FINDING OF NO SIGNIFICANT IMPACT

UNITED STATES ARMY STRATEGIC DEFENSE COMMAND

AGENCY: U.S. Army Strategic Defense Command (USASDC)

COOPERATING AGENCY: Strategic Defense Initiative Organization
U.S. Department of the Navy

ACTION: Conduct the Strategic Target System (STARS) Program

BACKGROUND: Pursuant to the Council on Environmental Quality regulations for implementing the procedural provisions of the National Environmental Policy Act (40 CFR 1500-1508), Army Regulation 200-2, Chief of Naval Operations Instruction 5090.1, and the Department of Defense (DOD) Directive 6050.1 on Environmental Effects in the United States of DOD actions, the USASDC has conducted an assessment of the potential environmental consequences of the STARS program activities for the Strategic Defense Initiative Organization. The Environmental Assessment considered all potential impacts of the proposed action alone and in conjunction with ongoing activities. The finding of no significant impact summarizes the results of the evaluations of STARS activities at the proposed installations. The discussion focuses on those locations where there was a potential for significant impacts and mitigation measures that would reduce the potential impact to a level of no significance. Alternatives to the STARS launch facility were examined early in the siting process but were eliminated as unreasonable. A no-action alternative was also considered. The Environmental Assessment resulted in a finding of no significant impact.

SUMMARY: The STARS program calls for design and development of the STARS booster and ground support handling and test equipment. A study of available booster assets, their condition, and quantities available was undertaken, resulting in a decision to utilize boosters from the retired Polaris A3 system to provide this ongoing launch capability. The A3 first-and second-stage boosters, together with a third-stage ORBUS 1 motor to provide maneuvering capability, will be used to deliver various experimental payloads through near space to U.S. Army Kwajalein Atoll. These payloads, will be sensors or targets that simulate re-entry vehicles. This program would involve launching the STARS booster from the Kauai Test Facility (KTF), located on the Pacific Missile Range Facility (PMRF), Kauai, Hawaii. The PMRF security force would clear, close and monitor traffic to portions of the beach area and roads to ensure public safety. The booster would deliver target vehicles to the U.S. Army Kwajalein Atoll, Republic of the Marshall Islands, where existing sensors can collect data on the payloads.

The STARS program would include a number of activities to be conducted at seven different sites. These activities are categorized as design, booster motor refurbishment and testing, fabrication/assembly/testing, construction, flight preparation, launch/flight/data collection, and data analysis. The locations and types of STARS activities are: Aerojet Solid Propulsion Division, Sacramento, California, booster motor refurbishment and testing; United Technologies Chemical System Division, San Jose, California, design, fabrication/assembly/testing; Pacific Missile Range Facility, Kauai, Hawaii, construction in previously disturbed area, flight preparation, launch/flight/data collection; Sandia National Laboratories, New Mexico, design, fabrication/assembly/testing, data analysis; U.S. Army Kwajalein Atoll, Republic of the Marshall Islands, flight preparation, launch/flight/data collection; Hill Air Force Base, Utah, fabrication/assembly/testing; and Hercules Incorporated, Magna, Utah, booster motor refurbishment and testing.

To determine the potential for significant environmental impacts as a result of the STARS program, the magnitude and frequency of the tests that would be conducted at the proposed locations were compared

to the current activities and existing conditions at those locations. To assess possible impacts, each activity was evaluated in the context of the following environmental components: air quality, biological resources, cultural resources, hazardous materials/waste, infrastructure, land use, noise, public health and safety, socioeconomics, and water quality.

FINDINGS: Environmental consequences were determined not to be significant for all activities at U.S. Army Kwajalein Atoll, Sandia National Laboratories, Hill Air Force Base, Aerojet Solid Propulsion Division, Hercules Incorporated, and United Technologies Chemical Systems Division.

Potential adverse effects to subsurface cultural resources as a result of construction of the liquid propellant holding area at the KTF on PMRF would be addressed by preconstruction archaeological survey and testing, and a monitoring program. Although no significant cultural resources were observed during previous surface surveys of the affected area, an archaeological testing program will be implemented prior to all ground-disturbing construction activities. Should any cultural resources be found during the testing phase, impacts will be mitigated by implementing an archaeological sampling and data recovery program and/or by avoidance. An archaeological monitoring program will also be implemented to address ground-disturbing activities during construction. Should cultural resources be discovered during this phase, impacts will be mitigated by carrying out a pre-established archaeological sampling and data recovery plan.

The Newell's shearwater, a Federally listed threatened bird species, may be attracted to STARS program floodlights during construction and operational activities. Mitigation will consist of using U.S. Fish and Wildlife Service-approved lighting that would minimize upward glare. Potentially significant impacts on the Category 1 candidate endangered plant *Ophioglossum concinnum* will be avoided by monitoring the construction site, avoiding proximity to any observed concentrations of these plants, and transplanting individuals from the construction site to any appropriate habitat within PMRF.

Liquid propellant hydrazines and N_2O_4 (less than 57 liters [15 gallons] of each) would be used on some STARS payloads. These propellants are highly toxic and injurious to humans, plants, and animal life and may cause respiratory distress in humans if a spill or leak occurs. Measures to reduce impacts on humans and biological resources include (1) building holding and fueling areas with catchment basins to contain spills, (2) minimizing the quantities of propellants and oxidizers stored at KTF, (3) safety procedures such as those defined in AR 200-1, NASA, and Air Force Regulations will be followed, which include quickly stopping any leaks that may develop and cleaning up any spills that may occur to minimize exposure to humans, vegetation, and wildlife, and (4) use of personnel protective equipment and engineering controls. During re-entry the liquid propellant tanks would break up, dispersing the remaining propellant in the atmosphere. This release is minor and would not affect the global natural resources.

Because the high temperatures associated with a STARS launch could ignite adjacent vegetation, a portable blast deflector shield will be used in the vicinity of the launch pad to protect vegetation. The potential for starting a fire would be further reduced by clearing all dead brush from around the launch pad. Additional measures to avoid impacts to vegetation, wildlife, and cultural resources are: (1) Spraying the vegetation adjacent to the launch pad with water just before launch to reduce the risk of ignition, (2) Having emergency fire crews available during all STARS launches to quickly extinguish fires, (3) Using an open (spray) fire nozzle, rather than a directed stream, when possible in extinguishing fires to avoid erosional damage to sand dunes and prevent possible destruction of cultural resources in the dune area.

Implementation of proposed mitigations will result in reduction of these impacts to a not significant level.

DEADLINE FOR RECEIPT OF PUBLIC COMMENTS: SEP 14 1990

POINT OF CONTACT: A copy of the Strategic Target Systems Environmental Assessment July 1990 is available from:

U.S. Army Strategic Defense Command
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STRATEGIC TARGET SYSTEM (STARS)

JULY 1990

ENVIRONMENTAL ASSESSMENT

REPORT DOCUMENTATION PAGE

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This Environmental Assessment documents the results of an analysis of the potential for and magnitude of impacts from pre-launch and launch activities of the Strategic Target System (STARS)

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Lead Agency:	United States Army Strategic Defense Command
Cooperating Agency:	Strategic Defense Initiative Organization
Title of Proposed Action:	Conduct the Strategic Target System
Affected Jurisdictions:	Pacific Missile Range Facility, Kauai, HI; U.S. Army Kwajalein Atoll, Republic of the Marshall Islands; Hill Air Force Base, UT; Sandia National Laboratories, NM; and the prime contracting facilities, Aerojet Solid Propulsion Division, Sacramento, CA; Hercules Incorporated, Magna, UT; United Technologies Chemical Systems Division, San Jose, CA.
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wp/V1198/SIG

EXECUTIVE SUMMARY

The Strategic Defense Initiative (SDI) program, announced by former President Reagan on March 23, 1983, is an extensive research program designed to determine the feasibility of developing an effective ballistic missile defense system. As part of its research and development efforts for the SDI, the U.S. Army Strategic Defense Command (USASDC) is developing the Strategic Target System (STARS) to provide the capability to launch test objects and instrumented platforms to support the test and evaluation of experimental and candidate operational systems. STARS would use a three-stage, solid propellant booster to launch non-nuclear payloads for research that would provide critical information for SDI decisions.

The program calls for design and development of the STARS booster and ground support handling and test equipment. A study of available booster assets, their condition, and quantities available was undertaken, resulting in a proposal to utilize boosters from the retired Polaris A3 system to provide this ongoing launch capability. The A3 first- and second-stage boosters, together with a third-stage ORBUS 1 motor to provide maneuvering capability, would be used to deliver various experimental payloads through near space on a suborbital trajectory. These payloads would be sensors or targets that would simulate re-entry vehicles. Booster systems are needed that can deliver target complexes to U.S. Army Kwajalein Atoll (USAKA), Republic of the Marshall Islands, where existing sensors can collect data on the payloads. The STARS program activities would consist of design, booster motor refurbishment and testing, fabrication/assembly/testing, flight preparation, launch/flight/data collection, and data analysis. These activities would be conducted at seven different locations.

Two demonstration flights are planned as part of the development program. The first would be a design demonstration flight to be targeted to the broad ocean area well north of USAKA; the second would fly payloads for multiple experiments to a target point near the USAKA range complex. Up to four STARS launches per year are anticipated over a 10-year period, beginning in spring 1991. All payloads will be non-nuclear.

The purpose of this Environmental Assessment (EA) is to assess the environmental consequences of the STARS development program and system operations in compliance with the National Environmental Policy Act, the Council on Environmental Quality regulations implementing the Act, Department of Defense (DOD) Directive 6050.1, Army Regulation 200-2, and Chief of Naval Operations Instruction 5090.1. This EA will address STARS booster and initial payload operations. The STARS program would involve various payloads. Activities related to these programs would be reviewed against this document, and any deviation from this environmental assessment would be addressed by separate environmental documentation.

To assess the significance of any impact, the list of proposed STARS program activities was first translated into facilities and personnel requirements, which were then compared with descriptions of the affected environment at the program activity locations. Assessment criteria were then applied to the activities to determine whether or not there was any potential for significant

environmental consequences. If a proposed activity was determined to present some potential for impact, no matter how slight, the activity was evaluated to assess the potential for significant impacts, considering the intensity, extent, and context in which the impact occurs. Potentially significant impacts were evaluated to develop mitigation opportunities that would reduce the potentially significant impact determination. If adequate mitigation measures were identified, they were explicitly incorporated into the proposed action.

Based on the application of this methodological approach, the following determinations of environmental consequences for STARS development program activities were made:

- Aerojet Solid Propulsion Division, Sacramento, California - environmental consequences not significant
- Hercules Incorporated, Magna, Utah - environmental consequences not significant
- United Technologies Chemical Systems Division, San Jose, California - environmental consequences not significant
- Hill Air Force Base, Utah - environmental consequences not significant
- Pacific Missile Range Facility, Kauai, Hawaii - environmental consequences potentially significant but mitigable
- Sandia National Laboratories, New Mexico - environmental consequences not significant
- U.S. Army Kwajalein Atoll, Republic of the Marshall Islands - environmental consequences not significant.

STARS development program activities at the Pacific Missile Range Facility (PMRF) could have potentially significant but mitigable environmental consequences for cultural and biological resources. Potential effects to subsurface cultural resources as a result of construction of a liquid propellant holding area at the Kauai Test Facility (KTF) on PMRF would be addressed by preconstruction archaeological survey and testing and a monitoring program. Although no significant cultural resources were observed during previous surface surveys of the affected area, an archaeological testing program would be implemented prior to all ground-disturbing construction activities. Should any cultural resources be found during the testing phase, impacts would be mitigated by implementing an archaeological sampling and data recovery program and/or by avoidance. An archaeological monitoring program would also be implemented to address ground-disturbing activities during construction. Should cultural resources be discovered during this phase, impacts would be mitigated by carrying out a pre-established archaeological sampling and data recovery plan.

Potentially significant but mitigable biological resource consequences from construction activities would also occur at PMRF. The Newell's shearwater, a Federally listed threatened bird species, may be attracted to STARS project floodlights during construction and operational activities. Mitigation would consist of using U.S. Fish and Wildlife Service-approved lighting that would minimize upward glare. Potentially significant impacts on the Category 1 candidate endangered plant *Ophioglossumconcinnum* would be avoided by monitoring the construction site, avoiding proximity to any observed

concentrations of these plants, and transplanting individuals from the construction site to any appropriate habitat within PMRF.

Liquid propellant hydrazines and nitrogen textroxide (an oxidizer) would be used on some STARS payloads in quantities of less than 57 liters (15 gallons) each. These materials are highly toxic and injurious to humans, plants, and animal life and may cause respiratory distress and dermal hazards in humans if a spill or leak occurs. Measures to reduce impacts on humans and biological resources include (1) building holding and fueling areas with catchment basins to contain spills, (2) minimizing the quantities of propellants and oxidizers stored at KTF, and (3) following safety procedures such as those defined in AR 200-1 and NASA and Air Force regulations. These procedures include quickly stopping any leaks that may develop and cleaning up any spills that may occur to minimize exposure of humans, vegetation, and wildlife.

Because the high temperatures associated with a STARS launch could ignite adjacent vegetation, a portable blast deflector shield would be used in the vicinity of the launch pad to protect vegetation. The potential for starting a fire would be further reduced by clearing all dead brush from around the launch pad. Additional measures to avoid impacts to vegetation, wildlife, and cultural resources are:

- Spraying the vegetation adjacent to the launch pad with water just before launch to reduce the risk of ignition
- Having emergency fire crews available during all STARS launches to quickly extinguish fires
- Using an open (spray) fire nozzle, when possible, rather than a directed stream, in extinguishing fires, to avoid erosional damage to sand dunes and prevent possible destruction of potential cultural resources in the dune area.

Implementation of proposed mitigations would result in reduction of these impacts to a not significant level.

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1.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

The National Environmental Policy Act (NEPA), the Council on Environmental Quality regulations implementing the NEPA (40 CFR 1500-1508), Department of Defense (DOD) Directive 6050.1, Army Regulation 200-2, and Chief of Naval Operations Instruction 5090.1, which implement these regulations, direct that DOD officials take into account environmental consequences when authorizing or approving major Federal actions. Accordingly, this Environmental Assessment (EA) has been prepared to analyze the environmental consequences of the proposed Strategic Target System (STARS) program.

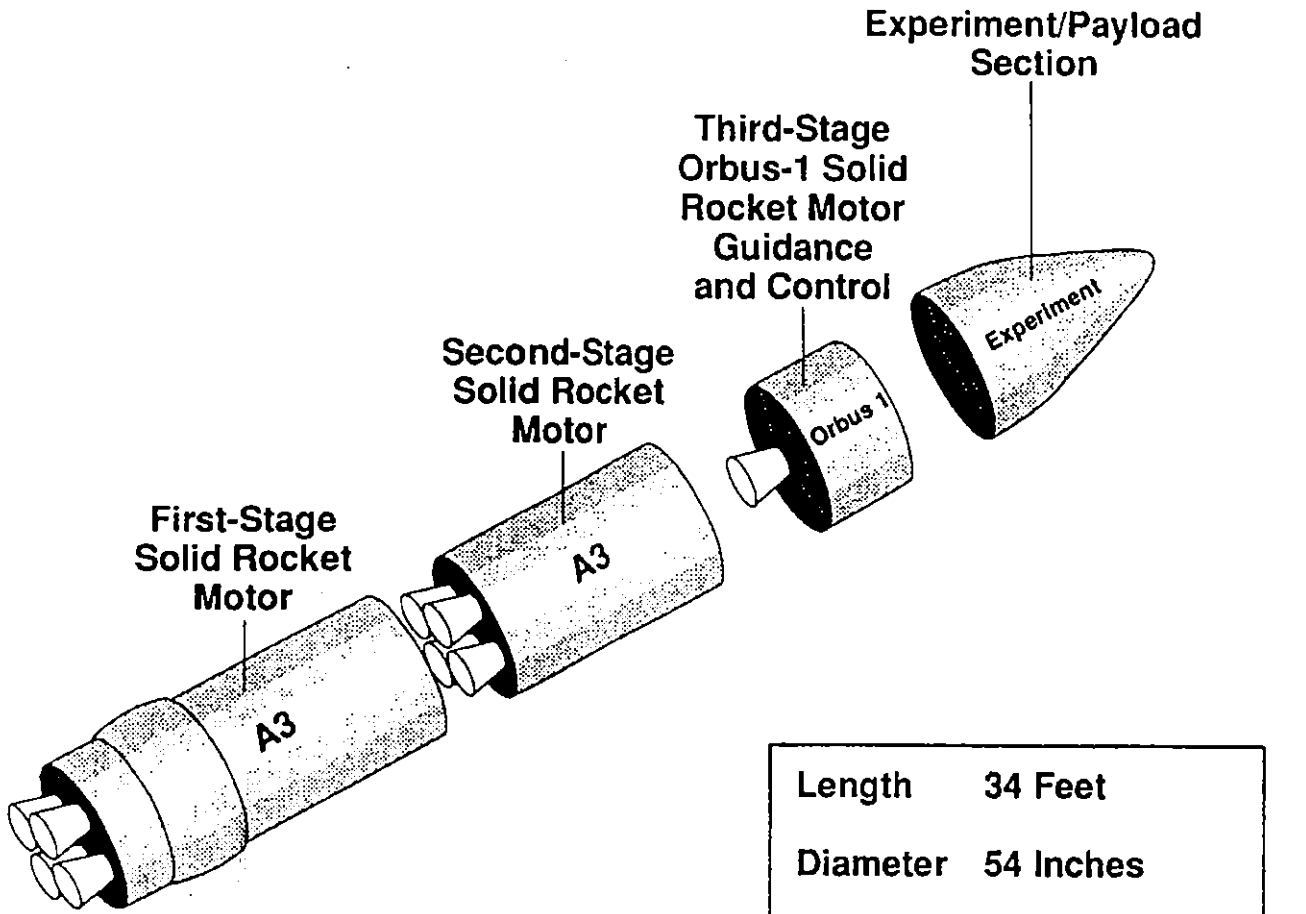
The STARS program is being developed to launch non-nuclear test objects and instrumented platforms to support the test and evaluation of experimental and candidate operational systems for the Strategic Defense Initiative (SDI). STARS would use a three-stage, solid propellant booster (Figure 1-1) to launch non-nuclear payloads for research that would provide critical information for SDI decisions.

