can contaminate drinking water sources (42 USC 300f et seq).

Under the Safe Drinking Water Act, the EPA has adopted National Primary Drinking Water Regulations (40 CFR, Part 141) that define maximum contaminant levels in public water systems. In addition, under the Safe Drinking Water Act the EPA may adopt a regulation that requires the use of a treatment technique in lieu of a maximum contaminant level. The EPA may delegate primary enforcement responsibility for public water systems to a state.

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Appendix C
Consultation Letters

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802-4213
TEL (310) 980-4000; FAX (310) 980-4018

APR 25 1995 F/SW033:ETN

Mr. Robert F. Shearer, P.E.
Assistant Chief of Staff,
Installations, Logistics, and Environment
U.S. Army Space and Strategic
Defense Command
Post Office Box 1500
Huntsville, Alabama 35807-3801

Dear Mr. Shearer:

Thank you for your letter requesting informal section 7 consultation regarding the proposed Army Mountain Top Experiment (AMTE) to be conducted at the Pacific Missile Range Facility, Kauai, Hawaii over the next three years. Activities to be conducted include command, control, and communications testing, target acquisition, missile intercept, and recovery of the target drones.

Listed species that may be found within the project area include the endangered Hawaiian monk seal (Monachus schauinslandi), humpback whale (Megaptera novaeanaliae) during the winter and early spring, sperm whale (Physeter macrocephalus), leatherback turtle (Dermochelys coriacea), and the threatened green turtle (Chelonia mydas). Critical habitat for these species has not been proposed or designated within the project area. Critical habitat for the Hawaiian monk seal has been designated out to the 20 fathom isobath around the Northwestern Hawaiian Islands beginning at Nihoa Island.

Monitoring the project area by visual (aircraft) and acoustic methods should insure that there are no adverse impacts to listed species. The probability of missile debris or the target drone striking a listed species or marine mammal is so small as to be negligible. Based on an evaluation of the project summary provided with your request and available information on the listed species identified above, I find that the proposed project will not likely adversely affect these listed species or critical habitat.

This concludes the informal section 7 consultation process for this proposed project. Consultation must be reinitiated if new information becomes available revealing effects of the project on listed species that were not previously considered, the project

is subsequently modified in manner that causes an effect to listed species that was not considered, or if a new species or critical habitat is designated that may be affected by the project.

Please forward a copy of the environmental assessment for this project when it is completed to Mr. Eugene Nitta at 2570 Dole Street, Honolulu, Hawaii 96822-2396. He may also be contacted at 808/973-2987 if you have any questions concerning this consultation.

Sincerely,

Hilda Diaz-Soltero
Regional Director

cc: F/SWO33 - Nitta

BENJAMIN J. CAYETANO
Governor of Hawaii

Chairperson
MICHAEL D. WILSON
Board of Land and Natural Resources

Deputy Director
GILBERT COLOMA-AGARAN

Aquaculture Development
Aquatic Resources
Boating and Ocean Recreation
Bureau of Conveyances
Conservation and Environmental Affairs
Conservation and Resources Enforcement
Forestry and Wildlife
Historic Preservation
Land Management
State Parks
Water and Land Development

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

P. O. Box 621
Honolulu. Hawaii 96809

DOC. ID.': 5374

MAR - ! 1995

Mr. Robert E. Shearer, P.E.
Assistant Chief of Staff,
Installations, Logistics, and Environment
Department of the Army
U.S. Army Space and Strategic Defense Command
Post Office Box 1500
Huntsville, Alabama 35807-3801

Dear Mr. Shearer:

Thank you for your letter of February 7, 1995 relative to the U.S. Army Space and Strategic Defense Command's (USASSDC) proposed project, in which you state that you are currently preparing an environmental assessment (EA) for the Army Mountain Top Experiment (AMTE) program at the Kauai Test Facility (KTF) and the pacific Missile Range Facility (PMRF), Kauai, Hawaii.

As you are currently in the process of preparing the EA, for this proposed project, we would appreciate be placed as a "consulted party" such that our comments and concerns, if any, are reflected within the document prior to any judgment relative to possible significant effects on the environment.

Aloha,

MICHAEL D. WILSON

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Ecoregion
300 Ala Moana Blvd, Room 6307
P.O. Box 50167
Honolulu, HI 96850

In Reply Refer To: DLB

MAY 12 1995

Mr. Robert F. Shearer, P.E.
Assistant Chief of Staff,
Installations, Logistics,
and Environment
Department of the Army
U.S. Army Space and Strategic Defense Command
P. O. Box 1600
Huntsville, Alabama 35807-3801

Dear Mr. Shearer:

The U.S. Flsh and Wildlife Service (Service) has received your April 17, 1995, letter requesting concurrence by the Service that Federally listed, proposed, and candidate endangered and threatened species will nor be affected by the proposed Army Mountain Top Experiment (AMTE) Program to be conducted at the Pacific Missile Range Facility (PMRF) Barking Sands, Kauai, Hawaii. We appreciated the opportunity extended to visit the site on May 8, 1995. The visit proved to be highly informative and all personnel were extremely helpful. The Service has the following comments to offer.

The AMTE program will involve captive carry tests and virtual engagement simulations by use of a target drone (BQM-34S or 74S) and target acquisition and tracking information from the U.S. Navy radar system at the PMRF-Kokee site. Live-fire PATRIOT (Phase Array Tracking to intercept of Target) launches may also be included by use of PATRIOT missiles, a mobile PATRIOT radar, and C-130 aircraft as the PATRIOT seeker. All target and potential PATRIOT launches will occur between the hours of 6 a.m. and 4 p.m. during two to three periods of one to two months over the next three years. The proposed AMTE activities will require the launch of approximately eight (8) target drones from the drone launch ped out to sea and approximately four (4) PATRIOT missiles from Launch Pad 1 out to sea. Intercept tests will occur offshore between 22 and 43 miles from the launch sites. No ground disturbanoe or construction is planned for this project.

Several federally listed species potentially occur throughout the area of the PMRF-Barking Sands. The Hawaiian hoary bat or 'ope'ape'a (*Lasiurus cinereus semotus*), which is listed as federally endangered, has been observed at the Polihale State Park and is known to forage offshore. The Hawaiian duck or koloa maoli (*Anas wyvilliana*), tho Hawaiian coot or 'alae ke'o ke'o (*Fulica americana alai*), the Hawaiian moorhen or 'alae 'ula (*Gallinula chloropus sandvicensis*), and the Hawaiian stilt or ae'o (*Himantopus mexicanus knudseni*) are all listed as federally endangered waterbirds as well as being listed under tho Migratory Bird Treaty Act (MBTA). The drainage ditch system that cuts through PMRF, including the Nohili Ditch, provides suitable habitat for theso waterbird species. Stilts and coots as well as other waterbird species are also attracted to the

sewage treatment oxidation ponds on PMRF. The Laysan albatross or moll (*Diomedea immutabilis*), the wedge-tailed shearwater or 'ua 'u kani (*Puffinus pacificus*), the black-crowned night-heron or 'auku'u (*Nycticorax nycticorax hoactli*), and the Pacific golden-plover or kolea (*Pluvialis fulva*), all of which are listed under MBTA, have also found suitable habitat on PMRF. Other MBTA listed birds that have been sighted at PMRF include the ruddy turnstone or 'akekeke (*Arenaria interpres*), the brown noddy or noio koha (*Anous stolidus pileatus*), and the great frigatebird or 'iwa (*Fregata minor palmerstoni*). The Hawaiian short-eared owl or pueo (*Asio flammeus sandwichensis*), which is listed under MBTA and as a category 2 candidate species, may also be seen at PMRF.

Although not located on the site of PMRF, three other species of birds listed under MBTA may traverse the area from their nesting grounds *out* to sea. These are the Newell's shearwater (*Puffinus auricularis*), also listed as federally threatened, the dark-rumped petrel or Hawaiian petrel or 'ua'u (*Pterodroma phaeopygia sandwichensis*), also listed as federally endangered, and the band-rumped storm petrel (*Oceanodroma castro cryptoleucura*), which is also listed as a category 2 candidate species. The Newell's shearwaters nest from March through November, at which time the fledglings make their flight from the higher elevations out to sea. The dark-rumped petrel have similar nesting habitats; however, fledging occurs slightly earlier, in October. Very little is known of the band-rumped storm patrol; however, they are usually soon onshore between April and November.

The Service's concern with potential impacts *to* these bird species is that marine birds *are* often attracted to bright lights, particularly the fledglings during their initial flights from higher elevations to the sea. The installation of bright lighting could pose a potentially significant threat to these birds by causing them to became disoriented *and* colliding with objects such as poles, buildings, vehicles, etc. However, as long as the installation of lights follows the guidelines as outlined in the enclosed publication entitled The Newell's Shearwater Light Attraction Problem, A Guide for Architects, Planners, and Resort Managers, we do not foresee any problems associated with the lighting for the program.

The green turtle (*Chelonia mydas*), which is listed as federally threatened, has been observed foraging in the waters off PMRF; however, they *do* not appear to nest there. One sea turtle nest was seen on the beach south of the runway in 1986. In addition, most foraging occurs around the Nohili Ditch, which is south of the proposed launch sites for both the drones and the PATRIOT missiles; however, the optional sites for the mobile PATRIOT radar are located in the area south of Nohili Ditch.