This section describes the background, purpose and need for the action, the proposed action, and alternatives, including the no-action alternative. Section 2.0 describes the affected environment at installations where STARS activities would be conducted. Section 3.0 assesses the potential environmental consequences of the proposed STARS activities on the environmental components studied, as well as the measures that would be taken to mitigate any potential impacts.

1.1 BACKGROUND

The SDI program, announced by former President Reagan on March 23, 1983, is an extensive research program designed to determine the feasibility of developing an effective ballistic missile defense system. In order to effectively demonstrate and validate the extremely expensive and highly technical research and development efforts and programs and their associated systems, all major SDI participating agencies, including the joint services, require the capability to deliver various experimental payloads through near space on a suborbital trajectory. These payloads and their associated experiments, usually in the form of sensors or targets that simulate re-entry vehicles, will provide information that is vital in the research, development, and selection of a strategically planned SDI. Booster systems are needed that can lift the payloads into space and deliver targets to U.S. Army Kwajalein Atoll (USAKA) in the Republic of the Marshall Islands, where ground-based sensors and sensors on aircraft can collect data on the payloads and their experiments.

It became apparent to SDI planners in 1984 that the number of SDI experiments planned over the next decade would rapidly deplete the quantities of boosters currently available that could meet experimental parameters. SDI planners estimated that the quantities of the "workhorse" booster system, the MINUTEMAN I, available through the U.S. Air Force's Reentry Systems Launch Program, would be quickly depleted. Various contractor- or government-suggested booster combinations were considered, but the majority had the disadvantage of using stages of the already scarce MINUTEMAN I boosters.



Length	34 Feet
Diameter	54 Inches
Weight	36,000 Pounds

Typical Strategic Target System (STARS)

Figure 1-1

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The U.S. Army Strategic Defense Command (USASDC) was directed by the Strategic Defense Initiative Organization (SDIO) to evaluate various possibilities for a booster, either contracting for development of a new booster or using existing assets. A study of available booster assets, their condition, and quantities available was undertaken, resulting in a proposal to utilize boosters from the retired Polaris A3 booster systems to provide this ongoing launch capability.

The A3 booster system was selected for use as the STARS booster for several reasons:

- Sizable quantities of first- and second-stage boosters were available from the Navy and were transferred to USASDC for the STARS program.
- A large technical data base was available from the U.S. Navy Special Projects Office through their A3 booster contractors.
- Auxillary equipment is available for testing and assembling the missiles.
- Baseline performance of the A3 boosters and the addition of a guided third stage satisfy technical requirements and allow moderate flexibility in payload weights and re-entry conditions.

These factors represent a significant cost savings because a new booster system does not need to be developed.

The Kauai Test Facility (KTF), located on the Pacific Missile Range Facility (PMRF), Kauai, Hawaii, was selected as a launch site because it had some available instrumentation and launch facilities. Launches from KTF to USAKA could provide the standard experimental flight profile most desired by SDI experimentors. This flight profile is similar to that provided by the diminishing MINUTEMAN I assets.

1.2 PURPOSE AND NEED FOR THE ACTION

The purpose of the STARS program is to provide the capability of carrying various experimental vehicles and equipment (payloads) through space on a suborbital ballistic trajectory to test developmental elements of the SDI system and other support functions. The USASDC, in supporting the SDI research and development effort, requires sufficient quantities of boosters with the necessary thrust and maneuvering capability to deliver non-nuclear, experimental payload vehicles to USAKA to simulate intercontinental ballistic missile (ICBM) re-entry conditions. These experiments are required to evaluate research data on candidate operational systems to determine the feasibility of developing an effective ballistic missile defense.

By firing two stages upward and the third stage downward during the descent, the payload simulates ICBM re-entry conditions in the vicinity of USAKA, 3,763 kilometers (2,338 miles) from existing facilities at KTF. Most launches are planned to carry target delivery systems; however, some missions may be highly lofted probes carrying measurement platforms to near-space to observe other exoatmospheric bodies or measure natural background conditions.

1.3 PROPOSED ACTION

The STARS program activities would consist of design, booster motor refurbishment and testing, fabrication/assembly/testing, construction, flight preparation, launch/flight/data collection, and data analysis. Table 1-1 delineates the various activities and locations associated with each activity; the test locations are shown in Figure 1-2.

STARS would be launched from the KTF on the PMRF. KTF is managed by Sandia National Laboratories (SNL) for the Department of Energy (DOE). Experimental payloads in single or multiple configurations would be flown to the broad ocean area (BOA) or targeted to splash down at re-entry points near USAKA (Figure 1-3).

Two demonstration flights are planned as part of the development program. The first would be targeted to the BOA well north of USAKA; the second would fly SDIO non-nuclear research payloads for multiple experiments to a target point near the USAKA range complex. The first two launches are planned during spring and summer of 1991.

Up to four STARS launches per year are anticipated over a 10-year period. These launches would include flights with lofted trajectories and flights to be targeted to the BOA near USAKA or well north of USAKA.

The STARS booster and development payloads are the primary components of the STARS program. The remainder of the system consists of various ground support equipment. The technical activities, significant hardware developed to support this program, and the environmental attributes of the applicable sites are discussed in detail in the following sections.

All STARS program activities (including those discussed below) would be in compliance with applicable health and safety requirements outlined in the appropriate health and safety plans. If not already in existence, a health and safety plan(s) would be prepared to provide guidance in meeting health and safety requirements, such as Occupational Safety and Health Administration (OSHA), DOD, DOE, and transportation regulations.

1.3.1 Design

Design consists of the conceptualization of main features of the STARS program prior to fabrication, assembly, and testing. STARS booster integration design activities are scheduled at Sandia National Laboratories, Albuquerque, New Mexico, and at United Technologies Chemical Systems Division, San Jose, California (the third-stage ORBUS-1 motor). STARS design would be undertaken by a staff that routinely performs these activities, and no additional personnel would be required. There would be no new construction or modification of existing facilities, and these activities are part of each installation's routine operations.

1.3.2 Booster Motor Refurbishment and Testing

The first- and second-stage boosters to be used for the STARS program are over 20 years old, and have exhibited characteristics typical of aging solid propellant motors. Therefore, the first- and second-stage motors must be

TABLE 1-1. STARS ACTIVITIES AND LOCATIONS

Activities	Aerojet Solid Propulsion Division, Sacramento, CA	Hercules Inc., Magna, UT	United Technologies Chemical Systems Division, San Jose, CA	Installation To Be Determined	Hill AFB, UT	Pacific Missile Range Facility Support Facilities, Kauai Test Facility, Kauai, HI	Sandia National Laboratories, Albuquerque, NM	U.S. Army Kwajalein Atoll, Republic of the Marshall Islands
Design			X				X	
Booster Motor Refurbishment and Testing								
1st Stage	X							
2nd Stage		X						
Testing (Static Firing)				X				
Fabrication/Assembly/ Testing								
1st and 2nd Stages					X			
3rd Stage			X				X	
Construction						X		
Flight Preparation						X		X
Launch/Flight/ Data Collection						X		X
Acquire and Track Booster and Targets						X		X
Data Analysis						X	X	X

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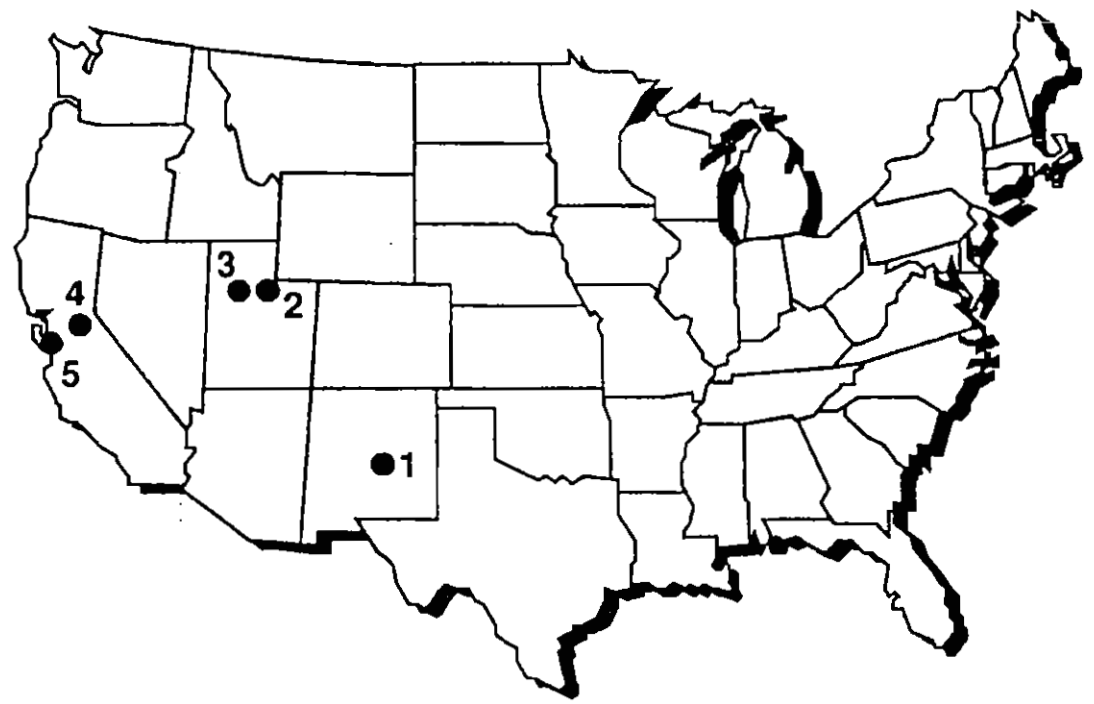
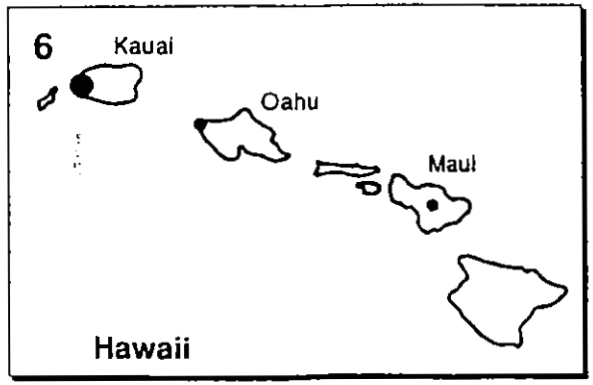
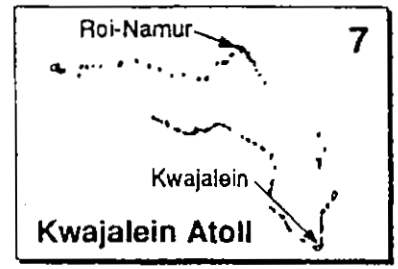






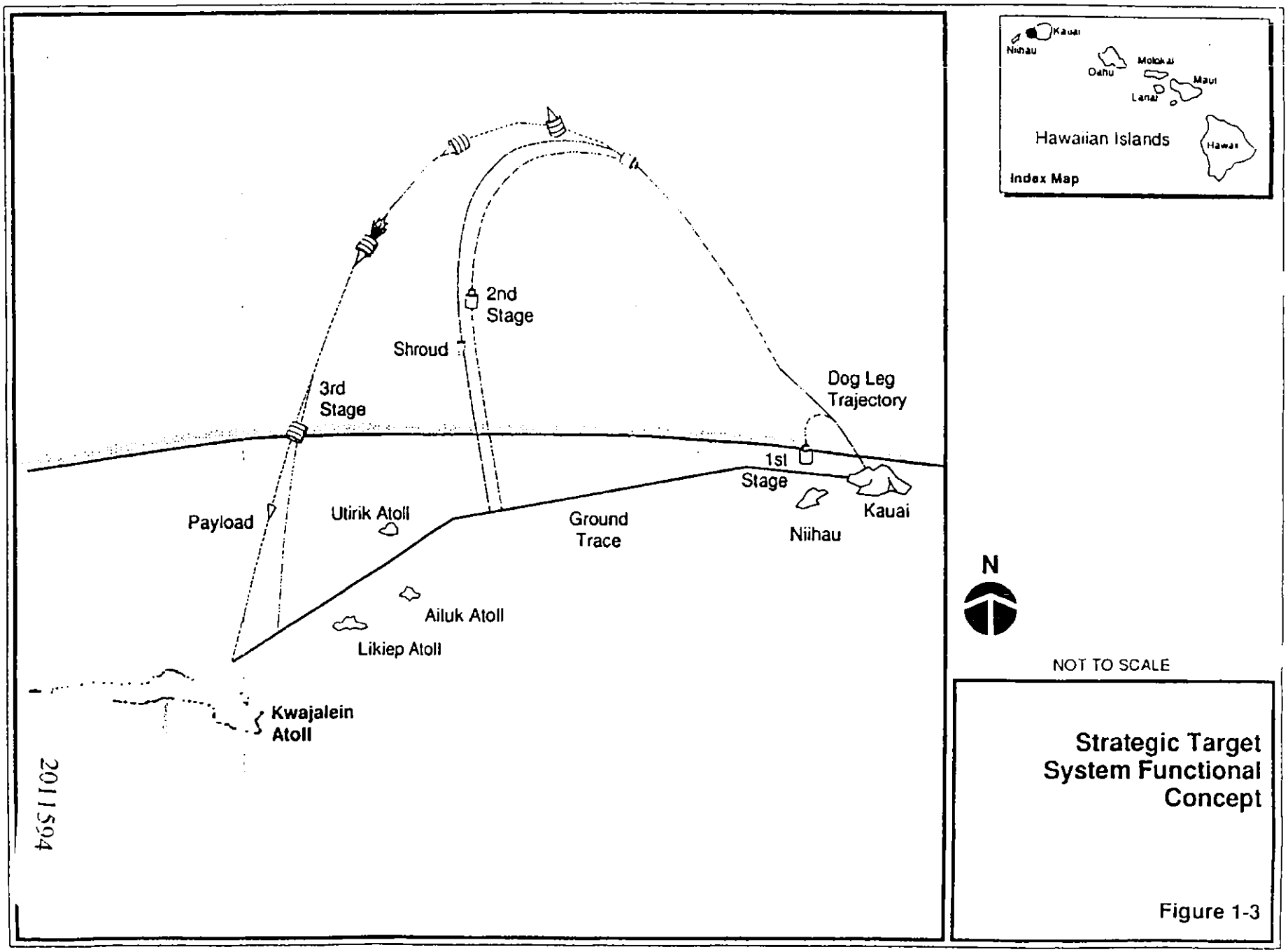
EXPLANATION:

1. SANDIA NATIONAL LABORATORIES
2. HILL AIR FORCE BASE
3. HERCULES INCORPORATED
4. AEROJET SOLID PROPULSION DIVISION
5. UNITED TECHNOLOGIES CHEMICAL SYSTEMS DIVISION
6. PACIFIC MISSILE RANGE FACILITY AND SUPPORT SITES
7. U.S. ARMY KWAJALEIN ATOLL

Not to Scale

STARS Test Locations

Figure 1-2



Strategic Target System Functional Concept

Figure 1-3

refurbished at the original motor manufacturer facilities prior to final assembly and testing at Hill Air Force Base (AFB). The first-stage motor would be refurbished at the Aerojet Solid Propulsion Division in Sacramento, California, and the second-stage motor will be refurbished at Hercules Inc. in Magna, Utah. If required, routine static firing safety tests of the first- and second-stage motors would take place as needed at a to-be-determined installation.

Aerojet Solid Propulsion Division, Sacramento, California

The first-stage booster motor refurbishment would be conducted at the Aerojet Solid Propulsion Division in existing facilities routinely used for these types of activities. The buildings used and the refurbishment activities to be performed on the first-stage booster are as follows:

> Buildings 01027, 04023, 04043, 04065, and 05005: Verifying that all O-rings are present and replacing applicable O-rings, inspecting for case bond separation, conducting flight worthiness test, installing the igniter and associated hardware, installing an insulator with a fiberglass wrap to avoid first-stage burn-through, X-raying the booster motor for cracks and voids in the solid fuel, and inspecting refurbished nozzles.

These activities involve the use of 1,1,1-trichloroethane (TCE), isopropyl alcohol, zinc chromate putty, methyl ethyl ketone, laquer-nitrocellulose, toluene, and xylene. These materials are stored and disposed of in authorized storage areas according to the Aerojet Safety Procedures Manual and Resource Conservation and Recovery Act (RCRA) permit requirements. Appropriate explosive safety quantity-distances (ESQDs) have been established around the missile maintenance area, based on the quantity of fuel in the missile. Approximately 15 existing personnel would be involved in the refurbishment process.

Hercules Incorporated, Magna, Utah

The second-stage booster motor refurbishment would be conducted at Hercules Inc. in existing facilities routinely used for these types of activities. The buildings used and the refurbishment activities to be performed on the second-stage booster are as follows:

> Buildings 35A, 49A, 2115, and 2224: Verifying and replacing applicable O-rings; inspecting for case bond separation; checking the insulator-to-boot gap; removing existing potting material and replacing it around the solid fuel propellant; conducting flight worthiness test; installing the nozzles, igniter, and associated hardware; and X-raying the booster motor for cracks and voids in the solid fuel.

These activities involve the use of 1,1,1-TCE, zinc chromate putty, and silicone-polybutene sealing compound (potting material). Appropriate ESQDs have been established for maintenance areas. Approximately 30 existing personnel would be involved in the refurbishment process.

Static Firing Test

A CONUS installation to be selected at a later date would conduct routine static firing tests of the first and second stages of the STARS booster as needed.

This static firing would test booster aging and refurbishment characteristics as a safety check. Some specific activities would be:

- Mounting the first stage horizontally in a bay, and the second stage vertically in another bay
- X-raying the boosters prior to firing to check for cracks and voids in the solid propellant
- Firing each stage for 60 to 85 seconds.

The booster would be supplied through Hill AFB, and transportation procedures would be in accordance with Bureau of Explosives (BOE) Tariff Number BOE-6000-1. Appropriate safety measures would be used during handling and storage of the boosters as required by the DOD and described in DOD 4145.26 M, DOD Contractor's Safety Manual for Ammunition and Explosives (March 1986). These activities would take place in existing facilities routinely used for these types of activities, and would use existing personnel.

1.3.3 Fabrication/Assembly/Testing

United Technologies Chemical Systems Division, San Jose, California

The fabrication/assembly/testing of the ORBUS-1 third-stage motors would be conducted at United Technologies Chemical Systems Division in San Jose, California. Activities to be conducted at this installation include fabricating major components of the rocket motor and guidance system, assembling the motor, installing the solid propellants, and testing the major electrical components. Appropriate ESQDs have been established based on the quantity of fuel in the booster. These procedures would involve the use of the cleaning solvents 1,1,1-TCE, alcohol, and paint primer. These are routine activities at this installation, and all materials are handled in accordance with established safety procedures. All STARS activities would be conducted in existing facilities routinely used for these types of activities, and would utilize approximately 40 existing personnel.

Hill AFB, Utah

After initial refurbishment activities at Aerojet Solid Propulsion Division and Hercules Inc., final assembly and testing of the STARS first- and second-stage booster motors will be conducted at Ogden Air Logistics Center (ALC) at Hill AFB. The boosters would be transported to Hill AFB from the original contractor facilities in existing tractor trucks, and in accordance with BOE-6000-1. Activities at Hill AFB would take place in existing facilities routinely used for these types of activities. The buildings used and the activities to be performed on the booster stages are as follows:

> Building 2409 and 2114: Testing for leaks using nitrogen gas (with a helium tracer) at pressures of 414 to 483 kilopascals (60 to 70 pounds per square inch) to verify compliance with a maximum leak criterion of 30-milliliters (1 fluid ounce) per year; checking the electrical system; conducting a general booster inspection; installing two flight termination systems without detonators; installing conduit cables, thrust termination cables, and recertified thrust vector control components; functional checkout of first- and second-stage thrust vector control systems; and

conducting the second-stage thrust manifold test using nitrogen at a pressure of 1,656 kilopascals (240 pounds per square inch).

Assembly and maintenance involves the use of the cleaning solvents 1,1,1-TCE and isopropyl alcohol in quantities of less than 30 milliliters (1 fluid ounce) each, and approximately 15 milliliters (0.5 fluid ounce) of triacetate. These materials are disposed of in accordance with established procedures. Appropriate ESQDs have been established around the missile maintenance area, based on the quantity of fuel in the missile. Approximately 15 existing personnel would be involved in the assembly and testing process.

Sandia National Laboratories, New Mexico

Initial third-stage structure assembly, electronic component assembly, and testing would be completed at this facility. Activities would take place in existing facilities routinely used for these types of activities, and no additional personnel would be required. The buildings used and the activities to be performed on the third-stage skin and booster components are as follows:

Building 892: Installation and assembly of electronic components; attitude control checkout using nitrogen gas; mass properties test, which involves spin balancing the third-stage skin; complete system checkout; and packing the components prior to shipment.

Building 9965: Pyro-shock testing to check flight worthiness of third-stage components.

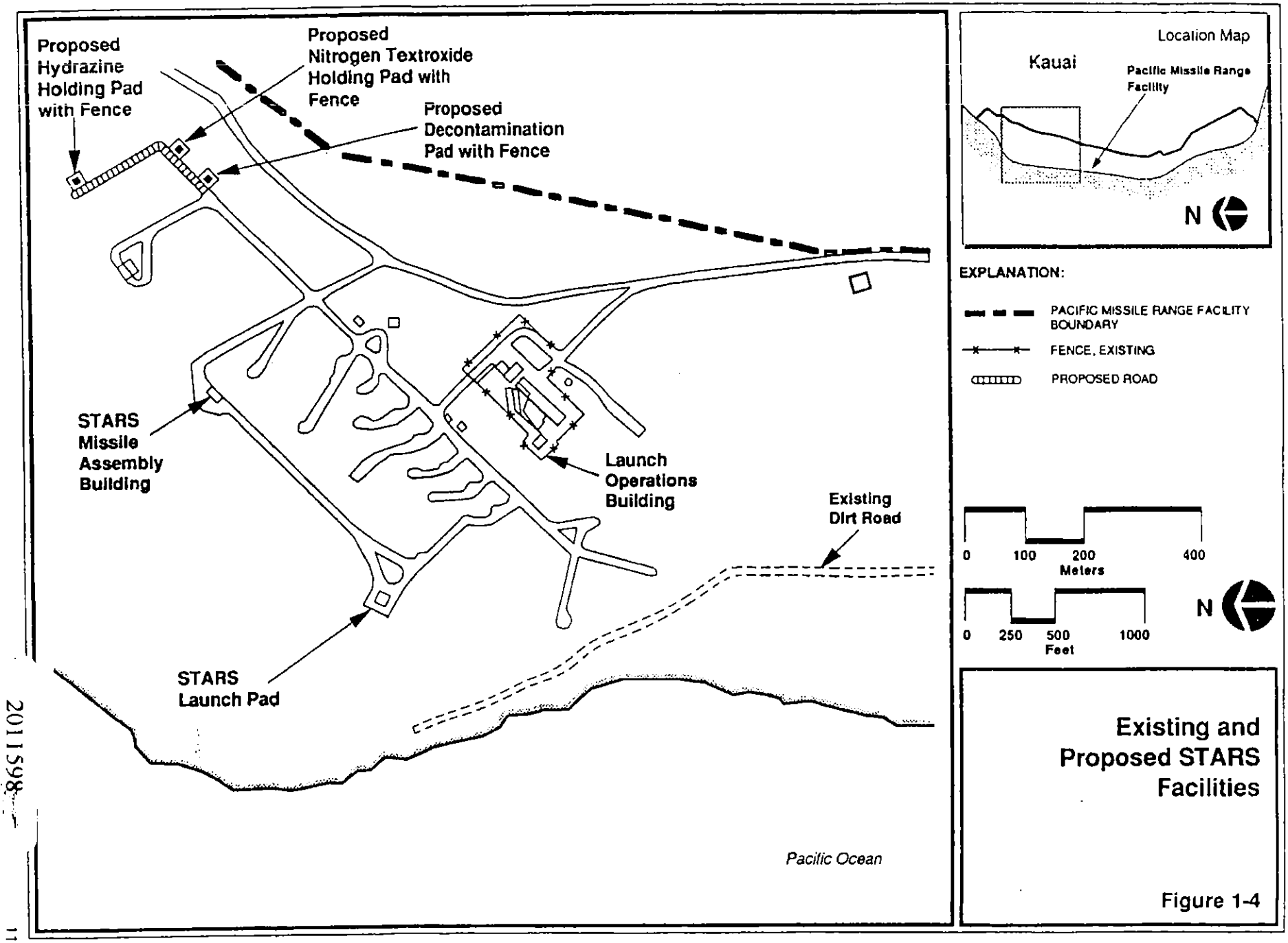
Building 6650: Environmental and vibration testing.

This type of testing and assembly is part of SNL's routine operations and appropriate safety procedures have been established. The STARS boosters would be transported to SNL from Hill AFB on C-141 aircraft using existing military facilities. At SNL the C-141s would be loaded with the payload, ground support equipment, and the third-stage booster for shipment to PMRF. All transportation would be in accordance with BOE-6000-1.

1.3.4 Construction

Pacific Missile Range Facility, Kauai, Hawaii

A new payload liquid propellant holding area for nitrogen tetroxide (N_2O_4) and hydrazines, which are used in some of the payloads, and an interim hazardous waste staging area would be constructed at the KTF to support various flight programs (Figure 1-4). The facility would be constructed in a previously disturbed area and would consist of three separate shelters. The preliminary design specifies two shelters (one for hydrazines and one for N_2O_4) to be approximately 2.4 by 3 meters (8 by 10 feet) and one shelter (decontamination pad and temporary hazardous waste staging) to be approximately 3 by 6 meters (10 by 20 feet). The three concrete holding pads would be open structures with shade covers to protect the materials from direct solar radiation. The pads would also be designed with catchment basins to contain any inadvertent spills to the pad area. A paved road would extend to each site and each pad would be protected by security fencing. Construction activities would utilize existing KTF personnel.



Existing and Proposed STARS Facilities

Figure 1-4

The construction of the concrete pads may affect the Category 1 candidate endangered plant species *Ophioglossum concinnum* (adder's tongue). In addition, use of floodlights in construction areas and during operational activities may affect a Federally listed threatened bird species, the Newell's shearwater (*Puffinus newelli*). As part of the proposed action, the following measures would be implemented to protect sensitive biological resources:

- Monitor the proposed construction sites following significant rainfall and prior to construction for the presence of *O. concinnum*
- Site the liquid propellant holding area to avoid any *O. concinnum* observed and/or
- Transplant individuals of *O. concinnum* from the construction site to any appropriate habitat (that currently supports the species) within PMRF
- Install and use U.S. Fish and Wildlife Service (USFWS)-approved outdoor lighting to reduce upward light glare and protect the Newell's shearwater.

In compliance with the Section 106 review procedures as established in 36 CFR 800, "Protection of Historic Properties" by the National Historic Preservation Act of 1966, both USASDC and DOE/SNL have formally consulted with the Hawaii State Historic Preservation Office (SHPO) to establish and implement mitigation programs that would reduce any adverse impacts that may occur to potential cultural resources within the STARS project areas (Advanced Sciences Inc., 1990a; U.S. Army Strategic Defense Command, 1989, 1990; U.S. Department of Energy/Sandia National Laboratories, 1990a, 1990b). These programs have included surface inspections within the STARS project areas. Preconstruction survey, testing and monitoring would also be conducted for any area where construction-related ground-disturbing activities will occur. Should any cultural resource materials or human remains be discovered as a result of project activities, a full or sample data recovery/research and documentation program (controlled excavation) would be implemented to mitigate any adverse effects.

Informal discussions with the Hawaii SHPO archaeologist for Kauai have indicated that a limited subsurface testing program should be conducted in the areas of the proposed propellant holding pads prior to beginning construction (McMahon, 1990b). Any human remains that might be discovered or inadvertently disturbed during project activities would be treated in accordance with PMRF's draft burial treatment plan (Pacific Missile Range Facility, undated). This would include notifying the PMRF Environmental Engineer, the Navy's archaeologist, the Office of Hawaiian Affairs (OHA), Kaual Burial Council, and the SHPO of the discovery of human remains. A ceremony may also be conducted by a Hawaiian priest *(Kahuna pule)*.

The decision as to final disposition of any human remains that may be encountered would be made in consultation with the above-mentioned agencies and individuals. Options for disposition of remains include:

- Avoidance of the burial site
- Repatriation of the remains to another area
- Curation of these remains.

Any analysis of human remains is to be performed with nondestructive methods.

Any activities related to cultural resources identification and evaluation would be conducted in compliance with the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation (Federal Register, 1983) and with the guidelines of the State of Hawaii (1989a).

Existing STARS launch and preflight facilities were constructed in accordance with the Preliminary Environmental Assessment Intermediate Range Booster System (IRBS) Facilities (Nevada Operations Office, 1986).

1.3.5 Flight Preparation

Payload-booster integration and mission planning would be provided by SNL/KTF to support up to four operational STARS launches per year. Component procurement and structure modification would be scheduled to support the proposed launch rate.

Flight preparation would involve all activities required to assemble the major STARS components prior to flight. STARS flight preparation would involve transporting the STARS booster, payload liquid propellants, and support equipment to KTF; assembling and testing them there, and establishing system radar and communication links between USAKA and PMRF.

Pacific Missile Range Facility, Kauai, Hawaii

After the booster is delivered from Hill AFB to SNL, initial flight preparation would consist of transporting the STARS boosters, payload, and ground support equipment from SNL to PMRF. The STARS components would be transported on C-141 aircraft using existing military facilities, equipment, and personnel. These facilities are routinely used for these types of operations, and transportation would be in accordance with BOE-6000-1.

Booster Flight Preparation - After the three separate booster stages have been delivered to PMRF and unloaded in the designated explosive loading (red label) area, they would be transported along existing safety routes within PMRF to the Missile Assembly Building in KTF. The in-flight destruct package, missile instrumentation, booster assembly, and range safety equipment system would be installed at that facility. Ground and flight system tests would be conducted at KTF beginning in late 1990; all elements of the flight vehicle would be electrically connected while on the missile transporter/erector trailer. To the maximum extent practical, the final system test would simulate the mission flight profile.

The transporter/erector trailer with the assembled flight vehicle would be towed to the launch pad where the erector would elevate the missile for placement on the launch stool by a mobile erector. Flight vehicle/range checkout would be followed by launch countdown dry runs in preparation for launch. The booster would remain on the launch pad for an average of 14 days while booster/payload integration and system checkout are performed. All pre-flight hazardous operations would be conducted in accordance with the appropriate SNL/KTF safety regulations.

The ESQD for explosive hazards (Figure 1-5) from the STARS boosters with the destruct charge is an area with a radius of 381 meters (1,250 feet) centered on the site of the hazardous operation, the launch pad and the Missile Assembly Building where explosives handling and storage would take place. The hazard zones are established in accordance with DOD Standard 6055.9 (DOD Ammunitions and Explosive Safety Standards) and with the U.S. Navy Ammunitions and Explosives Ashore Manual (NAVSEA OP-5). The launch pad is about 262 meters (800 feet) from the high tide line. Approximately 688 meters (2,256 feet) of public access area along the coastline of PMRF are within this ESQD. To ensure public safety, public access to this area would be restricted for the length of time the booster is on the launch pad; 24-hour security would be provided during this time to ensure that the safety distance criterion is met. This area would be closed for an average of 14 days per launch, or an average of 56 days per year.