Two plant species potentially occur on PMRF. 'Ohai (*Sesbania tomentosa*), which *is* listed as federally endangered, and Adder's tongue or pololei fern (*Ophioglossum concinnum*), which is currently listed as a category 1 candidate species. We would not anticipate any adverse impacts to either of these species as a result of the proposed activities.

Specifically in the Kauai Test Facility (KTF), where *the* drone launch pad and the launch Pad for the potential use of PATRIOT missiles are located, to the best of our knowledge, no endangered or threatened species occur. However, a wedge-tailed shearwater colony is located between the area of the PATRIOT bunch Pad 1 and the drone launch pad. In addition, as mentioned previously, endangered wetland birds and sea turtles may occur near the location of the optional PATRIOT radar sites just south of Nohili

Ditch. These species should be taken into consideration if PATRIOT missiles are to be fired.

The Service concurs that the project as described *in* the April 1995 Army Mountain Top Experiment Preliminary Final Environmental Assessment is not likely to adversely affect any federally listed endangered or threatened wildlife. If live-fire PATRIOT missiles *are* to be used, the Service agrees with the projects' proposal to *consult* with the Service prior to testing and to re-evaluate the program activities if necessary. The Service feels that this would be an appropriate approach.

The Service recommends that Department of Defense personnel record and keep track of wildlife sightings (or lack thereof) at PMRF for future reference. Such information could prove helpful in evaluating potential impacts. We appreciate your concern for endangered species end look forward *to* receiving a copy of the Final Environmental Assessment, If you have any questions, please contact our Branch Chief for Interagency Cooperation, Ms. Margo Stahl, or Fish and Wildlife Biologist Diane Bowen at 808/541-2749.

Sincerely,

for Brooks Harper
Field Supervisor
Ecological Services

Enclosure

cc: Bob Inouye - PMRF

DEPARTMENT OF THE ARMY
U.S. ARMY SPACE AND STRATEGIC DEFENSE COMMAND
POST OFFICE BOX 1500
HUNTSVILLE. ALABAMA 35807-3801

REPLY TO
ATTENTION OF

April 17, 1995

Assistant Chief of Staff,
Installations, Logistics,
and Environment

Mr. Don Hibbard
Administrator and Deputy
State Historic Preservation Officer
33 South King Street, Sixth Floor
Honolulu, Hawaii 96813

Dear Mr. Hibbard:

Enclosed for your review is a copy of the preliminary final Army Mountain Top Experiment (AMTE) Environmental Assessment (EA) prepared by the U.S. Army Space and Strategic Defense Command (USASSDC) for the Program Executive Office, Missile Defense. The EA provides information regarding program activities, the affected environment, analysis of potential effects, and program actions as part of the proposed action to mitigate environmental effects.

Since our initial consultation with your office (Appendix C of the EA), program requirements have been re-defined to include possible PATRIOT missile launches from the Kauai Test Facility within the Pacific Missile Range Facility, Kauai, Hawaii. The remaining aspects of the program are unchanged. There will be no construction or other ground disturbing activities and the use of existing facilities will not require modification.

Based on the non-intrusive, temporary, and mobile nature of the AMTE program and the mitigation measures outlined in the EA, the USASSDC has determined that the proposed action will have no adverse effects on historic properties and requests your concurrence before publication of the final EA which is scheduled for May 12, 1995.

Your assistance with this matter is greatly appreciated, Should you need additional information, please call Ms. Linda Ninh of my staff at (205) 955-5971.

Sincerely,

Robert F. Shearer, P.E.
Assistant Chief of Staff,
Installations, Logistics,
and Environment

Enclosure

STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION
33 SOUTH KING STREET, 6TH FLOOR
HONOLULU, HAWAII 96813

May 9, 1995

Mr. Robert F. Shearer, P.E.
Assistant Chief of Staff
Installations, Logistics and Environment
USASSDC/P.O. Box 1500
Huntsville. Alabama 35807

LOG NO: 14.551
DOC NO: 9505nm03

Dear Mr. Shearer:

SUBJECT: **National Historic Preservation Act - Review - Final EA for AMTE for the USASSDC Waimea, Waimea, Kauai**

The project uses existing facilities. No new construction is planned. It appears likely that actual launches will take place. Because a historic property of traditional cultural significance is present, we will defer our comments until we are able to review the comments which you obtain from Native Hawaiian individuals and organizations on the impacts of this project, in compliance with the National Historic Preservation Act.

If you have questions call Nancy McMahon at **742-7033.**

Very truly yours,

DON HIBBARD, Administrator and
Deputy State Historic Preservation Officer

NM:amk

DEPARTMENT OF THE ARMY
U.S. ARMY SPACE AND STRATEGIC DEFENSE COMMAND
POST OFFICE BOX 1500
HUNTSVILLE, ALABAMA 35807-3801

REPLY TO
ATTENTION OF

May 25, 1995

Assistant Chief of Staff,
Installations, Logistics,
and Environment

Mr. Don Hibbard
Administrator and Deputy
State Historic Preservation Officer
33 South King Street, Sixth Floor
Honolulu, Hawaii 96813

Dear Mr. Hibbard:

Thank you for your comments in your May 9, 1995, letter regarding the Army Mountain Top Experiment at Pacific Missile Range Facility, Waimea, Kauai, Hawaii.

Publication of the Notice of Availabiliy of the environmental assessment in the affected local area is scheduled for the week of June 2, 1995. The Finding of No Significant Impact will become effective 30 days from the date of signature. If we receive comments, including any from Native Hawaiian individuals and organizations, we will consult with your office.

Your continuing support in this matter is greatly appreciated. If you have any questions, please contact Ms. Linda Ninh of my staff at (205) 955-5971.

Sincerely,

Robert F. Shearer, P.E.
Assistant Chief of Staff,
Installations, Logistics,
and Environment

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Appendix D
Coastal Zone Management Form

DEPARTMENT OF THE ARMY
U.S. ARMY SPACE AND STRATEGIC DEFENSE COMMAND
POST OFFICE BOX 1500
HUNTSVILLE. ALABAMA 35807-3801

REPLY TO
ATTENTION OF

7 FEB 1995

Assistant Chief of Staff,
Installations, Logistics,
and Environment

Dr. Gregory Pai
Office of State Planning
P.O. Box 3540
Honolulu, Hawaii 96811-3540

Dear Dr. Pai:

The U.S. Army Space and Strategic Defense Command (USASSDC) is preparing an environmental assessment (EA) as requested by the U.S. Army Program Executive Office, Missile Defense, for the Army Mountain Top Experiment (AMTE) program at the Kauai Test Facility (KTF) and the Pacific Missile Range Facility (PMRF), Kauai, Hawaii. The purpose of the program is to demonstrate the ability to detect, acquire, and engage a cruise missile (CM) beyond the line of sight (BLOS) of a ground-based airdefense system radar. To achieve these objectives, the initial AMTE program will consist of equipment checkout and simulated live-fire tests of PATRIOT missiles using computer simulations at the KTF and PMRF in conjunction with the U.S. Navy's Wide Area Defense (WAD) program over the next 3 years.

The AMTE program will use surrogate CM target drone tracking data from the U.S. Navy's surrogate airborne sensors located at the PMRF-Kokee land-based test site. During the initial AMTE program, approximately eight surrogate CM target drone flights will be launched and controlled from the PMRF. These drones are currently flown from the PMRF for existing missions. Intercept tests of PATRIOT missiles with surrogate CM target drones are not currently in the planning stage but are considered reasonably foreseeable and will, therefore, be evaluated and included in the EA. Approximately four PATRIOT missiles Will be launched from the KTF, and four surrogate CM target drones will be launched and controlled from the PMRF. The intercepts will occur offshore between approximately 22 and 43 miles from the launch sites within the W-188 Warning Area (enclosure 1).

The AMTE program will be conducted on federal land and over U.S. Navy training areas in the open ocean area to the northwest of the PMRF. It is anticipated that all surrogate CM target drones and PATRIOT missile launches Will occur between 6 a.m. and 4 p.m., Monday through Friday, when Recreation Area 1 adjacent to the KTF and PMRF launch sites is usually closed. No additional beach closures will be required (Danger Zone 334.1900, Chapter 2, U.S. Coast Pilot 7). A completed Hawaii Coastal Zone Management Assessment form for the AMTE program is provided (enclosure 2) for your review and approval. The only expected