Explosive devices contained in the flight vehicle are identified by category below, along with the appropriate ordnance class and explosive weight (U.S. Department of the Army, 1989):

- Launch Vehicle

  Booster with Firing Ordnance

  Distance Hazard Classification - 1.1

  Ordnance Weight - 9,132 kilograms (20,132 pounds); ESQD from inhabited building - 381 meters (1,250 feet)

  Storage Compatibility Group - C

- Flight Termination System

  Safe and arm, linear shaped charge

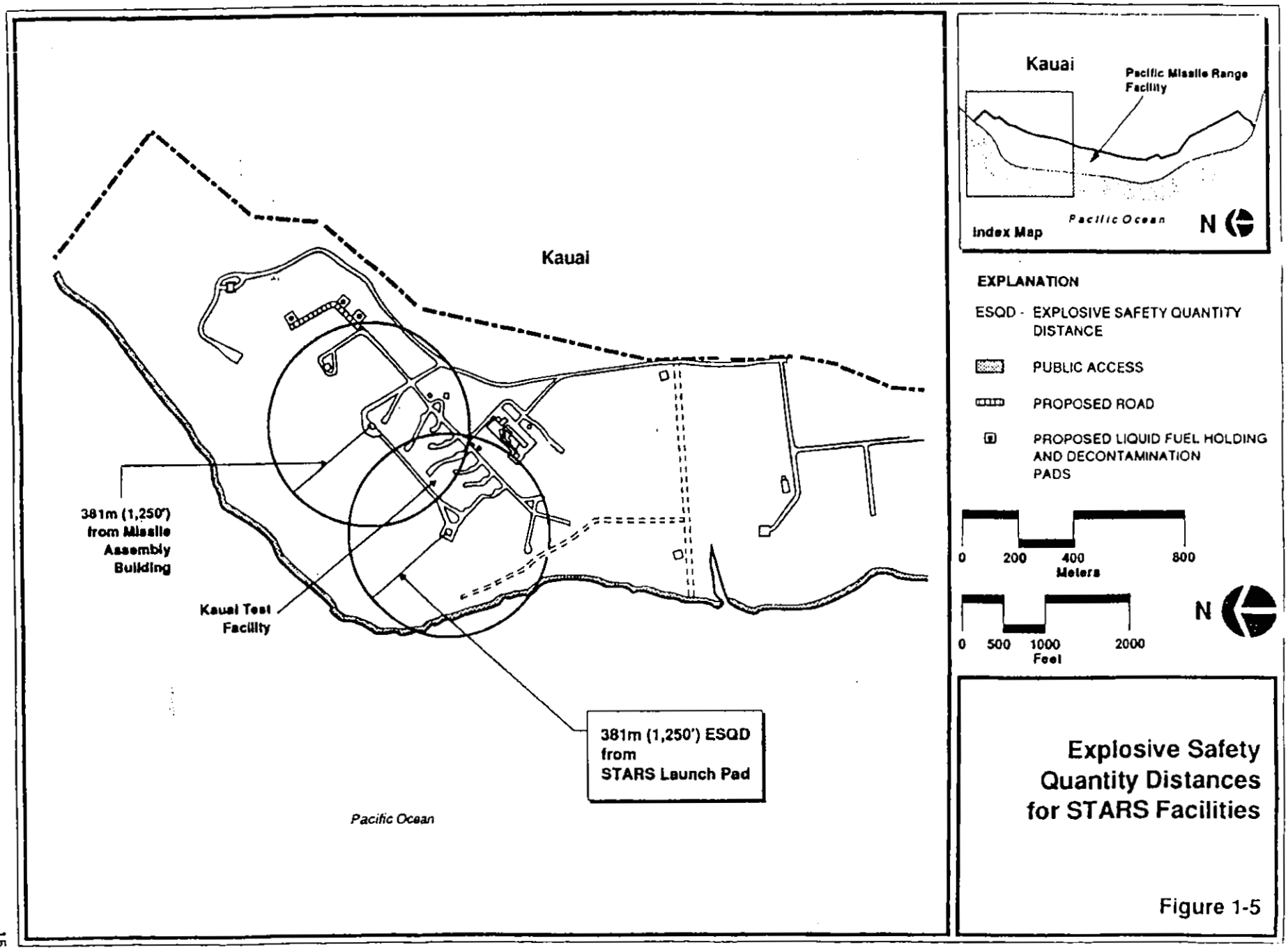
  Distance Hazard Classification - 1.1

  Ordnance Weight - 0.45 kilograms (1 pound); ESQD from inhabited building - 381 meters (1,250 feet)

  Storage Compatibility Group - D

Payload Flight Preparation - The STARS program would require the use of various experimental payloads with or without liquid propulsion systems. Some of these payloads would consist of liquid propulsion systems of less than 1,500 milliliters (51 ounces) prepackaged in the payload prior to shipment to KTF. Other payloads would require liquid propellant fueling at KTF of approximately 57 liters (15 gallons) each of hydrazine and N_2O_4. Activities related to these programs would be reviewed against this document. Any significant deviation from this environmental assessment would be addressed by separate environmental documentation.

Experimental payloads would use liquid propellant consisting of hydrazines and N_2O_4 (as an oxidizer). Some payloads may also use liquid hydrazine for experimental applications (see Section 1.3.6). Payloads with liquid propellants already installed would be flown to PMRF on military aircraft; otherwise, both hydrazines and N_2O_4 would be transported to the California coast by truck, then



Explosive Safety Quantity Distances for STARS Facilities

Figure 1-5

to PMRF in separate ships to Nawiliwili Harbor on Kauai, and finally transferred to PMRF by truck. All transportation would be in accordance with BOE-6000-1 and Department of Transportation (DOT) regulations. Hydrazine would be shipped in a 159-liter (42-gallon) drum with a protective plastic overwrap to protect against rust. N_2O_4 would be shipped in one 757-liter (200-gallon) steel cylinder. DOT-approved shipping containers would be used for these materials (49 CFR 173.276 and 49 CFR 172.102).

Prior to shipment to Kauai, a transportation safety plan would be developed by the STARS project office. The plan would include, but not be limited to, the following:

- Truck shipments on Kauai would have military escorts
- Shipments would be scheduled to avoid peak traffic periods
- All containers would be checked for leaks
- Truck drivers would be trained on recommended emergency procedures in the event of spills, leaks, or fires, and would be given telephone numbers of emergency response teams to call in case of an accident
- Local fire and police departments would be notified in advance of shipments, and informed by experienced personnel (and trained if necessary) of existing safety procedures to be used during ground transportation on Kauai
- A PMRF emergency response team would be trained in proper procedures for handling liquid propellants.

In addition, the number of liquid propellant shipments and the amount of liquid propellants stored at KTF would be kept to a minimum, consistent with the needs of the project.

The hydrazines and N_2O_4 would be stored on separate pads at the liquid propellant holding area at KTF in the original DOT-approved containers until needed for launch. All holding areas would be located on concrete pads with catchment basins to contain any possible spills. In addition, these areas would be monitored for leakage by SNL personnel. When needed for each launch, the hydrazines and N_2O_4 would be transported separately from the liquid propellant holding area to the launch pad, where they would be loaded into separate tanks in the payload. Unsymmetrical dimethydrazine (UDMH) and N_2O_4 would be loaded into approximately 57-liter (15-gallon) tanks. Fueling of the payload would be conducted 8 meters (25 feet) from the booster on the STARS concrete launch pad, which would have a catchment basin (Black, 1990). During fueling operations, the booster would be enclosed in the environmental shelter. Experienced personnel would perform the propellant loading operation, using existing safety procedures modified for KTF operations. A minimum of two personnel equipped with personal protective equipment and two-way communications would perform the propellant loading operation. An additional attendant with protective equipment would be available near the fueling site to provide assistance if required. All nonessential personnel not in the launch operations building would be cleared from an area of 381 meters (1,250 feet) around the launch pad. Additional hydrazine loading for payload experiments would follow the same procedures used for propellant tank loading. Prior to liquid propellant transfer operations, a safety plan would

be developed that would contain safety provisions from Army Regulation 200-1, the Air Force, and those developed by NASA.

The loading site would be equipped with fire fighting equipment, automatic fire detectors, and air monitors to detect any releases. The procedure would be monitored by safety personnel in the launch operations building using a video camera and voice communications. In the event of a spill, the safety personnel at PMRF and KTF would implement evacuation and clean-up procedures in accordance with an approved safety plan. Equipment used during propellant loading operations would be decontaminated after propellant transfer. On the decontamination pad, equipment would be washed down and all hazardous waste placed in marked hazardous waste containers. If a spill should occur, the concrete pad would be quickly washed down into the catchment basin to dilute any concentrations of hydrazines and N_2O_4, and all materials would be neutralized on site or pumped off the concrete pad into hazardous waste containers. The hazardous waste containers would be stored for less than 90 days, then transported off base by an Environmental Protection Agency (EPA)-permitted private contractor and delivered by ship to the U.S. mainland for treatment.

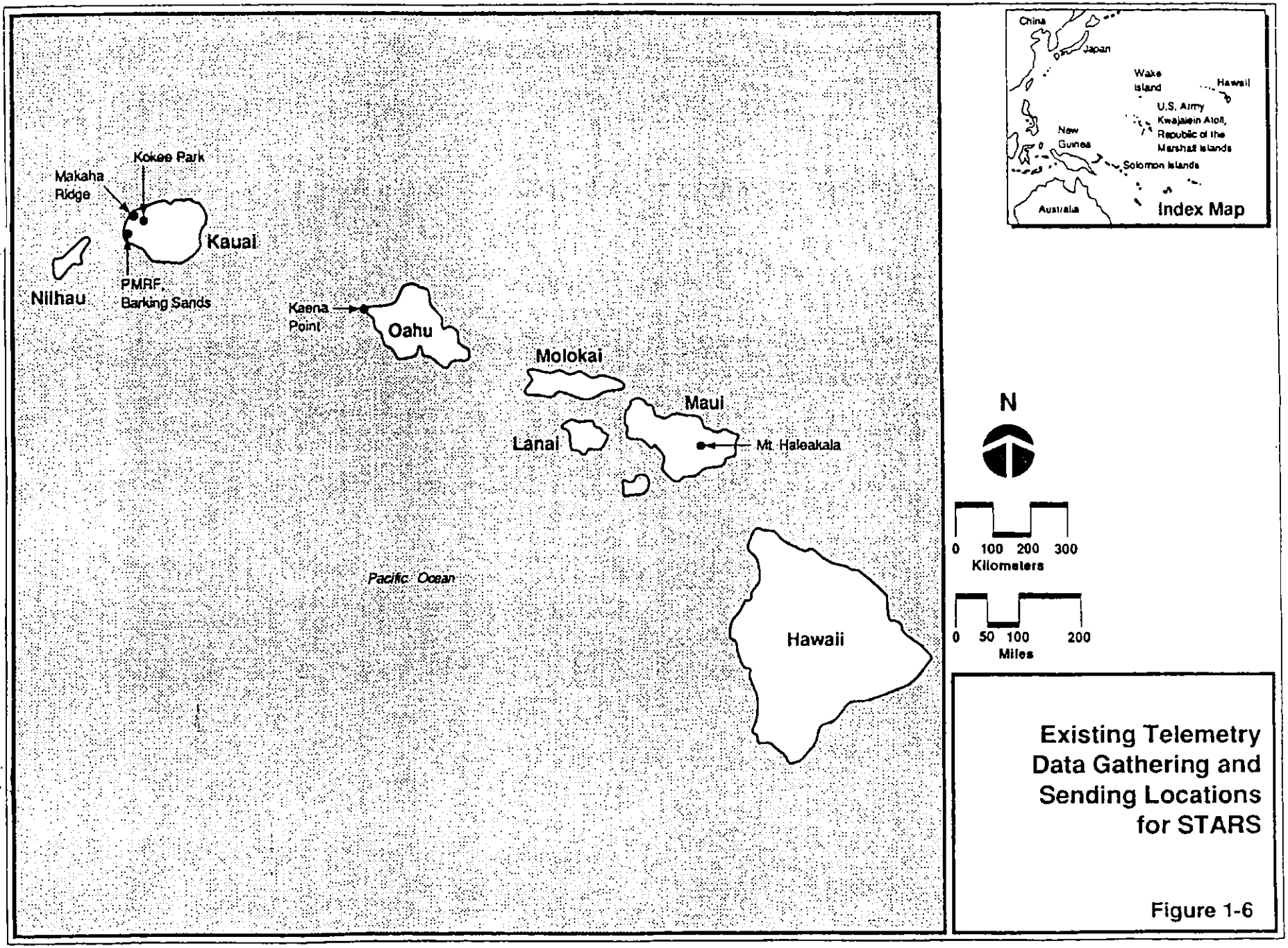
PMRF would review procedures for response to spills and hazardous substances and revise the oil/hazardous substances spill contingency plan at PMRF, which integrates base plans for emergency response.

Ground safety operating procedures for all KTF activities are addressed in the Safety Assessment for Missile Launch Complex at Barking Sands, Kauai (Sandia National Laboratories, 1988). These procedures have been adopted to ensure the safety of personnel involved in hazardous operations. This document states that safe operating procedures must be posted in all operating locations. Operations personnel must be familiar with the safety regulations prior to commencing operations covered by the document. In addition, safety regulations limit the number of personnel involved in hazardous operations. All final safety procedures would be reviewed by SNL prior to STARS operations. Approximately 45 additional temporary personnel would be required for all STARS operations at PMRF, including these flight preparation activities.

Communication Flight Preparation - Prior to flight, PMRF personnel would check the communication links, command destruct systems, telemetry, and radar system. Initial communication links would be made between PMRF, KTF, Western Test Range (WTR), Consolidated Space Test Center (Sunnyvale, California) and USAKA. Existing PMRF support facilities would be utilized. These facilities include PMRF (Barking Sands, Makaha Ridge, and Kokee Park, Kauai); the Air Force Hawaiian Tracking Station (HTS), Kaena Point, Oahu; WTR radar site at Kaena Point and Communication Center, Wheeler Air Force Base, Oahu; and a DOE building at the Mt. Haleakala site, Maui (Figure 1-6). These checks are part of the PMRF and KTF normal operating procedures and no additional personnel would be required.

U.S. Army Kwajalein Atoll, Republic of the Marshall Islands

STARS flight preparation activities would involve the preflight checkout of USAKA instrumentation, which is used when tests are conducted over the BOA north of USAKA and mid-atoll corridor (lagoon). This instrumentation tracks



Existing Telemetry Data Gathering and Sending Locations for STARS

Figure 1-6

and collects data associated with incoming target complexes. There would be no new construction or modification to existing facilities, and these activities are part of the installation's routine operations. No additional personnel would be required.

1.3.6 *Launch/Flight/Data Collection*

The STARS launch/flight/data collection involves the collection of booster and payload or target complex data. Booster data would include normal vehicle health and communication status downlinks. Data collection from the payload or target complexes is dependent on the specific payload function and design. The launch/flight/data collection activities are described in more detail below.

Pacific Missile Range Facility, Kauai, Hawaii

The currently planned STARS flight program would collect critical data on payloads launched from KTF to support program development and validation. The flight tests would take place up to four times a year for 10 years beginning in spring 1991.

Booster Launch/Flight - To ensure public safety during launch, the Pacific Missile Test Center (PMTC) has proposed a maximum launch hazard area with a radius of 3,048 meters (10,000 feet) within which any dangerous debris from the destruction of the missile (should flight termination be required) would fall. Any guidance systems failure during the initial launch that would allow destruct debris to fall outside this area would be detected by the missile flight safety officer who, as part of the flight safety operating procedures, would destroy the missile. The tracking radars from Barking Sands, Makaha Ridge, Kokee Park, and Kaena Point and telemetry from Makaha Ridge, Kaena Point, and the PMTC P-3 A Orion aircraft would input data into the PMRF flight safety solution. If necessary, the destruct action initiated by the missile flight safety officer at PMRF would be transmitted from KTF, Kokee Park, Kauai; DOE Mt. Haleakala site, Maui; and the PMTC P-3 A Orion aircraft.

The off-base lands within the 3,048-meter (10,000-foot)-radius launch hazard area are owned by the State of Hawaii and include approximately 28 hectares (70 acres) of the 62-hectare (154-acre) Polihale State Park; a section of coastline along PMRF approximately 30 meters (100 feet) wide and 5,251 meters (17,299 feet) long; and approximately 688 hectares (1,700 acres) of the 11,270 hectares (27,848 acres) of land leased by the Kekaha Sugar Company. A Memorandum of Agreement among PMRF, the State of Hawaii Department of Land and Natural Resources, and Kekaha Sugar Company is being developed. This agreement would allow PMRF security forces to request that the public and Kekaha Sugar Company personnel within the launch hazard area evacuate this area for approximately 10 minutes prior to and after launch for safety reasons. PMRF would notify the State of Hawaii before evacuation.

To minimize safety risk to the public in these areas, PMRF security forces on the ground, in boats, and in helicopters (if necessary), would use sweep and search measures to ensure that all areas within the launch hazard area are verified clear of people (except mission-essential personnel) by 10 minutes before launch. In addition, security forces would set up control points along the road into the launch hazard area to monitor and clear traffic during launch operations. There are no public buildings within this off-base area. All

nonessential personnel on the installation would be cleared from the launch hazard area, and launch personnel within the launch hazard area would be in buildings designed to withstand blast overpressure and fragments or would be provided personal protection equipment. Immediately after a successful launch, security forces would give the all clear signal, and the public would be allowed to re-enter the area. Evacuation procedures have been established for other launches at PMRF; 10 to 15 existing PMRF security personnel would be required to implement evacuation procedures for the STARS launches.

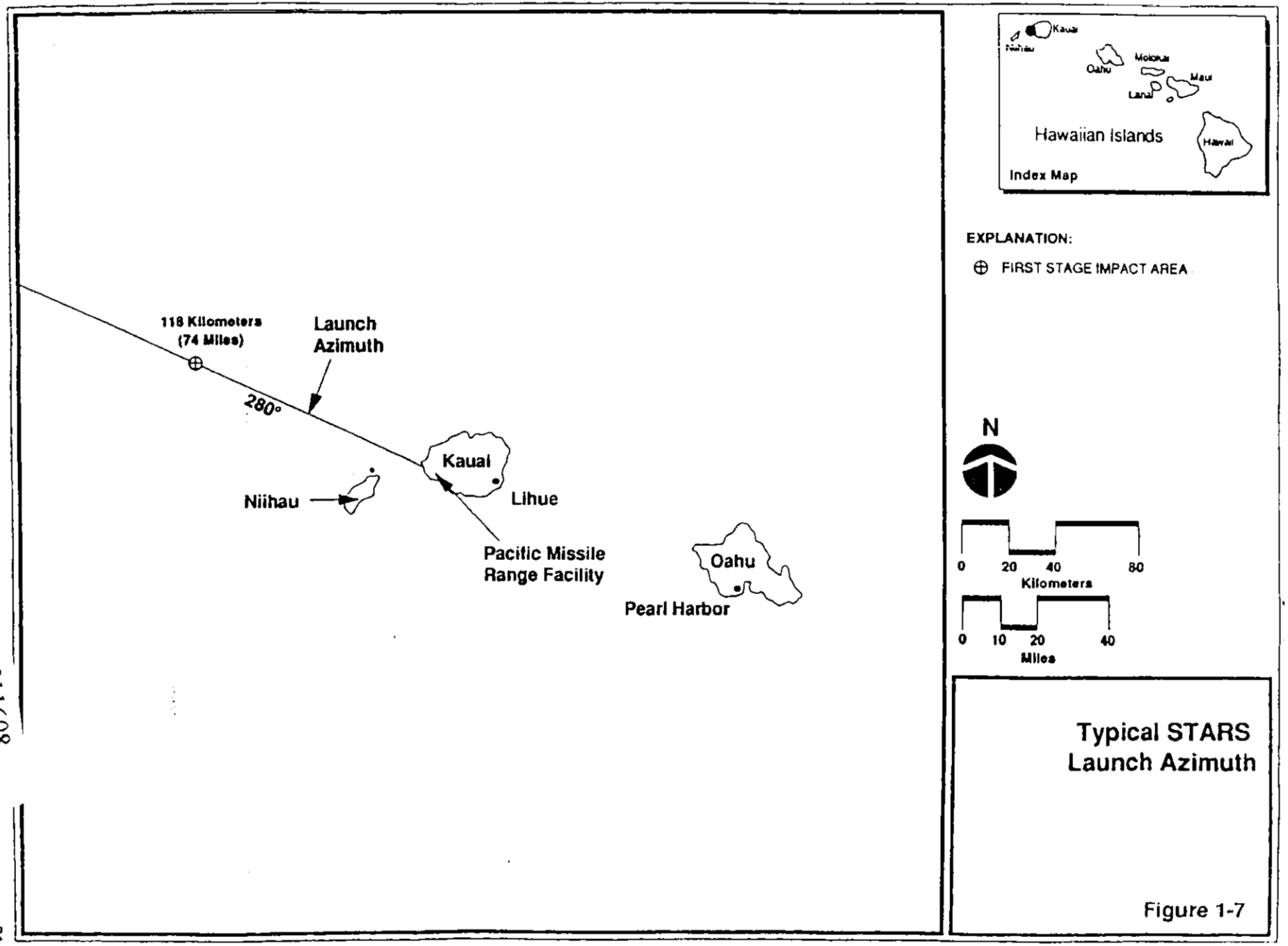
Commercial and private aircraft and ocean vessels would be notified in advance of launch activities by the PMRF Safety Office as part of their routine operations through Notice to All Airmen (NOTAM) by the Federal Aviation Administration (FAA) and Notice to Mariners (NOTMAR), respectively, so that they can reschedule or choose alternate routes during the flight experiments (Dawson, 1989b).

For each unique flight, an Operations Requirement report detailing safety and security requirements must be submitted to the range operations officer. The report is prepared by the range user to identify requirements directly related to the particular test or series of identical or similar tests. It provides specific details on the flight trajectory, measurement requirements, and support requirements, such as timing and real-time displays. The Operations Requirement report is coordinated with the PMTC/PMRF, and is the basis for the Operations Directive, which outlines specific support requirements for each launch.

The STARS launch would utilize a launch azimuth of 280 degrees (Figure 1-7). A comprehensive safety analysis would be made each time a new launch azimuth is needed to determine specific launch hazards and to meet safety criteria. The determination of the specific launch azimuth and its associated destruct boundaries and launch hazard area would be made by the PMTC, Point Mugu, California (lead safety agency for PMRF).

With liftoff establishing flight time "zero", the vehicle performs a pitch maneuver after 2.26 seconds of vertical ascent. Although the direction to the BOA near USAKA, 3,763 kilometers (2,338 miles) away, is 255.5 degrees, the initial flight azimuth is 280 degrees to avoid a direct overflight of the inhabited island of Niihau, 30 kilometers (18 miles) west-southwest of KTF. At 61.2 seconds, the vehicle has a velocity of 1,417 meters per second (4,650 feet per second) at an altitude of 28,651 meters (94,000 feet) and the surface range is 22 kilometers (13 miles). Ten seconds later, the guidance system initiates a downpitch maneuver to produce the desired trajectory. At the same time, another turn bends the ground track toward the target. Just prior to third-stage ignition, during coast, the range safety function is transferred from PMRF to USAKA. The first-stage booster impacts about 118 kilometers (74 miles) west of KTF at 379 seconds. The second-stage booster impacts at 1,224 seconds, 3,035 kilometers (1,886 miles) downrange near USAKA (Figure 1-8). During second-stage burn, up to 90 kilograms (198 pounds) of Freon may be released into the booster plume over the entire second-stage flight path, to provide maneuvering capabilities for the booster (Motta, 1990). The third stage ignites at about 665 seconds, after passing the highest elevation.

Most of the BOA north of Roi-Namur Island, USAKA, is accessible to the STARS launch vehicle with single dog-leg trajectory. However, direct



Typical STARS
Launch Azimuth

Figure 1-7

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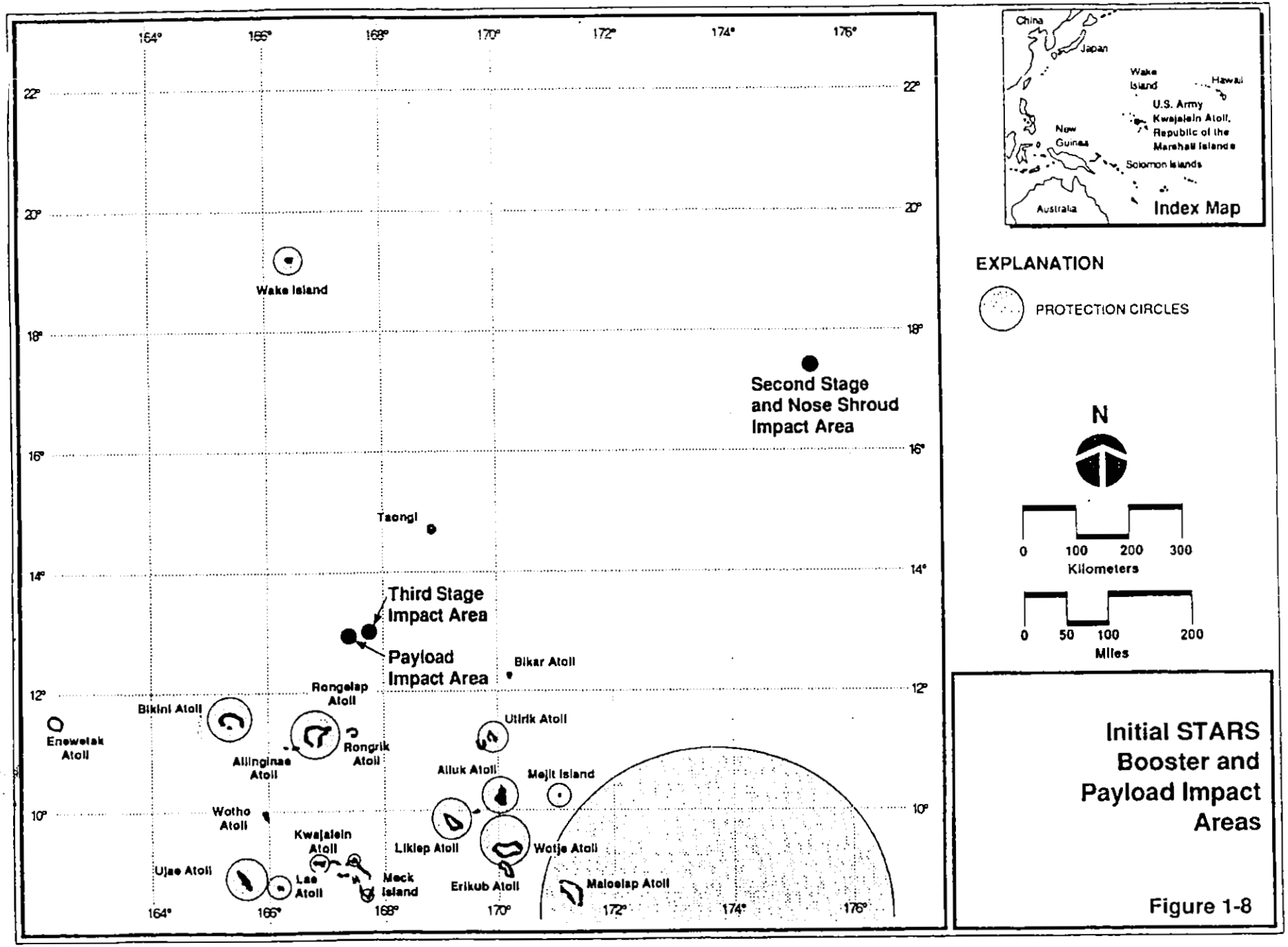

Initial STARS Booster and Payload Impact Areas

Figure 1-8

approaches to USAKA mid-atoll corridor targets using a single dog-leg trajectory are blocked by the inhabited atolls of Ailuk and Likiep. To avoid these islands, a second dog-leg turn is executed during third-stage burn. However, the initial demonstration flight would pass north of both atolls and impact in the BOA north of USAKA.

Because the high temperatures associated with a STARS launch could ignite adjacent vegetation, a portable blast deflector shield would be used in the vicinity of the launch pad to protect the vegetation and the adjacent sand dunes. The potential for starting a fire would be further reduced by clearing all dead brush from around the launch pad. Additional measures to avoid impacts on vegetation, wildlife, and cultural resources are:

- Spraying the vegetation adjacent to the launch pad with water just before launch to reduce the risk of ignition
- Having emergency fire crews available during all STARS launches to quickly extinguish any fire and minimize its effects
- Using open (spray) fire nozzle, when possible, rather than a directed stream in extinguishing fires, to avoid erosional damage to sand dunes and prevent possible destruction of potential cultural resources in the dune area.

Air quality and noise monitoring programs would be conducted in conjunction with the initial STARS launch. Air quality and noise monitoring plans would be prepared before the initial launch. The noise monitoring program would be designed to take into account the potential for reverberation or echoes from the cliffs to the east.

Payload Flight/Data Collection - After third-stage burn, the STARS payloads that use liquid propellant would be ignited in order to perform the maneuvers required to conduct specific experiments. These experiments would be conducted in the exoatmosphere (outside the earth's atmosphere), where most of the hydrazine and N_2O_4 liquid propellants would be consumed during flight. During re-entry, the liquid propellant tanks would break up, dispersing the remaining propellant in the atmosphere. Individual payloads would then impact in the BOA near USAKA.

A proposed STARS experiment payload would involve the deliberate venting of unburned hydrazine fuel into the exoatmosphere for the purpose of collecting sensor data (via satellite) regarding fuel vent phenomenology. This particular experiment payload would consist of two canisters, each capable of releasing approximately 57 liters (15 gallons) of hydrazine, and associated venting instrumentation (e.g., to monitor flow rate, temperature, and vent pressure). During payload flight(s), fuel venting would be initiated at an altitude of approximately 300 kilometers (483 miles), while a second venting would occur at an altitude of over 1,000 kilometers (1,609 miles). Up to two payload flights are proposed for this fuel vent experiment.

In the unlikely event of booster failure or flight termination, range safety procedures would require that the hydrazine and N_2O_4 propellant tanks, and proposed hydrazine venting experiment canisters, be ruptured, dispersing and partially burning the liquids so that the full quantities do not impact on the

ground or water together. Safety procedures for flight operation of payloads would be addressed by SNL safety documentation.

U.S. Army Kwajalein Atoll, Republic of the Marshall Islands

USAKA instrumentation on the Island of Roi-Namur is used when tests are conducted over the BOA northwest of USAKA. USAKA contains telemetry, optics, and radar sensors that would track and collect data on the STARS target complexes as they move toward and splash down into the BOA or mid-atoll corridor. There would be no new construction or modification to existing facilities, and these types of activities are part of the installation's routine operations. No additional personnel would be required.

1.3.7 Data Analysis

Data analysis activities would consist of evaluating data generated by STARS program activities. Analysis is a scientific exercise conducted to determine the cause or reasons for simulated or real phenomena noted during testing and/or evaluation. STARS data analysis activities would be conducted by SNL and the payload contractors. Data collected and analyses performed by the program personnel would be stored at the Advanced Research Center, Huntsville, Alabama, and the National Test Facility, Falcon AFB, Colorado. There would be no new construction or modification to existing facilities, and these activities are part of each installation's routine operations. No additional personnel would be required.

1.4 ALTERNATIVES CONSIDERED BUT NOT CARRIED FORWARD

Alternatives to the STARS program launch facility were examined early in the siting process but were eliminated from further consideration as unreasonable. The following section briefly describes alternative launch sites and discusses why they were eliminated. This examination was predicated upon selecting a site compatible with using USAKA as a target area because it is the existing designated anti-ballistic missile test range that is most capable of performing the experiments associated with the STARS program.

Although **Vandenberg AFB** has existing telemetry receiving assets and communication and launch operations/support assets that might have been adaptable to STARS, the maximum range of the STARS vehicle would fall far short of USAKA if launched from Vandenberg AFB. There are no acceptable impact areas or data collecting missile ranges within the range of a STARS missile launched from Vandenberg AFB.

Wake Island, Johnston Atoll, and Hawaii were considered as alternative sites because USAKA is within the range of a STARS missile launched from these islands.

Wake Island, although within range of USAKA, does not present the proper trajectory geometry to allow a STARS missile to deliver a payload within the desired SDI experimental parameters.

Johnston Atoll maintains a sensitive and hazardous chemical munitions storage and demilitarization mission in a small, confined area. The nature of that activity and the additional hazards and logistics requirements that STARS

construction, storage, and launch operations would place upon Johnston Atoll excluded it from further consideration.

PMRF, on the Island of Kaual, Hawall, Is the only existing launch and range support facility capable of supporting the STARS program because of its geographic location in relation to USAKA.

1.5 NO-ACTION ALTERNATIVE

The no-action alternative for the STARS program would be to continue development of SDIO experimental programs without the ability provided by the STARS program to gather actual flight test data. This alternative is not acceptable, because the STARS flight program is needed to conduct experiments in realistic environmental conditions. Currently, there are no simulation, analysis, or test facilities that can adequately replicate the effects of natural environmental conditions. The ramification of the no-action alternative would be that the required booster for SDIO experimental programs would not be available to launch any of the support payloads. Therefore, the overall objective of the STARS program, which supports the overall SDIO program and national policy goals, would not be met.

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2.0 AFFECTED ENVIRONMENT

The STARS program activities were identified in Section 1.0. Section 2.0 describes the physical and operational characteristics, permit status, and previous environmental documentation of each proposed STARS program installation. Specific physical characteristics described include installation size, support and test facilities, and environmental and public health and safety conditions. Operational characteristics include the socioeconomic variables of staffing, payroll, and housing; the characteristics of the surrounding communities; and infrastructure--electricity, solid waste, sewage treatment, transportation, and water supply. Referenced permits are those that relate to air quality, water quality, and hazardous materials. Previous environmental documentation includes records of environmental consideration, EAs, and environmental impact statements (EISs).

Available literature (such as EAs, EISs, and base master plans) for each of the installations was acquired and data gaps (i.e., questions that could not be answered from the literature) were identified. To supply the missing data, the installations were visited and/or telephone calls were made to installation personnel and pertinent Federal, state, and local agencies. Section 5.0 lists the agencies contacted. Sources of information collected through site visits or telephone interviews and other appropriate references are presented in Section 6.0.

Initial consideration of potential impacts was given to the full range of environmental components including visual and aesthetics, geology and soils, and hydrology. Some of these components were not considered further because the potential for significant impacts was determined to be negligible. During a community information exchange meeting held in Kauai, Hawaii, on June 14, 1990, a number of areas of concern were identified by the public, specifically air quality, biological resources, cultural resources, noise, and public health and safety issues. All of those concerns were considered in the preparation of this document. Based on these evaluations, ten broad environmental components were considered for inclusion in the description of the affected environment in order to provide a context for understanding the potential effects of the proposed action and assessing the significance of potential impacts. The data presented are commensurate with the importance of the potential impacts; the discussion focuses on the key issues. The ten areas of environmental consideration are air quality, biological resources, cultural resources, hazardous materials/waste, infrastructure, land use, noise, public health and safety, socioeconomics, and water quality.