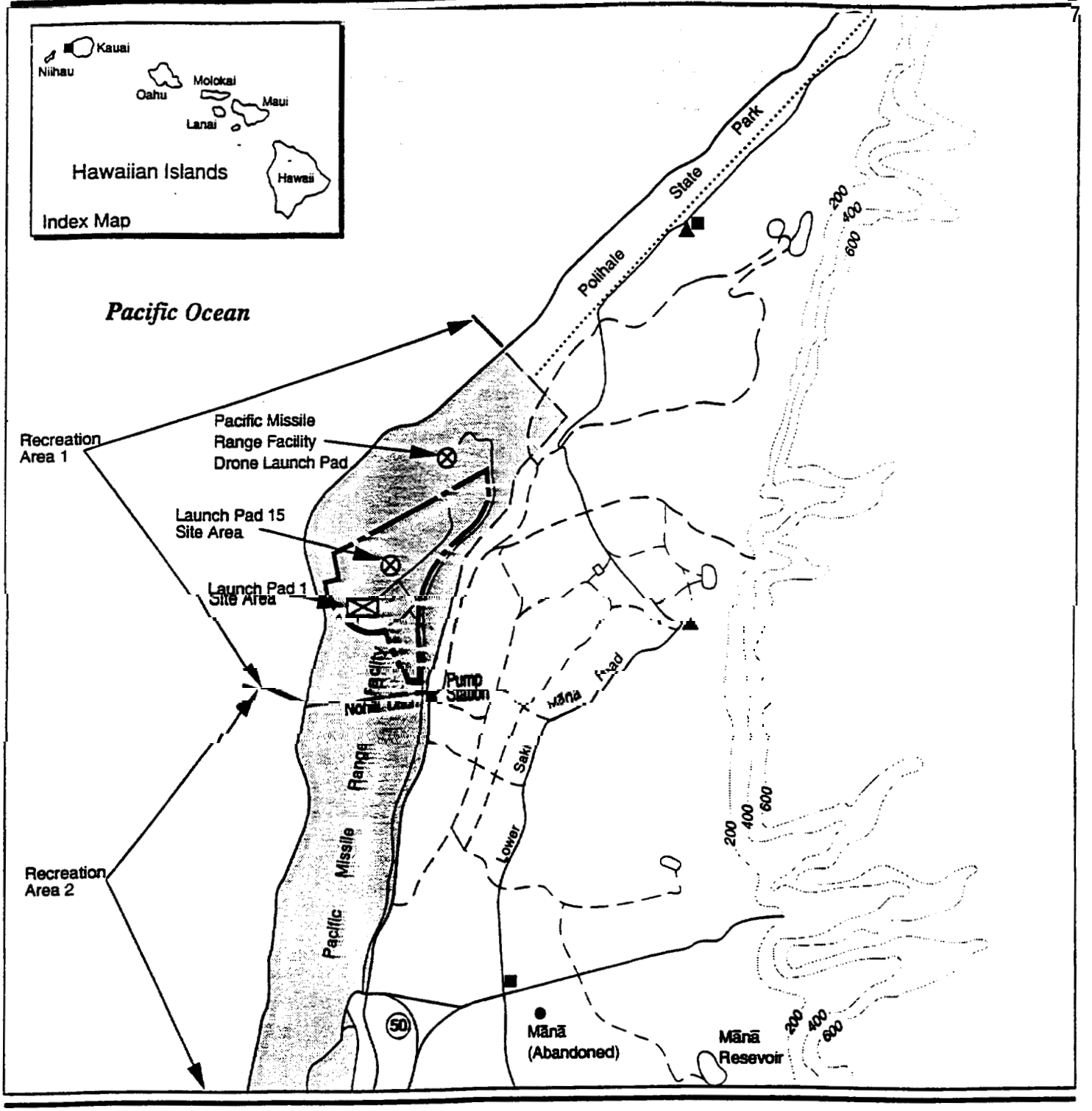
non-excluded resource effects are slight increases in electrical power and potable water required to support approximately 40 transient personnel.

We would appreciate any comments or concerns you may wish to express regarding the proposed AMTE program. Your assistance in this matter is greatly appreciated. Should you need additional information, please contact Ms. Linda Ninh at (205) 955-5971.

Sincerely,

Robert F. Shearer, PE
Assistant Chief of Staff,
Installations, Logistics,
and Environment

Enclosures



EXPLANATION

- Irrigation Drainage Ditch
- Kauai Test Facility
- Polihale State Park Boundary

AMTE Activity Location Map

0 500 1000 Meters

0 1500 3000 Feet

gr/USAKA/050-01/30/95

Enclosure 1

HAWAII CZM PROGRAM
ASSESSMENT FORM

RECREATIONAL RESOURCES

Objective: Provide coastal recreational opportunities accessible to the public.

Policies:

(1) Improve coordination and funding of coastal recreation planning and management.

(2) Provide adequate, accessible, and diverse recreational opportunities in the coastal zone management area by:

(a) Protecting coastal resources uniquely suited for recreational activities that cannot be provided in other areas;

(b) Requiring replacement of coastal resources having significant recreational value, including but not limited to surfing sites and sandy beaches, when such resources will be unavoidably damaged by development; or requiring reasonable monetary compensation to the State for recreation when replacement is not feasible or desirable;

(c) Providing and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value;

(d) Providing an adequate supply of shoreline parks and other recreational facilities suitable for public recreation;

(e) Encouraging expanded public recreational use of County, State, and Federally owned or controlled shoreline lands and waters having recreational value;

(f) Adopting water quality standards and regulating point and non-point sources of pollution to protect and, where feasible, restore the recreational value of coastal waters;

(g) Developing new shoreline recreational opportunities, where appropriate, such as artificial reefs for surfing and fishing; and

(h) Encouraging reasonable dedication of shoreline areas with recreational value for public use as part of discretionary approvals or permits by the land use commission, board of land and natural resources, or County planning commissions; and crediting such dedication against the requirements of section 46-6.

Check either "Yes" or "No" for each of the following questions.

		Yes	No
(1)	Will the proposed action involve or be near a dedicated public right-of-way?	X	
(2)	Does the project site abut the shoreline?	X	
(3)	Is the project site near a State or County park?	X	

(4)	Is the project site near a perennial stream?	__	X
(5)	Will the proposed action occur in or affect a surf site?	__	X
(6)	Will the proposed action occur in or affect a popular fishing area?	X	__
(7)	Will the proposed action occur in or affect a recreational or boating area?	X	__
(8)	Is the project site near a sandy beach?	X	__
(9)	Are there swimming or other recreational uses in the area?	X	__

Discussion

The proposed Army Mountain Top Experiment (AMTE) sites, sites 1 and 15 of the DOE Kauai Test Facility (KTF) and the area about 0.6 mile south of the KTF, are located within the Pacific Missile Range Facility (PMRF), Barking Sands. An existing beach access point to Recreational Area No. 1 lies just south of the proposed action sites. The proposed AMTE program will require temporary closure of the beach and ocean corridor fronting the sites. However, Recreation Area No. 1 is normally closed Monday through Friday from 6:00 a.m. to 4:00 p.m. and, consequently only program activities between 4:00 p.m. and 6:00 a.m. would affect access to Recreation Area No. 1 on the PMRF. Public access to Recreation Areas Nos. 2 and 3 would not be affected by the AMTE program, and neither would public access to Polihale State Park north of the PMRF.

HISTORIC RESOURCES

Objective: Protect, preserve, and, where desirable, restore those natural and man-made historic and pre-historic resources in the coastal zone management area that are significant in Hawaiian and American history and culture.

Policies:

(1) Identify and analyze significant archaeological resources;

(2) Maximize information retention through preservation of remains and artifacts or salvage operations; and

(3) Support State goals for protection, restoration, interpretation, and display of historic resources.

Check either "Yes" or "No" for each of the following questions.

		Yes	No
(1)	Is the project site within a historic/cultural district?	__	X
(2)	Is the project site listed on or nominated to the Hawaii or National Register of Historic Places?	__	X
(3)	Does the project site include undeveloped land which has not been surveyed by an archaeologist?	__	X
(4)	Has a site survey revealed any information on historic or archaeological resources?	__	X
(5)	Is the project site within or near a Hawaiian fishpond or historic settlement area?	X	__

Discussion

A 1OO-percent archaeological survey of the KTF within the PMRF boundaries, where sites 1 and 15 are located, was conducted in February 1990 as part of the Kauai Test Facility Environmental Assessment (U.S. Department of Energy, 1992). The report of the survey indicated that a pedestrian survey revealed no evidence of archaeological surface features or artifacts and that boreholes produced minimal cultural material, with no certain evidence of human activity. To date no sites included in the National Register of Historic Places (NRHP) have been recorded within either the KTF or the PMRF. However, Hawaiian oral tradition and traditional burial patterns indicate that the dunes and adjacent sandy areas at the KTF/PMRF can be considered areas of high sensitivity with the potential for containing human remains. The Nohili Dune, located just north of sites 1 and 15, is considered by the Hawaii State Historic Preservation Division to be eligible for inclusion in the NRHP because of its identification as a Native Hawaiian burial location. The village of Mānā lies well south of sites.

SCENIC AND OPEN SPACE RESOURCES

Objective: Protect, preserve and, where desirable, restore or improve the quality of coastal scenic and open space resources.

Policies:

(1) Identify valued scenic resources in the coastal zone management area;

(2) Ensure that new developments are compatible with their visual environment by designing and locating such developments to minimize the alteration of natural landforms and existing public views to and along the shoreline;

(3) Preserve, maintain and, where desirable, improve and restore shoreline open space and scenic resources; and

(4) Encourage those developments which are not coastal dependent to locate in inland areas.

Check either "Yes" or "No" for each of the following questions.

		Yes	No
(1)	Does the project site abut a scenic landmark?	X	—
(2)	Does the proposed action involve the construction of a multi-story structure or structures?	—	X
(3)	Is the project site adjacent to undeveloped parcels?	X	—
(4)	Does the proposed action involve the construction of structures visible between the nearest coastal roadway and the shoreline?	—	X
(5)	Will the proposed action involve construction in or on waters seaward of the shoreline? On or near a beach?	—	X

Discussion

Site preparation at the PMRF may involved the installation of alarms and lighting as well as the placement of mobile equipment, however most of the PMRF is effectively screened from the public by the vegetation along the eastern boundary, and thus no adverse impact to visual resources is anticipated.

COASTAL ECOSYSTEMS

Objective: Protect valuable coastal ecosystems from disruption and minimize adverse impacts on all coastal ecosystems.

Policies:

(1) Improve the technical basis for natural resource management;

(2) Preserve valuable coastal ecosystems of significant biological **or** economic importance;

(3) Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land water uses, recognizing competing water needs; and

(4) Promote water quantity and quality planning and management practices which reflect the tolerance of fresh water and marine ecosystems and prohibit land and water uses which violate State water quality standards.

Check either "Yes" or "No" for each of the following questions.

		Yes	No
(1)	Does the proposed action involve dredge or fill activities?	__	X
(2)	Is the project site within the Shoreline Setback Area (20 to **40** feet inland of the shoreline)?	__	X
(3)	Will the proposed action require some form of effluent discharge into a body of water?	__	X
(4)	Will the proposed action require earthwork beyond clearing and grubbing?	__	X
(5)	**Will** the proposed action include the construction of special waste treatment facilities, such as injection wells, discharge pipes, or cesspools?	__	X
(6)	**Is** an intermittent or perennial stream located on or near the project site?	__	X
(7)	Does the project site provide habitat for endangered species of plants, birds, or mammals?	__	X
(8)	**Is** any such habitat located nearby?	X	__
(9)	**Is** there a wetland on the project site?	__	X
(10)	Is the project site situated in or abutting a Natural Area Reserve?	__	X
(11)	**Is** the project site situated in or abutting **a** Marine Life Conservation District?	X	__
(12)	**Is** the project site situated in or abutting an estuary?	__	X

Discussion

While two species of plant, Pololei ***(Ophioglossum concinnum)*** (adder's tongue fern), a Category **1** Federal candidate species, and Lau'ehu ***(Panicum niihausense)***, a Category **2** Federal candidate species, have been observed on the PMRF or KTF, the proposed site preparation (installation of alarms, fencing, and lighting) at sites, would take place on previously disturbed areas.

Nine Federally listed or state-listed threatened and endangered wildlife species are known to exist in the vicinity of the proposed AMTE program sites. These include the 'Alae-ke'oke'o ***(Fulica americana alai)*** (American/Hawaiian Coot); Ae'o ***(Humantopos mexicanus knudseni)*** (Hawaiian black-necked stilt); 'Alae-'ula ***(Gallinula chloropus sandvisensis)*** (Hawaiian Gallinule/common moorhen); Koloa-maoli ***(Anas wyvilliana)*** (Hawaiian duck); A'o ***(Puffinus newelli)*** (Newell's shearwater); Pueo ***(Asio flammeus sandwichensis)*** (Hawaiian short-eared owl); the Hawaiian monk seal ***(Monachus schauinslandi)***; Green sea turtle ***(Chelonia mydas)***; and the humpback whale ***(Megaptera novaeangliae)*** offshore. The proposed site preparation (installation **of** alarms and fencing) at the sites would take place on previously disturbed areas and the security lighting at the sites would be designed to deflect downward to minimize adverse impacts to the Newell's shearwater, a threatened native seabird which may **fly** over the sites.

The probability of adversely impacting marine mammals known to be present in the ocean fronting the **PMRF,** such as the Hawaiian monk seal and humpback whale, and the green sea turtle, is considered negligible.

Operation of the tracking radars is not expected to adversely affect birds in the area. Birds would have to either hover stationary in the main beam or fly right down the main beam's path to be exposed to harmful levels of EMR – both highly unlikely scenarios.

ECONOMIC USES

Objective: Provide public or private facilities and improvements important to the State's economy in suitable locations.

Policies:

(1) Concentrate in appropriate areas the location **of** coastal dependent development necessary to the State's economy;

(2) Ensure that coastal dependent development such as harbors and ports, visitor industry facilities, and energy generating facilities are located, designed, and constructed to minimize adverse social, visual, and environmental impacts in the coastal zone management area; and

(3) Direct the location and expansion of coastal dependent developments to areas presently designated and used for such development, and permit reasonable long-term growth at such areas, and permit coastal dependent development outside **of** presently designated areas when:

(a) Utilization of presently designated locations is not feasible;

(b) Adverse environmental effects are minimized; and

(c) Development is important to the State's economy.

Check either "Yes" or "No" for each of the following questions.

		Yes	No
(1)	Does the project involve a harbor or port?	__	X
(2)	**Is** the project site within a designated tourist destination area?	X	__
(3)	Does the project site include agricultural lands or lands designated for such use?	__	X
(4)	Does the proposed activity relate to commercial fishing **or** seafood production?	__	X
(5)	Does the proposed activity relate to energy production?	__	X
(6)	Does the proposed activity relate to seabed mining?	__	X

Discussion

The proposed AMTE program would take full advantage of existing facilities on the PMRF, that is, sites presently designated and used for such purposes. The program would also have a cumulative positive net economic impact to Kauai and the State through both direct program-related procurements and direct and indirect personnel expenditures.

COASTAL HAZARDS

Objective: Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, and subsidence.

Policies:

(1) Develop and communicate adequate information on storm wave, tsunami, flood erosion, and subsistence hazard;

(2) Control development in areas subject to storm wave, tsunami, flood, erosion, and subsidence hazard;

(3) Ensure that developments comply with requirements of the Federal Flood Insurance Program; and

(4) Prevent coastal flooding from inland projects.

Check either "Yes" or "No" for each of the following questions.

		Yes	No
(1)	Is the project site on or abutting a sandy beach?	X	__
(2)	Is the project site within a potential tsunami inundation area as depicted on the National Flood Insurance Program flood hazard map?	__	X
(3)	Is the project site within a potential flood inundation area according to a flood hazard map?	__	X
(4)	Is the project site within a potential subsidence hazard area according to a subsidence hazard map?	__	X
(5)	Has the project site or nearby shoreline areas experienced shoreline erosion?	__	X

Discussion

Although some areas of the PMRF have been affected by tsunamis in the past, the proposed **AMTE** locations are not located within a potential tsunami or flood inundation area.

MANAGING DEVELOPMENT

Objective: Improve the development review.process, communication, and public participation in the management of coastal resources and hazards.

Policies:

(1) Effectively utilize and implement existing law to the maximum extent possible in managing present and future coastal zone development;

(2) Facilitate timely processing of application for development permits and resolve overlapping or conflicting permit requirements; and

(3) Communicate the potential short- and long-term impacts of proposed significant coastal developments early in their life cycle and in terms understandable to the general public to facilitate public participation in the planning and review process.

Check either "Yes" or "No" for each of the following.

	Yes	No
(1) Will the proposed activity require more than two (2) permits or approvals?	__	X
(2) Does the proposed activity conform with the State and County land use designation for the site?	X	__
(3) Has or will the public be notified of the proposed activity?	X	__
(4) Has a draft or final environmental impact statement or an environmental assessment been prepared?	X	__

Discussion

The AMTE program sites at the PMRF are located on property controlled by the Federal Government. Neither County or State jurisdiction apply in this area.

An Environmental Assessment (EA) for the **AMTE** program **is** currently in preparation. The public will be notified of the proposed activity with release of the EA for public comment, in accordance with Army Regulation **AR** 200-2.

FEDERAL CONSISTENCY
SUPPLEMENTAL INFORMATION FORM

Project/Activity Title or Description: Army Mountain Too Experiment (AMTE)

Island: **Kauai** Tax Map Key No.: **4-1-2-02:13** Est. Start Date: **4QTR FY95**

APPLICANT OR AGENT

Name & Title: Mr. Dale Moore, AMTE Project Manaaer

Agency/Organization: U.S. Army Program Executive Office Missile Defense Telephone: 205/955-4423

Address: PEO, MD SFAE-MD-AMT, **Box 1500,** Huntsville, **AL 35807-3801**

TYPE OF APPLICATION (check **one only)**

(X) I. Federal Activity
(statement "a")

"The proposed activity is consistent with and will be conducted in a manner consistent to the maximum extent practicable with the Hawaii Coastal Zone Management Program."

Signature _____ LTC, AD Date 30 JAN 95
Deputy PM

( ) II. Permit or License
(statement "b")

"The proposed activity complies with Hawaii's Coastal Zone Management Program and will be conducted in a manner consistent with such a program."

Signature _____ Date _____

( ) III. OCS Plan/Permit

( ) IV. Grants & Assistance

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Appendix E
EMI/EMC Analysis

UNCLASSIFIED REPORT ON THE ELECTROMAGNETIC COMPATIBILITY/INTERFERENCE ANALYSIS OF THE U.S. ARMY MOUNTAIN TOP EXPERIMENT, PACIFIC MISSILE RANGE FACILITY, KAUAI. HI

17 April 1995

DEFENSE EVALUATION SUPPORT ACTIVITY
TECHNICAL SERVICES DIRECTORATE
2251 WYOMING BLVD, SE
KIRTLAND AFB, NM 87117-5609

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Scope:

The purpose of this analysis was to evaluate the potential for interference between the equipment planned for use by the Army during the Wide Area Defense (WAD) Advanced Concept Technology Demonstration (ACTD), the Navy equipment planned for use in the ACTD, and other emitters and receivers in the area. Operational frequencies were analyzed and specific frequencies were nominated for the Navy's MK74 Fire Control System, Cooperative Engagement Capability (CEC), and AIVAN (sometimes referred to as the E-2C JTIDS Avionics Van); and the Army's Patriot Data Link Terminal, Patriot Radar (AN/MPQ-53), Patriot Missile Downlink Transmitter, the SINCGARS radio (AN/VRC-89/90) and the C-130 captive carry aircraft with the ERINT PAC-3 missile seeker.