Several of these broad environmental components are regulated by Federal and/or state environmental statutes, many of which set specific standards (see Appendix A). The status of compliance of each project area and installation with respect to these standards was included in the information collected on the affected environment, if possible. The ten areas of environmental consideration are discussed briefly below.

Air Quality - Information on air quality at each installation was collected and reviewed, if appropriate, with emphasis on background ambient air quality compared with the primary National Ambient Air Quality Standards (NAAQS). The attainment status of the area in which each installation is located was also ascertained, if possible. Existing air emissions sources at each installation were

evaluated to determine compliance with the emissions standards set forth in the associated state implementation plan. Possible new air emissions sources, such as those associated with expansion of facilities and new construction, were evaluated using the New Source Performance Standards.

Biological Resources - Existing information on plant and animal species found at each installation, particularly any species that is protected or on Federal or state lists of threatened or endangered species, was reviewed, if appropriate.

Cultural Resources - Existing information on cultural and historic resources at each installation was reviewed, if appropriate, with particular attention paid to known National Register of Historic Places sites and Native American, Hawaiian, or other ethnographically sensitive areas.

Hazardous Materials/Waste - Existing hazardous materials/waste management practices and records of compliance were reviewed, if appropriate, in order to determine the installation's capability to handle any additional materials/waste and any potential problems with hazardous materials/waste use, handling, storage, treatment, or disposal.

Infrastructure - The capacity and current demands of the following infrastructure elements for each installation were examined, if appropriate, to determine if there were any infrastructure constraints to growth: electricity, solid waste disposal, sewage treatment, water supply, and transportation.

Land Use - Base master plans, environmental management plans, and other documentation were reviewed, if appropriate, to determine if there are any known conflicts between existing and future facilities and land uses, coastal zone management regulations, and proposed program activities.

Noise - Existing environmental documents were reviewed and installation personnel were interviewed, if appropriate, to determine if noise concerns are an issue at any of the installations.

Public Health and Safety - Existing environmental documents were reviewed and installation personnel were interviewed, if appropriate, to determine if public and occupational health and safety concerns are an issue at any of the installations.

Socioeconomics - Key socioeconomic indicators (population, housing, employment, and income data) for the supporting region of each installation were examined, if appropriate, to evaluate the potential consequences of increased population, expenditures, and employment.

Water Quality - Water quality concerns at each location were identified and the installation's record of compliance and applicable permits were examined, if appropriate.

The following sections present a brief description of each installation where STARS program activities are planned, followed by a description of the relevant affected environment (i.e., the environmental components that may be changed by the proposed action).

2.1 AEROJET SOLID PROPULSION DIVISION

The Aerojet Solid Propulsion Division is a commercial/industrial operation in the Sacramento metropolitan area, California (Figure 2-1). Approximately 3,500 people are employed at the installation; about 15 would be involved in STARS activities. STARS activities would take place in existing facilities that would require no modification or refurbishment.

The Aerojet Solid Propulsion Division has all applicable Federal, state, and local permits and authorizations necessary for operation (Reilly, 1990; Yeadon, 1990). The facility complies with Federal standards for water quality and air quality, although it is located within a nonattainment area for ozone and carbon monoxide (Munz, 1990). This facility was placed on the EPA's National Priorities List in 1979 for release of TCE into several municipal wells (Miller, 1990). Aerojet has since installed six water treatment facilities that capture these contaminants. The EPA is currently conducting a feasibility study on remediation.

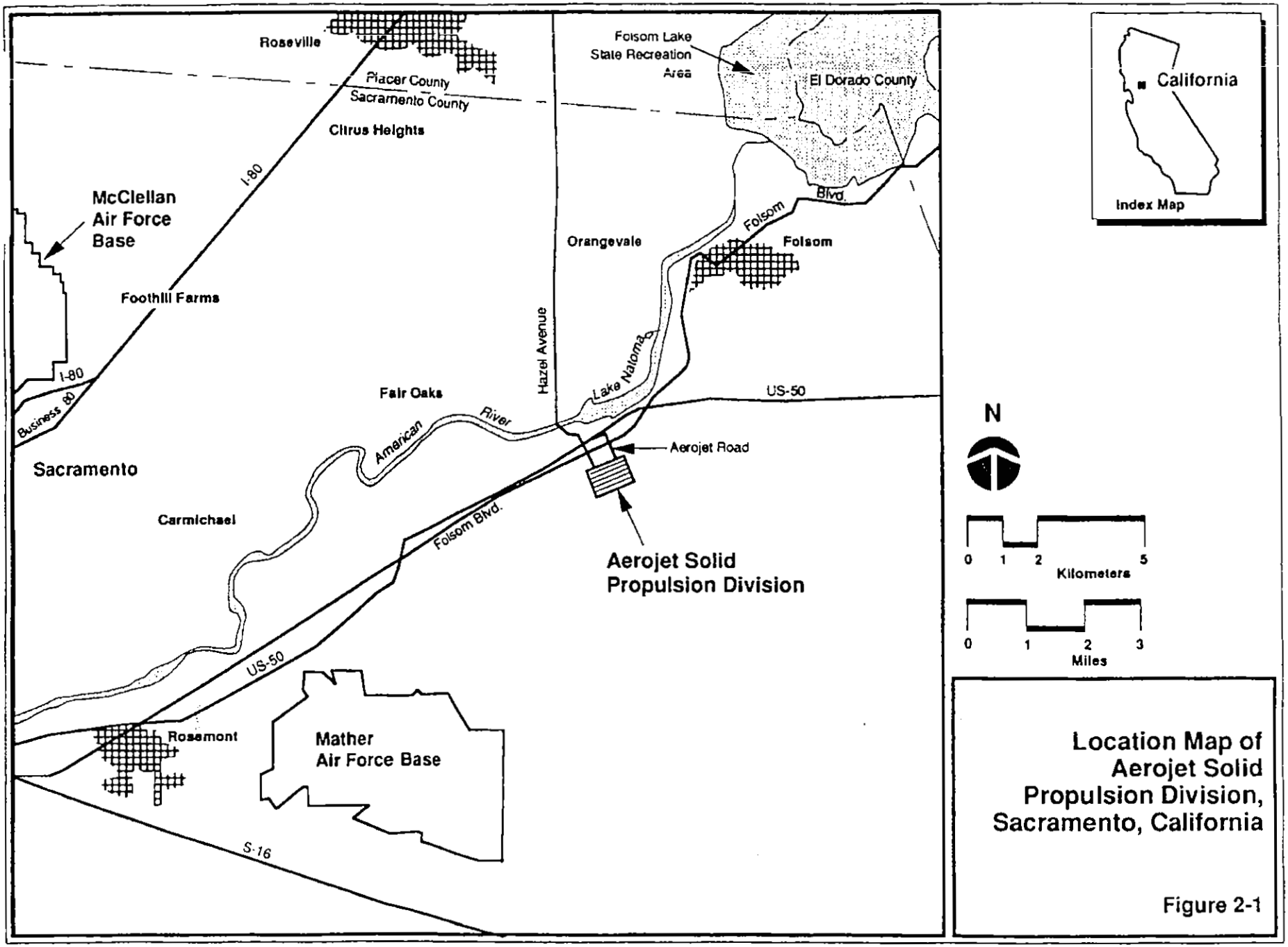
There are no recorded historic or archaeological sites at the facility. No threatened or endangered species are known to frequent the facility (Schulenburg, 1990). Noise is not an issue, and no public health and safety issues have been identified. All hazardous waste is disposed of according to the specific RCRA permit requirements and the Aerojet Safety Procedures Manual. Facility infrastructure is supported by adjacent communities and demand is within capacity. The surrounding communities in Sacramento County have a combined population of approximately 988,000 (Adams, 1990).

2.2 *HERCULES INCORPORATED*

Hercules Inc. is a commercial/industrial operation in Magna, Utah, approximately 15 miles from Salt Lake City (Figure 2-2). Approximately 4,000 people are employed at the installation; about 30 would be involved in STARS activities. STARS activities would take place in existing facilities that would require no modification or refurbishment.

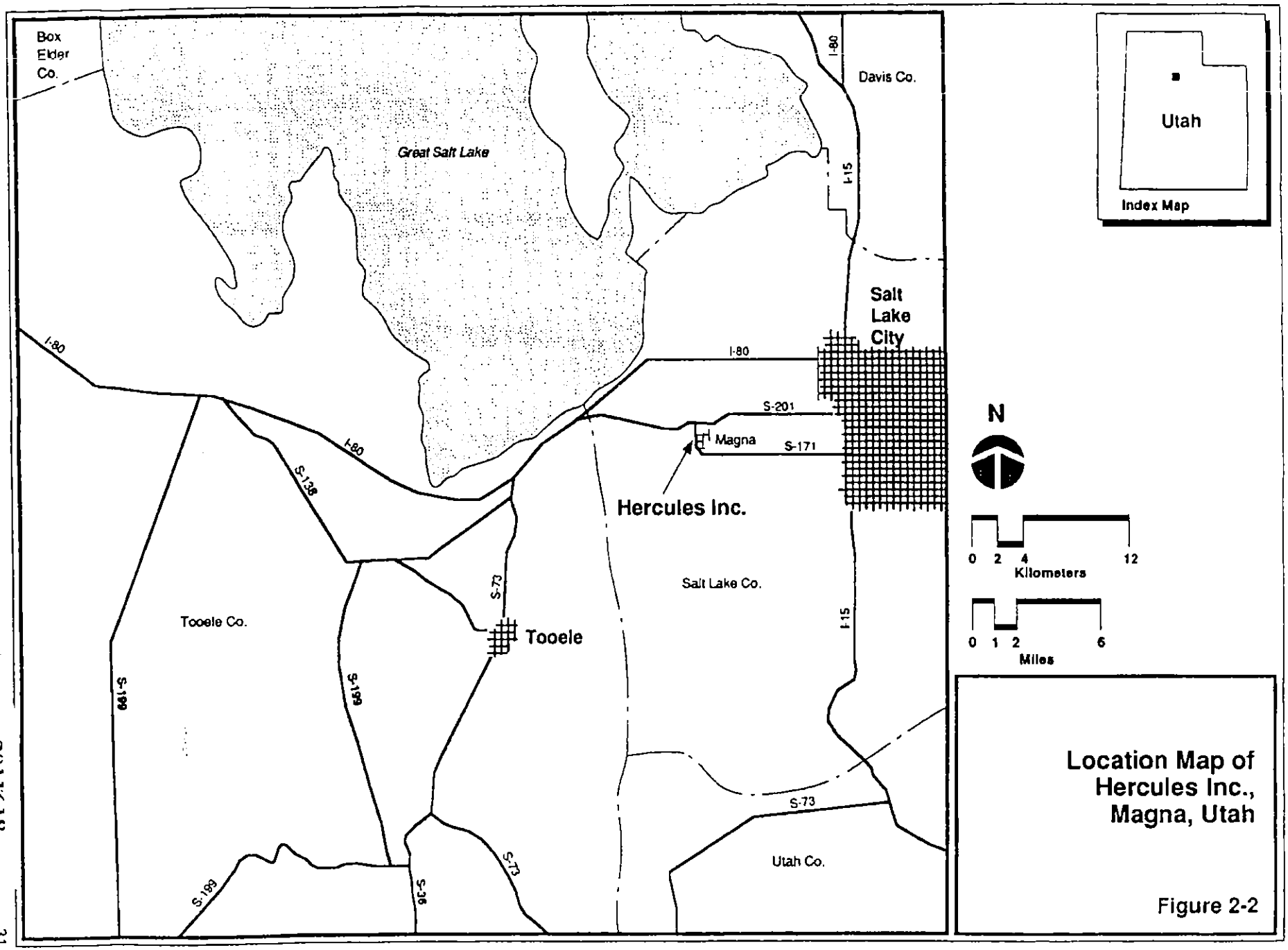
Hercules Inc. has all applicable Federal, state, and local permits and authorizations necessary for operation (Thiesen, 1990; McNeal, 1990; Larsen, 1990; Huish, 1990; Stott, 1990). The facility complies with Federal standards for water quality and air quality, although it is located within a nonattainment area for ozone, carbon monoxide, sulfur dioxide, and particulates (Robinson, 1990; Hillwig, 1990).

There are no recorded historic or archaeological sites at the facility, and no threatened or endangered species are known to frequent the area. Noise is not an issue, and no public health and safety issues have been identified (Schmidt, 1990). All hazardous waste is disposed of according to the specific RCRA permit requirements. Facility infrastructure is supported by adjacent communities and demand is within capacity. The surrounding communities in Salt Lake County have a combined population of approximately 705,000 (Jepson, 1990).



Location Map of Aerojet Solid Propulsion Division, Sacramento, California

Figure 2-1



Location Map of Hercules Inc., Magna, Utah

Figure 2-2

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2.3 UNITED TECHNOLOGIES CHEMICAL SYSTEMS DIVISION

The United Technologies Chemical Systems Division is a commercial/industrial operation in San Jose, California, in the San Francisco Bay metropolitan area (Figure 2-3). Approximately 2,000 people are employed at the installation; about 40 would be involved in STARS activities. STARS activities would take place in existing facilities that would require no modification or refurbishment.

The United Technologies Chemical Systems Division has all applicable Federal, state, and local permits and authorizations necessary for operation (Libretti, 1990; Low, 1990; Hart, 1990). The facility complies with Federal standards for air quality, although it is located within a nonattainment area for ozone and carbon monoxide (Libretti, 1990).

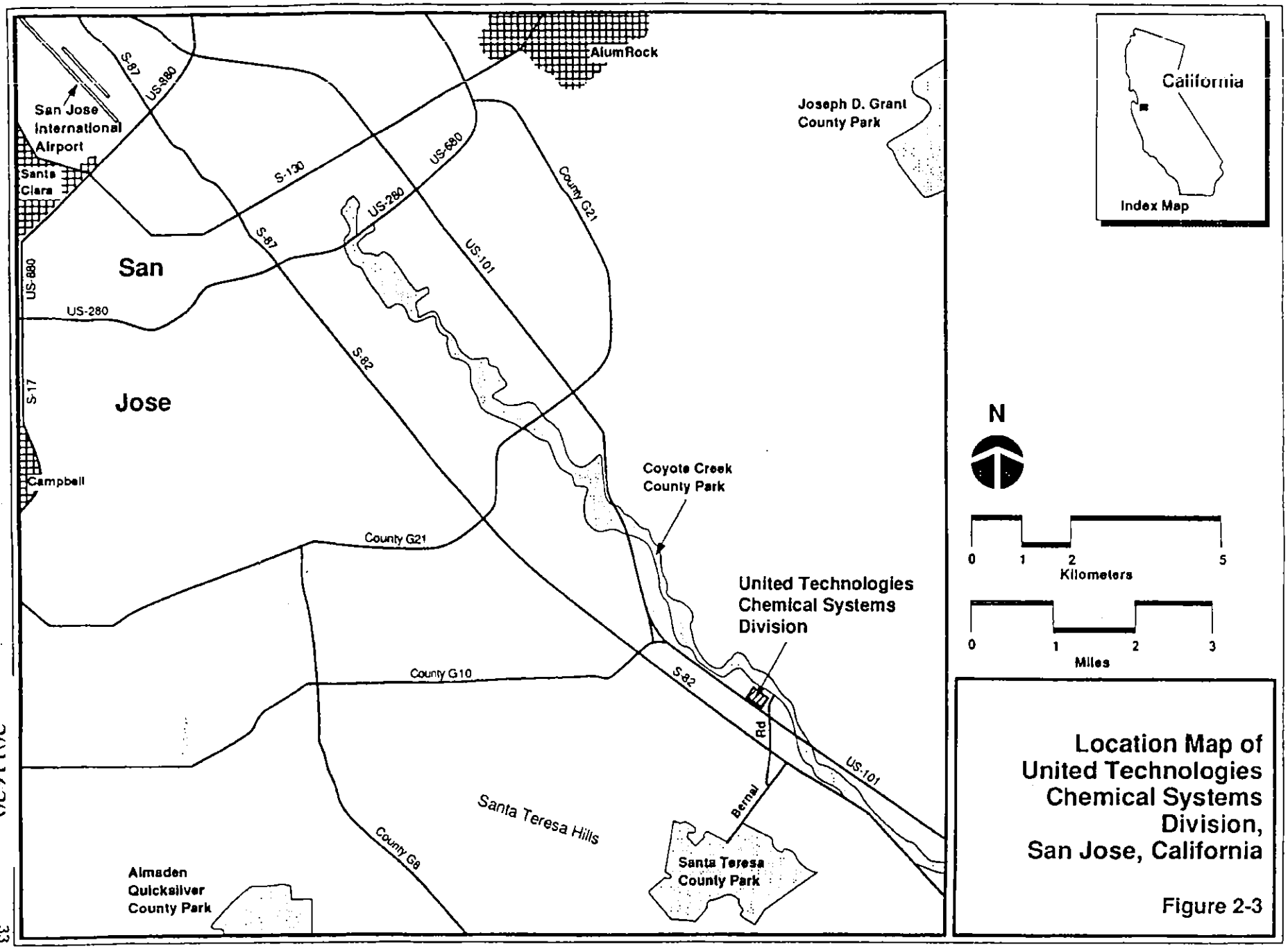
There are no recorded historic or archaeological sites at the facility. One Federally listed threatened species, the Bay Checker Spot butterfly, is known to occur at the facility; six Federally listed endangered species are known to occur within the surrounding area (Albertson, 1990). Noise is not an issue, and no public health or safety issues have been identified (Thrasher, 1990). All hazardous waste is disposed of in accordance with an RCRA interim Part B permit. United Technologies has a sewer treatment plant and adequate water supply on site; both are currently operating within capacity (Thrasher, 1990). All other infrastructure requirements are supported by adjacent communities and demand is within capacity. The surrounding communities in Santa Clara County have a combined population of approximately 1,300,000 (U.S. Bureau of the Census, 1983).