Current plans call for the MK74 Fire Control System, Cooperative Engagement Capability (CEC), the AIVAN (sometimes referred to as the E-2C JTIDS Avionics Van) to be located at Kokee Park (Parcel A), Kauai, HI. The Patriot Data Link Terminal, Patriot Radar (AN/MPQ-53), Patriot Missile Downlink Transmitter, and the SINCGARS Radio (AN/VRC-89/90) will be located at the north end of the Pacific Missile Range Facility-Barking Sands on the Kauai Test Facility. The C-130 captive carry aircraft with the ERINT Missile Seeker were analyzed for an operational height from 0-50,000 feet above mean sea level. There is a possibility that the AIVAN may be placed at the Pacific Missile Range Facility - Makaha Ridge, Kauai HI. Due to proximity of Makaha Ridge to Kokee Park, and the fact that the Elevation of Makaha Ridge is considerably lower than that of Kokee Park, location of the AIVAN at Makaha Ridge would not affect the results of this analysis.

Analysis Tool:

The analysis was performed using the Joint Spectrum Management Systems (JSMS Version **4.1)** software. JSMS is distributed to authorized users by the Department of Defense Electromagnetic Compatibility Analysis Center for use in an operational environment.

JSMS is an automated capability that supports the joint spectrum manager in peacetime and during wartime/contingency operations. The JSMS mission is to support joint task force operational planning as well as real-time management of the radio frequency spectrum. JSMS provides the ability to assign compatible frequencies; identify potential interference resulting from existing or proposed use of the **RF** spectrum; maintain current frequency assignment, Joint Restricted Frequency List (JRFL), Communications-Electronics Operating Instructions (CEOI), and equipment databases; and perform engineering tasks.

During peacetime, JSMS is intended to be used by the joint staff at their

permanent headquarters to facilitate the task of managing the spectrum during the planning and execution phases of exercises, as well as to perform routine spectrum management functions.

The Frequency Nomination module was utilized for this analysis. This module allows the user to generate a ranked list of frequencies for one or more nominated assignments. This is accomplished by considering potential interference to and from existing assignments.

Source Data:

Data Base used with the JSMS program was JSMS DB-0016 (Government [both Federal and State1 assignments local to Kauai, HI, CD-FARS V1.1 FCC (which includes data on the island of Niihau), DB-0139 (wwide satellite), J/F12 (Equipment) supplemented with data gleaned during a Kokee Park on-sight EMR survey conducted in July, 1994. This data base contains all government (including those of the State of Hawaii) and non-government transmitters and receivers with permanent assignments.

When possible, the J/F-12 government equipment database was utilized for the operational characteristics of the equipment. However, several pieces of equipment were not contained in the database: the AN/ARC-35, IMPR IFF, the MK74 Fire Control System, and the ERINT PAC-3 missile seeker. In these cases, the information normally contained in the J/F-12 equipment database was provided by Mr. Jim Connerton of VEDA, Inc. for the AN/ARC-35 and the IMPR IFF interrogator, Mr. Phil Donnelly of Raytheon, Inc. for the MK74 Fire Control System, and Mr. Dave Smith of MICOM for the ERINT **PAC-3** Missile Seeker.

Equipment Characteristics:

The equipment addressed in the analysis consisted of the AIVAN (including the **JTIDS** radio), the **MK74** Fire Control System, the Cooperative Engagement Capability (CEC), the Patriot Data Link Terminal, Patriot Missile Radar (AN/MPQ-53), Patriot Missile Downlink Transmitter, ERINT (PAC-3) missile seeker, C-130 captive carry aircraft and the **SINCGARS** radio(AN/VRC-89/90). The operational characteristics used in the analysis are shown in Table 1.

Analysis

During the execution of the Frequency Nomination module, it is necessary to determine the level at which a proposed transmitter and/or receiver will potentially cause interference to or experience interference from existing frequency assignments. To accomplish this, JSMS first limits the number of assignments that need to be analyzed by defining the analysis regions, based on the transmitter

frequency. The frequency bands of the transmitters analyzed are shown in Table 1.

Equipment	Frequency Band (MHz)	Effective Radiated Power	J/F-12 Equipment Number
AIVAN			
AN/ARC-156	225-400	10W/30W	3501
AN/ARC-182	30-400	10W/30W	464014
AN/ARC-35	2-30	400W	Unknown
JTIDS	Classified	200W/1200W	5127
IMPR IFF	Classified	2KW	Unknown
AN/APX-100B	Classified	500W	4844
MK74			
Pulse	Classified	5KW	Unknown
CWI	Classified	5KW	Unknown
CEC (AN/SPG-051D)	Classified	Classified	6638
Patriot Data Link Terminal	Classified	Classified	2227/4
Patriot Radar (AN/MPQ-53)	Classified	Classified	2443/3
Patriot Missile Downlink Transmitter	Classified	Classified	363913
C-130 Aircraft			
AN/TPX-46 IF	Classified	Classified	2303/5
ARN-118	Classified	Classified	A4116/2
AN/APX-72 IFF	Classified	Classified	1990/2
AN/ARC-186	Classified	Classified	4807/2
AN/ARC-64	Classified	Classified	Unknown
ERINT Missile Seeker (PAC-3)	Classified	Classified	Unknown
SINCGARS (AN/VRC-89/90)	Classified	Classified	4967/4

Table 1. Equipment Characteristics

In analysis regions below 30 Megahertz (MHz) Environmental transmitters and receivers are considered to exist in one of three distinct regions. The innermost region is a smooth-earth circular area called the groundwave region. **JSMS** defines the radius of the groundwave circle as **1.2** times the maximum line-of-sight **(LOS)** distance between the proposed assignment and an outstanding assignment with an antenna height of 20 meters. LOS distance is calculated assuming a smooth, spherical earth. **All** interactions occurring within the groundwave circle are submitted for analysis.

The second regions, the first hop region, includes the area outside the groundwave circle but within 3133 kilometers **of** the proposed assignment's location. The 3133 kilometer limit was chosen as the approximate maximum first skywave hop distance, assuming a 3.5° antenna take-off angle, an earth radius of 6371.2 kilometers, and an F2-layer virtual height of 300 kilometers. **All** interactions occurring with environmental transmitters or receivers in this region are assumed by default to be cases of potential interference. These interactions, therefore, are not subjected to further analysis.

The multi-hop region is the area beyond 3133 kilometers from the proposed assignment. Interactions occurring with environmental assignments in this region are considered to be beyond the scope of **JSMS** intent and are not analyzed. While this may seem questionable, accurate prediction of HF skywave propagation requires exhaustive calculations involving the modeling of the ionosphere. **A** multi-hop interference analysis would introduce a large increase in execution time. Additionally, to perform a complete HF assessment, all worldwide HF assignments would need **to** be included in the **JSMS** database. The number of these assignments make this prohibitive.

For the portion of the spectrum above 30 MHz, two regions are defined. The regions are separated by a circle that describes the maximum limit of transmission, disregarding skywave or ducting phenomena. The radius of this circle **is** determined by the following process:

1. The proposed assignment's terrain elevation is retrieved from the appropriate terrain database.

2. The proposed assignment's antenna height is added to its terrain elevations.

3. The outstation is assumed **to** be aboard an aircraft flying at 30,000 feet.

4. The maximum **LOS** distance between the two antenna heights is calculated.

5. The maximum LOS distance is then multiplied by a factor of 1.2 to account for additional factors, such as atmospheric deviations, that could potentially increase transmission distance.

The area inside this circle is called the transmission region; the quiet region includes everything outside the circle. Interactions within the transmission region are submitted for analysis. Transmitters and receivers in the quiet region are considered too distant to be potential sources or victims of interference and are not analyzed.

The Detailed Analysis module was used for the analysis. In this module, after determining antenna coupling, power coupling, and receiver noise floor, interactions are first submitted to a free-space analysis and then, if necessary are submitted to a terrain-dependent path loss calculation. The resulting interference-to-noise ratio is then compared to the interference threshold. Those interactions that exceed the interference threshold are considered to be cased of potential interference.

Upon completion of the Detailed Analysis, a ranked list frequencies was generated for interference-free assignments. These proposed assignments, based on the users required number of frequencies, are shown in Table 2 for each piece of equipment. The proposed assignments, with the exception of the frequency agile and pulse emitters, were analysis to the third harmonic during the analysis.

Assumptions:

During its analysis of transmitter-receiver interactions, JSMS makes a number of assumptions. Most of these assumptions are conservative and have the effect of predicting a level of interference greater than may actually occur. Therefore, most JSMS results can be described as worst case. The assumptions used are listed below:

1. Environmental transmitters and receivers without geographical coordinates, with the exception of CEOI assignments, are given default coordinates and radii based on their state or country (or location). Otherwise, they are considered to be potential sources/victims of interference.

2. Attenuation due to rain, snow, ice, foliage, or man-made obstacles is not considered.

3. Skywave propagation is not considered. Frequencies nominated were based upon LOS requirements.

4. Atmospheric ducting is not considered.

5. The O-decibel (dB) receiver passband is assumed to be equivalent to its corresponding transmitter's widest authorized emission bandwidth.

6. Most cosite interactions are not considered. The omitted interactions are spurious emissions, spurious responses, transmitter and receiver intermodulation, non-linear adjacent signal responses, and broadband transmitter noise.

7. For the purpose of determining path loss values, antenna polarization is assumed to be vertical unless it is specified as horizontal.

8. Transmitting and receiving antennas without azimuths are assumed to have non-directional (or rotating) antennas.

9. If a transmitter or receiver has multiple antennas, the one with the highest gain is used for analysis.

10. Antennas with mainbeam gains of 8 dBi or less are considered to be omnidirectional.

11. Earth stations are given extra protection. They are assumed to have their mainbeam pointed directly at the source/victim.

12. All potential interference interactions are calculated for one-on-one source-victims interactions. In reality, the total interfering signal is the sum of all undesired signals arriving at the receiver.

13. Transmitters that are identified as operating in a frequency agile mode (frequency hoppers) are not considered to be potential interferences.

14. Cabling and insertion losses are not considered.

Results:

The JSMS model has predicted that the use of the nominated frequency assignments shown in Table 2 will not interfere with existing transmitters or receivers of record in the area with the exception of the Patriot Radar (AN/MPQ-53) and the Patriot Missile Downlink Transmitter. Since this analysis was performed, the requirement for the Patriot Missile Downlink Transmitter has been deleted. A review of the operating bandof the Patriot Radar indicated that there is not available space to accommodate the desired operating frequencies of this equipment without potential interference with the other two Department of the Navy users in the band. Therefore, a frequency nomination could not be performed. The two potentially threatened transmitters are radars belonging to the Pacific Missile Range Facility. The Area Frequency Coordinator

will determine the means, most likely through proper narrow operating frequencies, for deconflicting the Patriot Radar from these two existing assignments. There was no potential interference discovered with non-Department of Defense users in the area. In all cases, the Area Frequency Coordinator will make assignments. The nominated frequencies are only recommendations based upon information which does not include local temporary assignments.

Equipment	Frequency Band (MHz)	Emitters in the Band (100 Mile radius)	Number of Frequency Assignments (Requested)
AIVAN			
AN/ARC-156	225-400	49	2 (Yes- DESA)
AN/ARC-182	(30-400)		2 (Yes-DESA)
	30-87.975	19	None
	118-155.975	289	None
	156-173.975	128	None
	225-399	49	2 (Yes-DESA)
AN/ARC-35	2-30	148	2 (Yes-DESA)
JTIDS	Classified	10	2 (Yes-DESA)
IMPR IFF	Classified	3	1 (Yes-DESA)
AN/APX-100B	Classified	2	1 (Yes-DESA)
MK74			
Pulse	Classified	3	1 (Yes-DESA)
CWI	Classified	0	1 (Yes-DESA)
CEC	Classified	*0*	1 (Yes-DESA)
Patriot Data Link Terminal	Classified	5	6 (Yes-MICOM)
Patriot Radar (AN/MPQ-53)	Classified	2	9 (Yes-MICOM)*
Patriot Missile Downlink Transmitter	Classified	2	16 (Yes-MICOM)*
C-130 Aircraft			
AN/TPX-46 IF	Classified	3	1(Yes-MICOM)
ARN-118	Classified	5	1(No-MICOM)
AN/APX-72 IFF	Classified	2	TBD (NO-AF)
AN/ARC-186	Classified	19	TBD (NO-AF)
AN/ARC-64	Classified	144	TBD (NO-AF)
ERINT Missile Seeker (PAC-3)	Classified	49	1(No-MICOM)
SINCGARS (AN/VRC-89/90)	Classified	19	4 (Yes-MICOM)

* Requires local area frequency coordinator deconfliction

Table 2. Summary of Requested Assignments

Appendix F
Air Quality Modeling Analysis

AIR QUALITY MODELING ANALYSIS

In compliance with the Clean Air Act, the U.S. Environmental Protection Agency (EPA) has established National Ambient Air Quality Standards (NAAQS) for six criteria pollutants: carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter with a hydrodynamic diameter less than or equal to 10 microns (PM-10), and sulfur dioxide (table F-1). The primary NAAQS are designed to protect public health with an adequate margin of safety, and the secondary NAAQS are designed to address harm to environmental and economic interests. The Hawaii Department of Health has adopted state ambient air quality standards that are as strict as or stricter than the NAAQS, and they have also adopted a standard for hydrogen sulfide (table F-1).

Launch operations constitute the largest source of uncontrolled emissions into the atmosphere for the Army Mountain Top Experiment (AMTE) project. These emissions are generated in the ground cloud at lift-off and along the launch trajectory. Emissions are associated with the oxidation of fuel and propellants. Emission composition is determined by the type and composition of the various propellants.

AMTE project activities could include the launch of PATRIOT missiles from launch pad 1 at the Kauai Test Facility (KTF). The combustion products from the PATRIOT missile's rocket motor are given in table 4-2. The chemical species listed in table 4-2 are those that occur shortly after the exhaust exits the rocket motor nozzle. It is likely that due to the high temperature of the exhaust, chemical reactions continue to occur in the exhaust. This will naturally cause some changes in the relative amounts, and even the occurrence, of the various chemical species. However, data are not known to exist for the exhaust cloud once it reaches equilibrium, and it is not anticipated that the species or their amounts will differ significantly from those given. The analysis in this document of a solid-propellant launch vehicle uses the emissions given in table 4-2.

The major emission products from solid propellant rocket motors are carbon monoxide, aluminurn oxide, and hydrogen chloride. Carbon monoxide is a criteria pollutant, and will be compared to its corresponding NAAQS value (table F-1).

Aluminum oxide has a very low toxic potential. The aluminum oxide in the rocket exhaust is a solid dust. Thus, as the most conservative estimate, all of the aluminum oxide can be assumed to be particulate matter with a hydrodynamic diameter less than or equal to 10 microns (PM-10) and then compared to the NAAQS value for PM-10. Also, the aluminum oxide concentrations will be compared to the 8-hour American Conference of Governmental Industrial Hygienists standard given in table F-2. This is a standard for dust, not specific to aluminum oxide.

Hydrogen chloride is not a criteria pollutant but is one of the 189 hazardous air pollutants listed in Title III of the Clean Air Act. Its concentrations will be compared to the guidelines from the National Research Council (1987) and the U.S. Environmental Protection Agency (1992), as given in table F-2.

Table F-1: National and Hawaii Ambient Air Quality Standards

Pollutants	Average Time	Hawaii Standards[a]	National Standards[b]	
			Primary[c,d]	Secondary[c,e]
Carbon monoxide	8-hour	5 mg/m³	9 ppm (10mg/m³)	--
	1-hour	10 mg/m³	35 ppm (40mg/m³)	--
Lead	Quarterly	1.5 µg/m³	1.5 µg/m³	Secondary as primary standard
Nitrogen dioxide	Annual	70 µg/m³	0.053 ppm (100 µg/m³)	Same as primary standard
Ozone	1-hour	100 µg/m³	0.12 ppm (235µg/m³)	Same as primary standard
Sulfur dioxide	Annual	80 µg/m³	80 µg/m³ (0.03 ppm)	--
	24-hour	365 µg/m³	365 µg/m³ (0.14 ppm)	--
	3-hour	1,300 µg/m³	--	1,300 µg/m³ (0.5 ppm)
Hydrogen sulfide	1-hour	35 µg/m³	--	--
PM-10	Annual	50 µg/m³	50 µg/m³	Same as primary standard
	24-hour	150 µg/m³	150 µg/m³	Same as primary standard

Notes:
[a] Hawaii Standards; Limiting concentrations specified for a 12-month period or a calendar quarter shall not be exceeded. Limiting concentrations specified for 1-hour, 3-hour. 8-hour, and 24-hour periods shall not be exceeded more than once in any 12-month period.
[b] National standards, other than ozone and those based on annual averages or annual arithmetic means, are not be to exceeded more than once a year. The ozone standard is attained when the expected number of days per calendar year, with maximum hourly average concentrations above the standard, is equal to or less than 1.
[c] Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based on a reference temperature of 25 o C and a reference pressure of 760 millimeters of mercury. All measurements of air quality are to be corrected to a reference temperature of 25 o C and a reference pressure of 760 millimeters of mercury (1013.2 millibar); ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.
[d] National Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health. Each state must attain the primary standards no later than 3 years after that state's implementation plan is approved by the U.S. EPA.
[e] National Secondary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public welfare from any know or anticipated adverse effects of a pollutant. Each state must attain the secondary standards within a "reasonable time" after the implementation plan is approved by the U.S. EPA.
[f] Calculated as arithmetic mean.

Source: *Clean Air Act*, 42 USC 7401 et seq: Chapter 11-59, Hawaii Administration Rules.