2.4 STATIC FIRING TEST INSTALLATION

A CONUS static firing test installation has not yet been selected; therefore, details of the affected environment at a specific site cannot be described. However, because the installation must be able to meet the STARS schedule, the following can be assumed: The static firing test activities would be conducted at existing facilities with no significant increases in contractor personnel. The facilities would operate at levels and intensities similar to current conditions and would not require major modifications or construction. As a condition of the contract, the USASDC would require that the installation possess all applicable Federal, state, and local permits, and be in compliance regarding air emissions, wastewater discharges, noise, public health and safety, and hazardous materials/waste practices. In addition, the USASDC would ensure, through contract clauses, that installation activities would maintain compliance with all existing Federal, state, and local permits and practices. Changes in operations outside the scope of current permits must be incorporated into permit modifications prior to test activity implementation. Any new permits or modifications would be acquired by the affected installation's environmental planning staff in coordination with the test program's management. The USASDC would maintain close liaison with the affected installation environmental planning staff to ensure compliance with all applicable regulations.

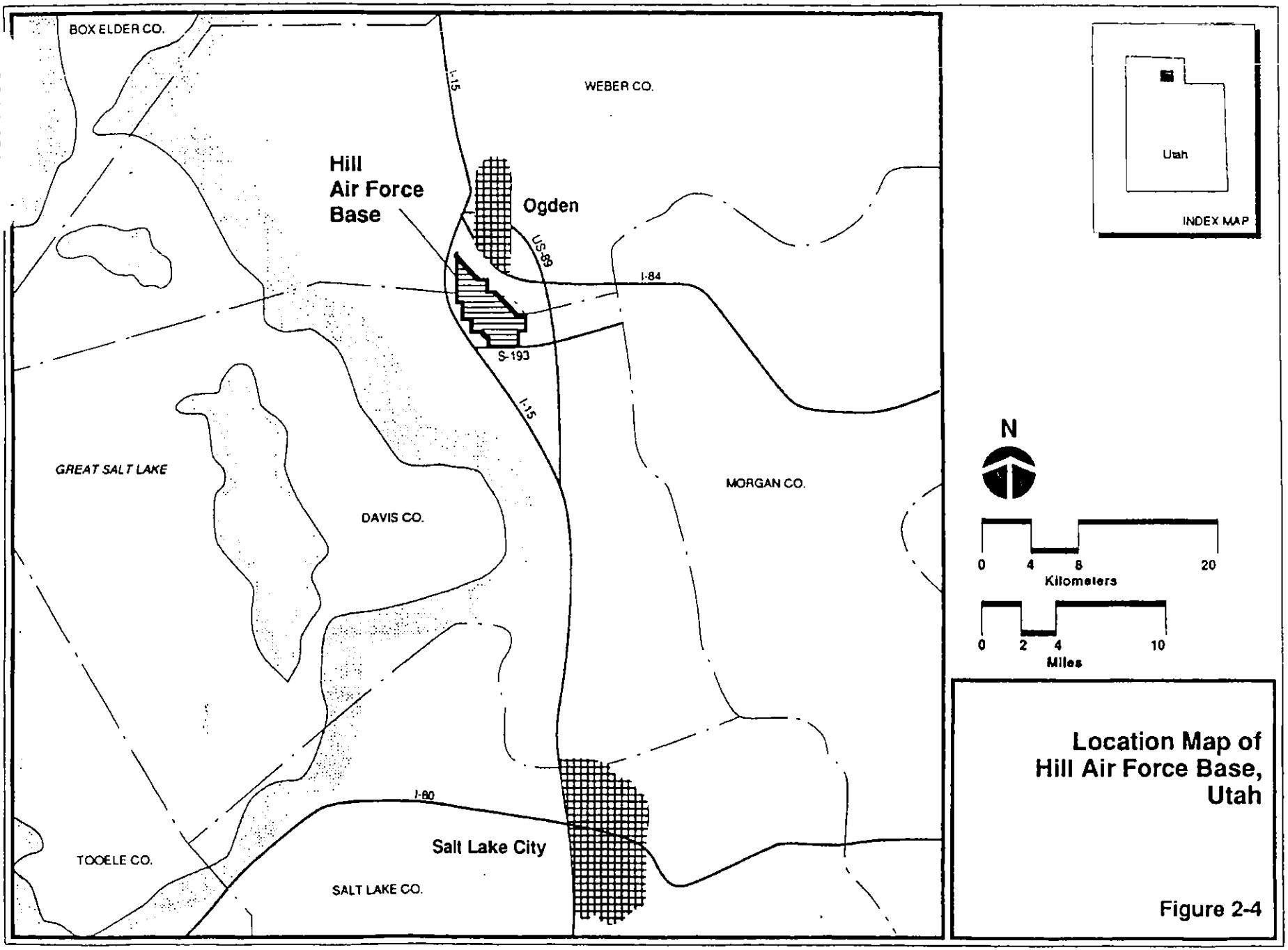
2.5 HILL AIR FORCE BASE

Hill AFB is 8 kilometers (5 miles) south of Ogden, Utah (Figure 2-4). The base provides logistics support and system management for MINUTEMAN and PEACEKEEPER missiles, laser and electro-optical guided bombs, F-4 and F-16 aircraft, air munitions, aircraft landing gear, and photographic and aerospace



Location Map of United Technologies Chemical Systems Division, San Jose, California

Figure 2-3



Location Map of Hill Air Force Base, Utah

Figure 2-4

training equipment. The base also manages the Utah Test and Training Range (Air Force Association, 1990).

Hill AFB has all applicable Federal, state and local permits and authorizations necessary for STARS operations. The installation complies with Federal standards for water quality and air quality, although it is located within a nonattainment area for ozone and carbon monoxide (Dalley, 1988; Taylor, 1988, 1989). The base was placed on the EPA National Priorities List on October 9, 1984, for a potential threat of hazardous substances (Littlejohn, 1988). The listing currently cites 39 separate hazardous waste disposal sites on base. The base is participating in the Installation Restoration Program (IRP), which identifies, evaluates, and controls the migration of hazardous contaminants (James, 1988; Littlejohn, 1988). In addition, the EPA is preparing to initiate negotiations for a Federal facilities agreement, in which Utah and the EPA will work with Hill AFB to set up a clean-up framework within the guidelines established by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (Johnson, 1990).

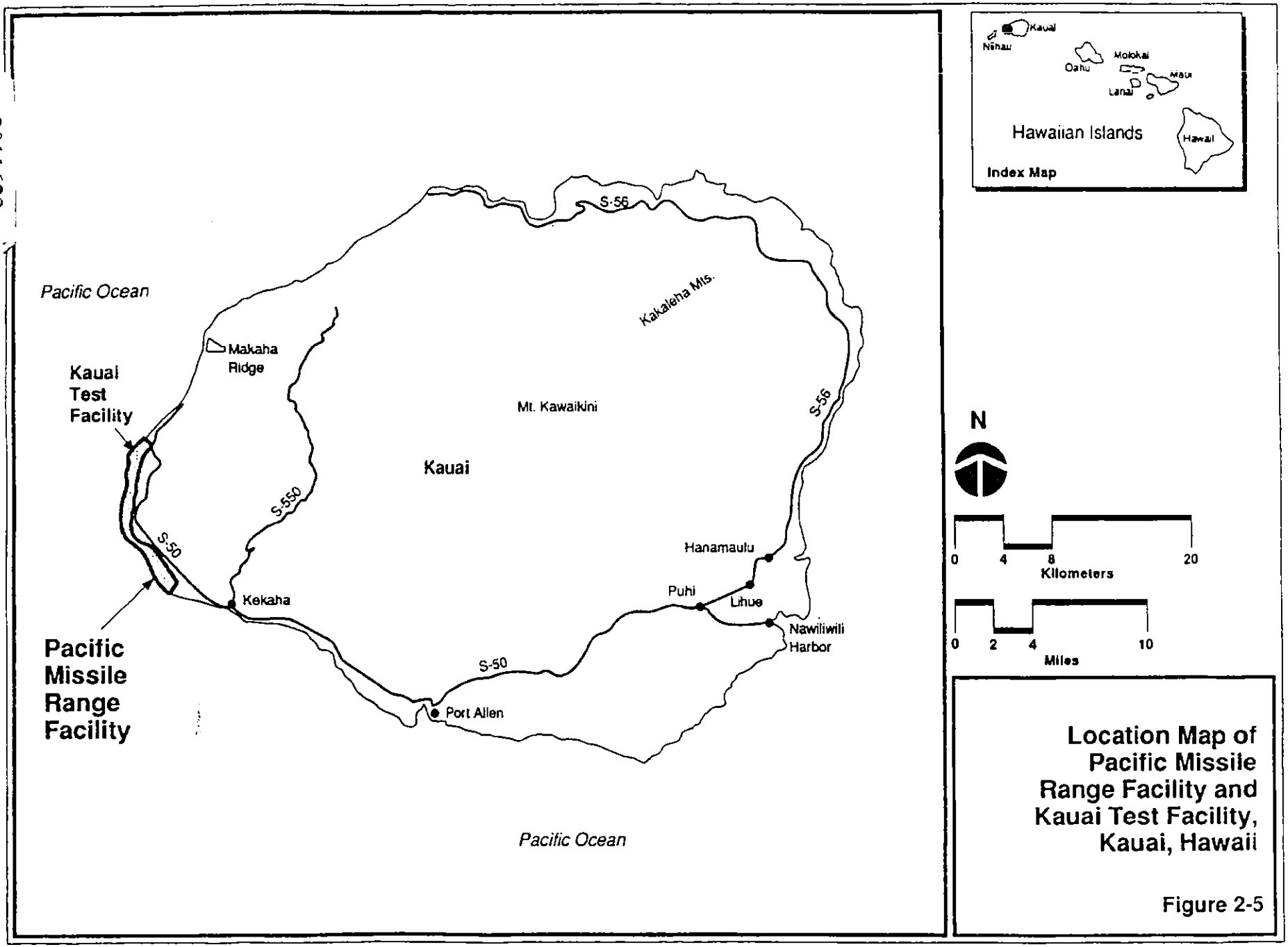
Two Federally listed threatened and two endangered species occur in the area; the bald eagle, an endangered species, has been sighted at the base (U.S. Department of the Air Force, 1978; Taylor, 1989). No known cultural resources exist on the installation (Taylor, 1988). Facility infrastructure is generally adequate (McKenzie, 1987; Taylor, 1987, 1988) and land use is in accordance with the Base Master Plan (Ogden ALC, 1984). Noise levels are consistent with air base operations with specified attenuation goals (Ogden ALC, 1984; Pierson, 1987). No significant public health and safety issues have been identified other than hazardous waste issues, which are being addressed in the IRP. The surrounding communities in Davis and Weber counties have a combined population of approximately 340,000 (U.S. Bureau of the Census, 1988).

2.6 PACIFIC MISSILE RANGE FACILITY

The PMRF at Barking Sands is on the west side of the Island of Kauai, Hawaii (Figure 2-5). PMRF is a long, narrow site bordered on the west by the Pacific Ocean and on all other sides by agricultural and undeveloped land (Botanical Consultants, 1985). PMRF contains both land- and water-based facilities to support U.S. Navy test programs (Botanical Consultants, 1985). In addition, launch facilities are used to launch test flights of tactical missiles and other projectiles.

KTF, also called the DOE Test Readiness Facility, is a rocket preparation and launch facility operated by SNL. KTF is a tenant on the northern portion of PMRF. The tenant agreement is for land only; all facilities maintenance and repairs are handled by SNL for the DOE.

Between 1962 and 1988, approximately 310 rockets were launched from KTF; none contained nuclear weapons. KTF has been and is being used for research and development testing of science and technology payloads, to advance development of maneuvering target complexes, to study the atmosphere and the exoatmosphere, and to support other programs (Sandia National Laboratories, 1990). Existing support facilities include a wind radar site, missile and rocket launchers, maintenance operations facilities, a warehouse and shipping/receiving building, a missile assembly building, and administrative offices. Permanent staff levels at KTF vary from 10 to 20, although during rocket system launches or other



Location Map of Pacific Missile Range Facility and Kauai Test Facility, Kauai, Hawaii

Figure 2-5

scheduled activities, as many as 100 personnel may be at KTF on temporary duty. Current average launch activity consists of one STRYPI, two NIKE, and two TERRIER system launches per year.

PMRF has all applicable Federal, state, and local permits, and authorizations necessary for STARS operations. PMRF complies with Federal standards for water quality and hazardous waste (Miyaska, 1989; Sano, 1989; Waki, 1989; Nelson, 1989); however, three sites may be contaminated by hazardous waste. None of the sites are on the EPA's priority list for remedial measures (U.S. Department of the Navy, 1989; Nelson, 1989).

Installation infrastructure demands are within operating capacity (U.S. Department of the Navy, 1989; Iwamoto, 1989b; The Earth Technology Corporation, 1989), although some concerns have been expressed over the main base sanitary sewer system, which is operating at 6,057 liters (1,600 gallons) per day over design capacity, but is satisfactorily treating the sewage (Fukunaga and Associates Inc., 1989). Land use is in accordance with the installation's Draft Master Plan (U.S. Department of the Navy, 1989). The island of Kauai has a population of approximately 44,000 (U.S. Bureau of the Census, 1988). The island's economy is tourist based, with approximately 1.4 million visitors and a hotel occupancy rate of 67.5 percent in 1988 (Uchiyama, 1989).

Potential impacts on air quality, biological resources, cultural resources, land use, noise, and public health and safety could occur during STARS construction and operational activities. Therefore, more detailed information relevant to understanding these potential impacts is provided in the following sections.

2.6.1 Air Quality

The major air emission sources on PMRF are five diesel-powered generators and various types of rocket launches. The State of Hawaii first approves and then monitors all generators for continued compliance with air emissions standards. From 1981 through 1989, approximately 519 sounding rockets, 481 drones, and 8 hand-held rockets were launched from PMRF (Kagawa 1990c). In addition, KTF launched 28 sounding rockets from 1983 through 1989. Because of the prevailing tradewinds in the vicinity, launch emissions are quickly dispersed and ambient concentrations diluted such that no air quality problems exist. Currently, the island of Kauai is in attainment for all air quality standards (Sano, 1989).

2.6.2 Biological Resources

STARS construction and operational activities at KTF would take place on the west coastal plain of Kauai. This area consists of alluvium, lagoon deposits, calcareous beach, and dune sands. Although extensive sand dunes are adjacent to the northern edge of the STARS launch facility, the terrain within the launch area consists of flattened dunes with very little relief. The surface typically consists of loose sand.

There are no natural streams in the northern part of PMRF. The installation and the adjacent Mana Plain were originally a large marshland that was drained and filled for agriculture. Thousands of linear feet of canals have been excavated to keep the water table below the root zone of sugar cane in the adjacent fields (The Traverse Group, Inc., 1988). These canals provide the only surface water in the area.

Vegetation - The vegetation within KTF is dominated by kiawe/koa haole scrub and ruderal vegetation. Kiawe/koa haole scrub is dominated by the non-native, naturalized, woody species kiawe (*Prosopis pallida*) and koa haole (*Leucaena leucanthemum*). The understory, when present, consists of naturalized shrub and herbaceous species. Clearings in the kiawe are dominated by patchy, non-native, herbaceous species. Ruderal vegetation primarily composed of herbaceous, non-native species is characteristic of disturbed areas, although native species may be present. The ruderal vegetation at KTF is mowed regularly.

The launch pad site to be used for the STARS program is near the western end of KTF (Figure 2-6). Kiawe/koa haole vegetation occurs adjacent to the site. Kiawe dominates the overstory, forming a closed canopy approximately 8 meters (25 feet) high. When present, the understory is composed primarily of Guinea grass (*Panicum maximum*). Other introduced species such as lantana (*Lantana camara*) are present beneath the kiawe in smaller numbers.