Flight Scenarios

The analysis of potential ambient air quality impacts from proposed AMTE activities considers both normal launch and early flight termination scenarios. For the most part, it is assumed that during either scenario the only air pollutants emitted are the exhaust from the rocket motor combustion products.

During a normal launch scenario the missile accelerates while the rocket motors of the missile's stage or stages burn. This boost stage normally lasts only a few minutes. While

Table F-2: Exposure Guidelines for Hydrogen Chloride and Aluminum Oxide

Pollutant	Exposure Duration	Guideline	Exposure Term	Application	Organization
HCl	10 minutes	100 ppm (150 mg/m^3)	Emergency Exposure Guidance Level (EEGL)[a]	Workplace	National Research Council (NRC)[b]
	15 minutes	20 mg/m^3	Maximum Likelihood Estimate (MLE)[c]	Public	EPA[d]
	30 minutes	100 ppm (150 mg/m^3)	Immediately dangerous to life and health[e]	Workplace	National Institute for Occupational Safety and Health[f]
	1 hour	20 ppm (30 mg/m^3)	EEGL	Workplace	NRC[b]
	1 hour	6 mg/m^3	MLE[c]	Public	EPA[d]
	1 hour	1 ppm (1.5 mg/m^3)	Short-term Public Emergency Guidance Level (SPEGL)[g]	Public	NRC[b]
	24 hours	20 ppm (30 mg/m^3)	EEGL[a]	Workplace	NRC[b]
	24 hours	1 ppm (1.5 mg/m^3)	SPEGL[g]	Public	NRC[b]
	8-hour days for 40-hour/week	5 ppm (7 mg/m^3)	Permissible exposure limit – ceiling[h]	Workplace	Occupational Safety and Health Administration (29 CFR 1910.1000)
	8-hour days for 40-hour/week	5 ppm (7.5 mg/m^3)	Threshold limit value – ceiling[h]	Workplace	American Conference of Governmental Industrial Hygienists[i]
	90 days	0.5 ppm (0.7 mg/m^3)	Continuous Exposure Guidance Level[j]	Workplace	NRC[b]
Aluminum oxide (Al_2O_3) as aluminum dust	8 hours	10 mg/m^3	Threshold limit value – time-weighted average	Workplace	American Conference of Governmental Industrial Hygienists[i]

[a]Concentration that will permit continued performance of specific tasks during rare emergency conditions
[b]National Research Council, 1987
[c]Concentration at which the Maximum Liklihood Estimate predicts only a 1 percent probability that any adverse effects will be observed (and a 99 percent probability that no adverse effect will be observed); derived from Figure 4 of U.S. Environmental Protection Agency, 1992[d]U.S. Environmental Protection Agency, 1992
[e]Concentration from which one could escape within 30 minutes without a respirator and without experiencing any escape-impairing or irreversible health effects.
[f]U.S. Department of Health and Human Services, 1990
[g]Suitable concentration for unpredicted, single, short-term, emergency exposure of the general public
[h]Ceiling value which should not be exceeded at any time for the duration of the exposure
[i]American Conference of Government Industrial Hygienists, 1992
[j]Ceiling concentrations designed to avoid adverse health effects, either immediate or delayed, of more prolonged exposures and to avoid degradation of crew performance that might endanger the objectives of a particular mission as a consequence of continuous exposure up to 90 days

the rocket motors are burning, the missile is accelerating; therefore, a higher concentration of combustion products occurs near the launch site than along the rest of the flight path.

Only a part of the exhaust products emitted during a normal flight will have any effect on the ambient air quality. Under the CAA, ambient air is that portion of the atmosphere that is both external to buildings and to which the general public has access (40 **CFR** 50.1). Only that portion of the exhaust products that are emitted while the missile is in the troposphere has the potential to affect the ambient air quality. This is because air and pollutants above the troposphere mix extremely slowly with the air in the troposphere (Seinfeld, 1986). The troposphere exists from ground level to an altitude of approximately 9 miles (Seinfeld, 1986).

The combustion-product exhaust is much hotter than the ambient air (typically a few thousand degrees Celsius). Because of this, buoyancy causes the cloud of rocket exhaust that was released near the ground to rise until it reaches an equilibrium height. For Aries missiles whose first-stage propellant mass is more than five times that of the PATRIOT missile, the ground cloud is expected to rise to heights of **329** to 1,312 feet (ft) (Strategic Defense Initiative Organization, 1991). This process is discussed in detail in the ***Space Shuttle Advanced Solid Rocket Motor Program Supplemental Environmental Impact Statement*** (National Aeronautics and Space Administration, 1990).

In addition to pollutants above the troposphere being essentially excluded from affecting ground-level air quality, pollutants that are above the top of the mixing layer, which exists below the top of the troposphere, are also excluded from affecting ground-level air quality. The mixing height (or depth) is defined as the air above the surface through which relatively vigorous vertical mixing occurs; the value of the mixing height is set primarily by the atmosphere's local vertical temperature profile (U.S. Environmental Protection Agency, 1972). The reason that pollutants emitted above these excluding layers have little or no effect on ambient air quality is that the pollutants become diluted in the very large volume of air in these layers before they are very slowly transported down to ground level.

Normally higher mixing heights lead to better air quality because they afford a larger volume of air in which emitted pollutants may diffuse, and thus the pollutants reach lower concentrations. However, if a ground cloud rises above the height of the mixing layer, then, due to the excluding effect, essentially none of the rocket emissions will affect the ambient air quality. (National Aeronautics and Space Administration, 1990)

The other flight scenario considered is missile failure. This includes vehicle destruction on the pad, in-flight failure, and command vehicle destruction. Emissions from these possibilities would be the same as those during a normal launch, with the exception of a launch pad accident or one very shortly after lift-off. Otherwise the emissions would occur at an altitude that would allow significant dilution of the pollutants before they reached ground level.

Air Quality Modeling of Missile Flight Scenarios

The short-term air quality impacts caused by the launch of an individual PATRIOT missile were modeled with the TSCREEN PUFF computer model. TSCREEN PUFF is part of TSCREEN, which is an Environmental Protection Agency (EPA) application package of three screening dispersion computer models (U.S. Environmental Protection Agency, 1990). More specifically, TSCREEN automates the screening techniques from "A Workbook of Screening Techniques for Assessing the Impacts of Toxic Air Pollutants" (U.S. Environmental Protection Agency, 1988). Screening techniques use simplifying assumptions and generate estimates which are generally upper bounds on expected pollutant concentrations. The EPA recommends that screening models be used first, and if the results exceed applicable concentration limits, then a more refined model should be used (U.S. Environmental Protection Agency, 1978).

Most sources of air pollution are continuous sources (e.g., emissions from stacks or equipment leaks); however, emissions from missile launches are essentially instantaneous. The TSCREEN PUFF model is designed for use with instantaneous releases of pollutants, such as equipment openings or relief-value discharges. TSCREEN PUFF is programmed to select the atmospheric stability class that yields the maximum ground-level pollutant concentration. (U.S. Environmental Protection Agency, 1988;1978).

As inputs TSCREEN PUFF requires the mass of the puff of material released and the elevation at which the puff was released. As mentioned, for normal flights only a portion of the missile's exhaust would be released below the top of the mixing layer. Using a conservative approach, for all modeling performed, the mass of the puff released during a normal flight was assumed to equal the total emissions from the PATRIOT missile's rocket motor.

For the TSCREEN model calculations the puff of emission was assumed to be released at its final ground cloud height. Although this assumption tends to underpredict concentrations very near the launch site, it will not significantly affect concentrations at points beyond the distance at which final ground-cloud rise is reached. This assumption is generally made for these types of analyses (Strategic Defense Initiative Organization, 1991; U.S. Department of the Air Force, 1988). As mentioned earlier, the final altitude for ground clouds for missiles with more than five times the propellant of the PATRIOT missile are expected to be 328 ft to 1,312 ft (Strategic Defense Initiative Organization, 1991). Following the example of the previous analysis (Strategic Defense Initiative Organization, 1991), the conservative value of 164 ft was chosen for the release height for the PATRIOT missile.

Furthermore, the TSCREEN PUFF model uses the conservative value of 1,050 ft for the mixing height, which is above the assumed release height. Therefore, all the material in the puff will affect the calculated ground-level concentrations. Furthermore, the TSCREEN PUFF model uses the very conservative value of 2.3 miles per hour for the wind speed. Stronger wind speeds tend to more quickly disperse, and thus dilute, the emitted pollutants.

For the missile failure, it is assumed that the mass of the puff again equals all of the emissions from the PATRIOT missile's rocket motor. For a missile failure that involved this type of total conflagration, the final rise height of the ground cloud would be greater than that for a normal launch due to the greater amount of energy released, and thus greater temperature of the exhaust (Strategic Defense Initiative Organization, **1991).** However, in keeping with choosing values that will give conservative estimates for air quality impacts, the same value as for normal launches, 164 ft, was used for the computations.

Thus for a single-stage missile, such as the PATRIOT, the analyses for normal flight and missile failure are the same.

Results **of the** Air Quality Modeling

The TSCREEN PUFF computer model provides ground-level pollutants in terms of peak instantaneous concentrations and time-mean concentrations of up to 60 minutes. Time-mean concentrations for time periods longer than **1** hour are customarily estimated by a power law equation (U.S. Department of Health, Education, and Welfare, **1970).** The power law equation used is $X_s = X_k * (t_k / t_s)^p$, where X_s is the time-mean concentration for the desired longer time t_s, X_k is the time-mean concentration at the known time t_k, and p is the "power" to which you are raising the ratio of the times. A value of p between 0.17 and 0.20 is normally used (U.S. Department of Health, Education, and Welfare, **1970).** This method is more reliable for shorter than for longer time periods and for continuous rather than for instantaneous sources. Thus, for missile launches, extrapolating to even 8-hour time-mean concentrations is of questionable utility. For this reason, an aluminum oxide 24-hour time-mean concentration was not calculated for comparison to the 24-hour PM-10 NAAQS. In the 8-hour time-mean calculations, a value of p = 0.20 was used in order that the most conservative (that is, largest) time-mean concentrations were calculated. Local background concentrations need to be added to the time-mean concentrations calculated for missile launches. This is most applicable to carbon monoxide and aluminum oxide (as PM-10).

Results from the air quality modeling are given in table F-3. The results are clearly below the corresponding NAAQS and guideline values.

Table F-3: Estimated Concentration from PATRIOT Missile (mg/m^3)[a]

Pollutant	Release (kg [lb])	Average Period	Guideline (mg/m^3)	Exposure Term	Distance Downwind km (feet) 0.7 (2,400)	1 (3,281)	3 (9,842)	5 (16,404)	7 (22,966)
Hydrogen Chloride	23.5 (51.8)	1 hour	30	EEGL[b]	0.392	0.261	0.253	0.163	0.108
		1 hour	1	SPEGL[c]	0.392	0.261	0.253	0.163	0.108
Carbon Monoxide	26.1 (57.6)	8 hours	10	NAAQS[d]	0.288	0.191	0.185	0.119	0.079
		1 hour	30	NAAQS[d]	0.436	0.290	0.281	0.181	0.120
Aluminum Oxide	40.7 (89.7)	8 hours	0	TLV-TWA[e]	0.449	0.298	0.230	0.186	0.124
		1 hour	–	–	0.680	0.452	0.439	0.282	0.188

[a]Values used in TSCREEN PUFF model (U.S. Environmental Protection Agency, 1990):
release height = 50 m (164 ft)
wind speed = 1 m/s (3.3 ft/s)
mixing height = 320 m (1,049.7 ft)

[b]Emergency Exposure Guidance Level (National Research Council, 1987)

[c]Short-term Public Emergency Guidance Level (National Research Council, 1987)

[d]National Ambient Air Quality Standards (40 CFR 50.109)

[e]Threshold Limit Value – Time-weighted Average (American Conference of Government Industrial Hygienists, 1992)

wp/t-f3.011-05/23/95

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Appendix *G*
Cultural Resources Background

CULTURAL RESOURCES BACKGROUND

Cultural resources are prehistoric and historic sites, structures, districts, artifacts, or any other physical evidence of human activity considered important to a culture, subculture, or community for scientific, traditional, religious, or any other reason. Only those cultural resources determined to be potentially significant under the given legislation are subject to protection from adverse impacts resulting from an undertaking. Additional information on Cultural Resources is provided in Appendix G. For ease of discussion, cultural resources have been divided into archaeological resources (prehistoric and historic), historic buildings and structures, and traditional resources (e.g., Native Hawaiian, American Indian, Asian). For the purposes of this analysis, cultural resources are also defined to include paleontological resources.

Only those cultural resources determined to be potentially significant under the given legislation are subject to protection from adverse impacts resulting from an undertaking. To be considered significant, cultural resources must meet one or more of the criteria established by the National Park Service that would make that resource eligible for inclusion in the National Register of Historic Places (National Register). The term "eligible for inclusion in the National Register" includes all properties that meet the National Register listing criteria which are specified in Department of Interior regulations at 36 CFR 60.4. Therefore, sites not yet evaluated may be considered potentially eligible to the National Register and, as such, are afforded the same regulatory consideration as nominated properties. Whether prehistoric, historic, or traditional, significant cultural resources are referred to as "historic properties."

Archaeological Resources (Prehistoric and Historic)

The physiography and climate of Kauai have supported a cultural resources chronology that extends into the past for nearly 2,000 years (Department of Land and Natural Resources, 1993). Oldest in the archipelago and distinct from the other islands of Hawaii, cultural materials recovered from Kauai infer a prehistoric connection with much older cultures from the southern islands of central Polynesia (U.S. Department of Energy, 1992). The region within which the PMRF is situated is known as Mana. Throughout prehistory, large areas of the Mana Plain were covered by the great Mana swamp, and large inland lakes allowed natives from the village of Mana to canoe as far south as Waimea (State of Hawaii, 1993). It is believed that these wet conditions encouraged the independent invention of aquaculture on Kauai and the construction of stone and earthen ponds for the growing of staples such as taro, yam, and sweet potatoes (Kikuchi, 1987). With European discovery by Captain James Cook in 1778, aquaculture transitioned to agriculture through the draining of the swamp and the cultivation of sugar cane and rice. The first successful sugar plantation to export from the islands was established at Koloa in 1835 (Hawaii Visitors Bureau, 1993), and by the 1930s, nearly all of the Mana swamp had been filled to produce this crop.

Mana is also an area specifically referred to in Hawaiian literature and oral tradition as a *leina-a-ka-'uhane*, a place (generally cliffs or seacoast promontories) where the spirits of men, after death, plunge into eternity and are divided into one of three spiritual realms:

the realm of the wandering spirits, the realm of the ancestral spirits, or the realm of the endless night (Han et al., 1986; Fornander, 1917). Typical of native Hawaiian mortuary practices, burial sites believed to be associated with the Mana *leina-a-ka-'uhane* have been identified throughout the cliffs and dunes (Bennett, 1931).

A review of existing archaeological and historical literature, records, and maps indicates that there are numerous recorded and unrecorded archaeological sites within the PMRF and surrounding area, some with subsurface components. Artifacts associated with the sites on the PMRF-Barking Sands include hearths, shell fishing lures, earth ovens, stone adze fragments, and human burials. Of the recorded sites, only one, the Nohili Dune, is eligible for inclusion in the National Register; the site is eligible as a traditional cultural property (Hawaii Department of Land and Natural Resources, State Historic Preservation Division, 1992a;b;c). However, because of the number and dispersed location of sites located within its boundary and the high probability that additional human burials may be present, the entire PMRF-Barking Sands could also be eligible (U.S. Army Strategic Defense Command, 1990b).

Historic Buildings and Structures

Military use of the area known as the PMRF began in 1940 when the U.S. Army acquired a preexisting grass airstrip. Named Mana Airport, the airfield was used extensively throughout World War II, changing names a number of times before being renamed Bonham AFB in 1954. In 1956, the U.S. Navy entered into a joint-use agreement for the use of Bonham AFB, 1,900 acres of which were transferred to permanent Navy status in 1964. Two years later, the Navy land was transferred (within the Navy) to the Commander, Pacific Missile Test Center and was renamed the PMRF.

The current mission of the PMRF is as a multi-environment test range providing realistic testing environments for antisubmarine, air, and surface weapon systems. The KTF portion of the PMRF was constructed in 1962. The KTF originally supported the high-altitude nuclear testing program; however, it now supports DOE research and development activities, including the launching of sounding rockets and rockets carrying experimental non-nuclear payloads.

Historic Buildings and Structures

All of the existing facilities within the boundary of the PMRF-Barking Sands were constructed between 1942 and 1995. None of these facilities are known to have been evaluated for eligibility for inclusion in the National Register; none are currently listed.

Traditional Resources

Traditional resources can include archaeological sites, burial sites, ceremonial areas, caves, mountains, water sources, trails, plant habitat or gathering areas, or any other natural area important to a culture for religious or cultural reasons. As such, by their nature, most of the cultural materials identified within the ROI could also be considered traditional resources. Regionally identified traditional cultural sites, most particularly cemeteries, indicate that in addition to the native Hawaiians, numerous cultures have peopled the

island of Kauai: Japanese, Korean, Portuguese, Chinese, and Filipino (Cleeland, **1975).** Within the boundary of the PMRF, all of the traditional cultural materials identified to date have been associated with native Hawaiians or Japanese. **A** Japanese cemetery is located in the central portion **of** the installation, and cemeteries associated with each of the other cultures are located near Kekaha, Hanapepe, and Waimea.

Paleontological Resources

Paleontological resources consist of the physical remains of extinct life forms or species that may have living relatives. They include fossilized remains of plants and animals, casts or molds of the same, or trace fossils such as impressions, burrows, and tracks. Geological studies indicate that the formation of Kauai was completed near the end of the Pliocene epoch (approximately 1.6 million years ago). The PMRF-Barking Sands is located on an extension of the Mana Plain which consists of flattened dunes that have little relief and is estimated to be at least 60 ft deep (U.S. Army Strategic Defense Command, 1992a). The State of Hawaii Coastal Management Program has designated the dunes and adjacent sandy beach areas in the northern portion of the PMRF-Barking Sands as moderately sensitive due to the potential for the presence of human burials and paleontological remains (The Traverse Group, Inc., 1988); however, no significant paleontological remains have been identified to date. There are no National Natural Landmarks.

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