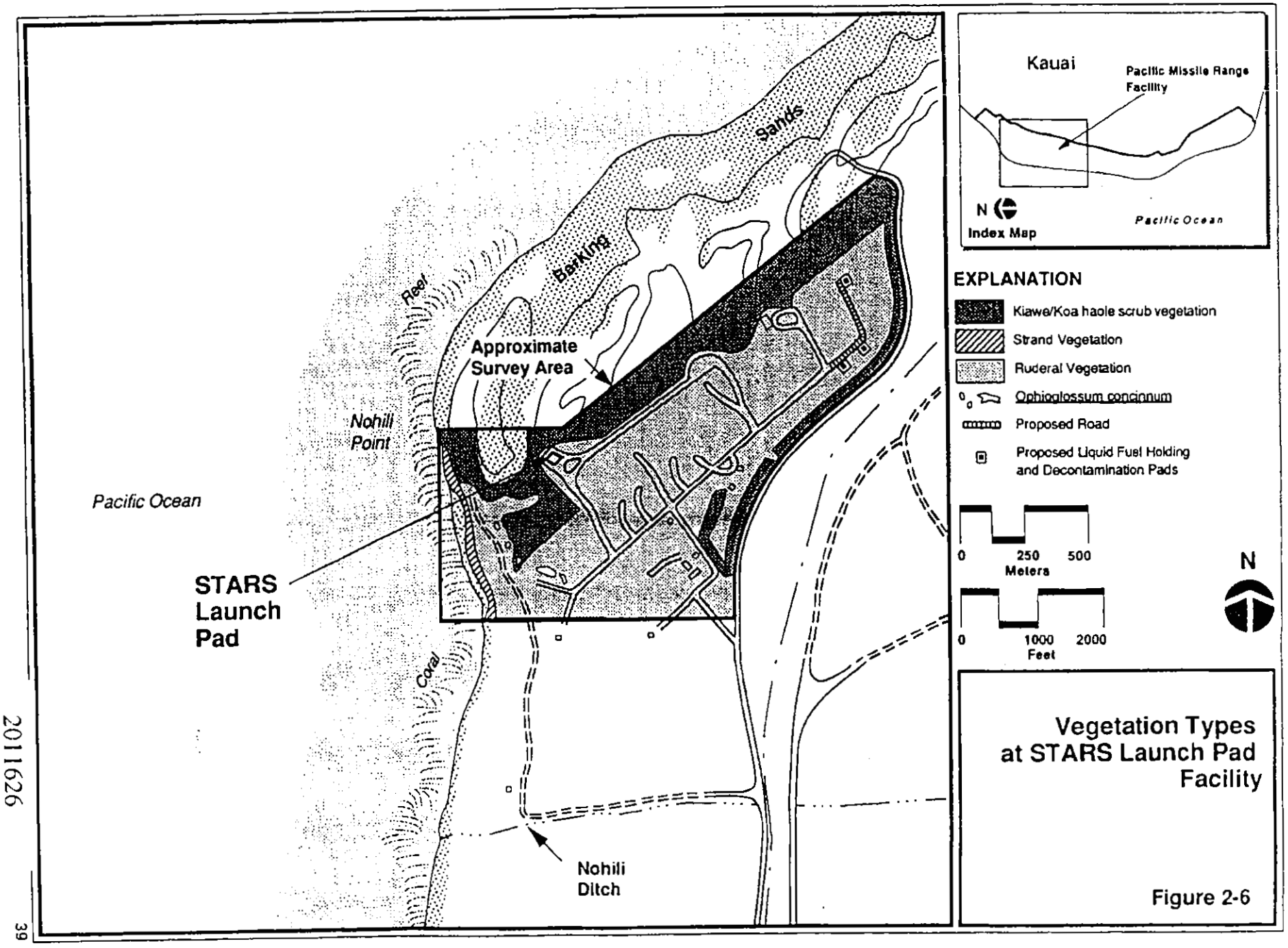
The proposed liquid propellant holding area is near the eastern end of KTF (Figure 2-6). The site contains ruderal vegetation and numerous kiawe seedlings and is generally more disturbed than the ruderal vegetation farther west at KTF.

Wildlife - Forty species of birds have been identified in the area (The Traverse Group, Inc., 1988). Six of these species are endemic to Kauai: the American (Hawaiian) coot (*Fulica americana alai*), black-necked (Hawaiian) stilt (*Himantopus mexicanus knudseni*), common moorhen (*Gallinula chloropus sandvicensis*), Hawaiian duck (*Anas wyvilliana*), Newell's shearwater (*Puffinus newelli*), and short-eared owl (*Asio flammeus sandwichensis*). The remaining 34 species include 24 exotic, 4 migratory, and 6 indigenous species. No rookeries or raptor nest sites were observed during field surveys within PMRF in 1985 (Botanical Consultants, 1985) or surveys in the KTF area in July 1989 and January and February 1990. The only endemic terrestrial species that may occur in the area is the Hawaiian short-eared owl. The exotic bird species are generally common field and urban birds that are often regarded as pests. Several species of game birds, including the ring-necked pheasant, may use the various vegetation types on PMRF.

Thirteen species of mammals are known to inhabit the Island of Kauai. Eleven of these species are exotics and include several feral species. Two species, the Hawaiian monk seal *(Monachus schauinslandi)* and Hawaiian hoary bat *(Lasiurus cinereus semotus)*, are Federally listed as endangered and are discussed below. Most of the rodents and feral mammal populations are controlled through trapping programs conducted by the Navy (The Traverse Group, Inc., 1988).

Threatened and Endangered Species - A Biological Assessment (U.S. Army Strategic Defense Command, 1990) has been prepared for the STARS project in compliance with Section 7 of the Endangered Species Act. The Biological Assessment discusses all federally listed or candidate threatened and endangered species identified in 1990 by the USFWS (Appendix B, page B-8) and National Marine Fisheries Service (Appendix B, page B-9) as potentially occurring in the project area as well as other species in the adjacent region.

One federally listed candidate endangered plant species, *Sesbania tomentosa* (o'hai), may potentially occur within the PMRF. It is known to occur in the dune habitat in Polihale State Park immediately to the north of KTF. However, *S. tomentosa* was not observed in the project area during field surveys conducted



Vegetation Types at STARS Launch Pad Facility

Figure 2-6

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in January and February 1990. Therefore, this species is not expected to be affected by the proposed STARS project activities.

Botanical Consultants (1985) reported the presence of *O. concinnum* in *Dodonea-Nama* scrub vegetation on the southern end of PMRF. *O. concinnum* is a Category 1 candidate endangered species. (This classification refers to taxa for which substantial information on biological vulnerability and threats is on file to support the appropriateness of proposed listing as an endangered or threatened species.) *O. concinnum* is a nonseasonal, ephemeral fern (Brauggman, 1990).

The plant is dormant underground until there is sufficient rainfall for it to send up vegetative and reproductive fronds. These fronds are present for only a few weeks. During the January and February 1990 reconnaissance of the project area, several groups of *O. concinnum* were observed in clearings in kiawe/koa haole scrub and in ruderal vegetation at the western end of KTF.

Endangered bird species that may be present on PMRF include the common moorhen, black-necked (Hawaiian) stilt, American (Hawaiian) coot, and the Hawaiian duck. These species are found only in wetland habitat, which is limited on PMRF. North Nohili ditch drains sugar cane fields adjacent to PMRF/KTF and provides habitat for several waterbird species that may include the common moorhen, black-necked stilt, American coot, and the Hawaiian duck. The common moorhen, black-necked stilt, and American coot were observed at north Nohili ditch, at the Mana-based pond (outside PMRF), during the January and February 1990 field reconnaissance surveys. The Newell's shearwater is Federally listed as threatened and may be present adjacent to PMRF (The Traverse Group, Inc., 1988). The Laysan albatross (*Diomedea immutabilis*) and the wedge-tailed shearwater (*Puffinus pacificus chlororhynchus*) are protected migratory birds that nest on PMRF. During the January 1990 field reconnaissance of the STARS site, approximately six pairs of the Laysan albatross displaying courtship behavior were observed in the KTF area.

Two Federally listed endangered mammal species may be present on PMRF: the Hawaiian monk seal and the Hawaiian hoary bat (The Traverse Group, Inc., 1988). The monk seal has established a colony on Niihau Island, but is considered a "straggler" at PMRF and would not be a potential inhabitant of the area (Naughton, 1990). The Hawaiian hoary bat may occur in the proposed area. This mammal roosts in trees during the day (Baldwin, 1950; Tomich, 1986) and commonly feeds off-shore (Tomich, 1986) on insects concentrated there by breezes (Telfer, 1990a). Hawaiian hoary bats have been observed feeding off-shore of Polihale State Park (Telfer, 1990a). The threatened green sea turtle (*Chelonia mydas*) has been known to come ashore and nest on PMRF on the beach adjacent to base housing in the southern portion of the installation. In addition, the migratory humpback whale (*Megaptera novaeangliae*) passes through the channel between Kauai and Niihau islands. The whales may arrive as early as October, but the general season is between December and April. Peak numbers occur in February (Nitta and Naughton, 1989).

Sensitive and Unique Habitats - The dune area on PMRF is ecologically important and has been designated as such by the County of Kauai. The dunes support a well-developed native strand community. In addition, the drainage canals on PMRF are potentially important waterbird habitat. The remaining marshy areas are residuals of the original large marshland that was drained for sugar cane production and may be important to aquatic birds (The Traverse Group, Inc., 1988).

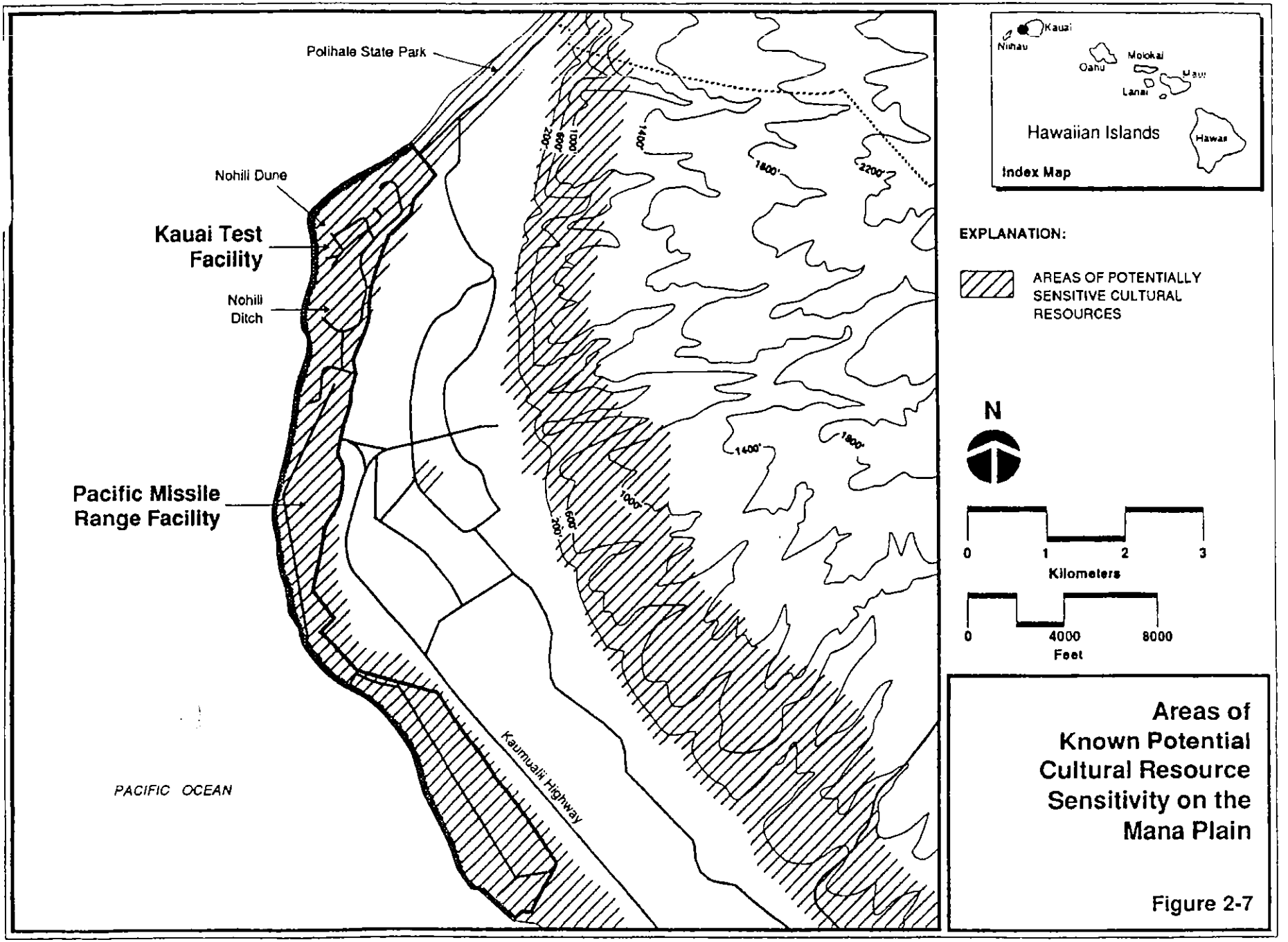
2.6.3 Cultural Resources

PMRF is located within an archaeologically and ethnographically sensitive area of Kauai. This region, known as Mana (Figure 2-7), has been identified in traditional Hawaiian religious cosmology as *leina-a-ka-u'hane*. This term refers to the cliffs or seacoast promontories from which the spirits of the dead would plunge to enter the spiritual realm (Han et al., 1986; Kamakau, 1968). The Nohili Dune, adjacent to the STARS launch facility, is such a seacoast promontory. References to Mana specifically mentioning burial of dead in the Nohili area have been found in recorded Hawaiian oral literature (Fornander 1917, 1969). Traditional Hawaiian mortuary practices also indicate that human burials may be present in the dune areas, such as those adjacent to the project location (Bennett, 1931; Han et al., 1986; Kirch, 1985; Te Rangi Hiora, 1957).

A review of existing archaeological and historical literature, records, and maps in the Bishop Museum, the U.S. Navy's Pacific Division Naval Facilities Engineering Command Planning Department, and the Hawaii SHPO indicates that there are numerous recorded and unrecorded archaeological sites within PMRF and the surrounding area. Three sites recorded by Bennett (1931) and re-recorded by Ching (1974) are adjacent to the northern boundary of PMRF. One of these sites consists of the sandy area extending from Polihale State Park to the northern portion of the installation. Bennett (1931) has described this area as showing evidence of burials and campsites. Although no human remains or traces of habitation were reported during a field survey conducted by Ching (1974), it was recommended that this area be given state archaeological reserve status to ensure its protection from future development (Ching, 1974). The second site is the Elekuna *heiau*, a religious area at Mana located in an inland cove on the eastern side of the Barking Sands dunes (Bennett, 1931). The third site described by Bennett (1931) once consisted of habitation sites along the inland side of the Barking Sands dunes. This site has been destroyed by sugar cane plantation land-clearing activities directly adjacent to KTF (Ching, 1974).

Mapped information indicates that there is a large "major ancient burial ground" in the dune area in northern PMRF (U.S. Department of the Navy, undated). The burial ground area shown on the Navy's map extends from a point on the shoreline approximately 400 meters (1,312 feet) south of the mouth of Nohili ditch into Polihale State Park. The STARS launch facility, at the toe of Nohili dune, is within this burial ground area. An unscaled 1891 land survey map (Imlay, 1891) indicates that a habitation area, Keanapuka, existed directly south of Nohili Point. Existing information indicates that the entire installation could be considered an archaeological site and human burials or archaeological resources may be uncovered anywhere within the PMRF (Hommon, 1989; McMahon, 1989) and the sand dune areas (Bennett, 1931). The PMRF/KTF area is potentially eligible for inclusion on the National Register of Historic Places (Hommon, 1989). Information obtained from the Navy's archaeological map also indicates that there are at least four other areas within PMRF where native Hawaiian burials have been uncovered as a result of natural erosional processes.

An archaeological survey of the western portion of the Nohili ditch, directly southwest of KTF, was conducted in 1979. A subsurface post-hole mold and a fire hearth were observed within the exposed south wall of the ditch bank (Kikuchi, 1979). This survey indicated the potential for archaeological resources in the vicinity of the ditch. An archaeological site directly north of this area was



Areas of Known Potential Cultural Resource Sensitivity on the Mana Plain

Figure 2-7

identified during surveys conducted in January 1990. Dark, shell-laced, midden soil and several earth-ovens *(imus)* were observed at this site. Other items noted were a stone adze blade-tip fragment and a tiger cowry shell octopus lure. Human bone fragments were also observed in the eroding dune ledge at this site (Advanced Sciences, Inc., 1990b). Subsequent ground-penetrating radar scans of this area by the U.S. Soil Conservation Service and the Hawaii SHPO have confirmed this finding (Doolittle, 1990; McMahon, 1990a). An 1874 land survey map (Gay, 1874) indicates that a settlement named Moeleoa was located within this area, which is approximately 0.95 kilometer (3,117 feet) from the STARS launch facility.

The State of Hawaii's Coastal Management Program has designated the dunes and adjacent sandy beach areas in the northern portion of PMRF as "moderately sensitive." The designation is based on the potential for the presence of human burials and paleontological remains (The Traverse Group, Inc., 1988). Key Navy facilities planning staff at Pearl Harbor and PMRF have indicated that there could be considerable potential for the inadvertent disturbance of burials and archaeological materials during ground-disturbing operations at PMRF (Hommon, 1989; Iwamoto, 1989c). Archaeologists and sources within the Hawaiian community have given similar indications (McMahon, 1989, 1990b; Pantalea, 1989; Manina, 1989; Panui, 1989).

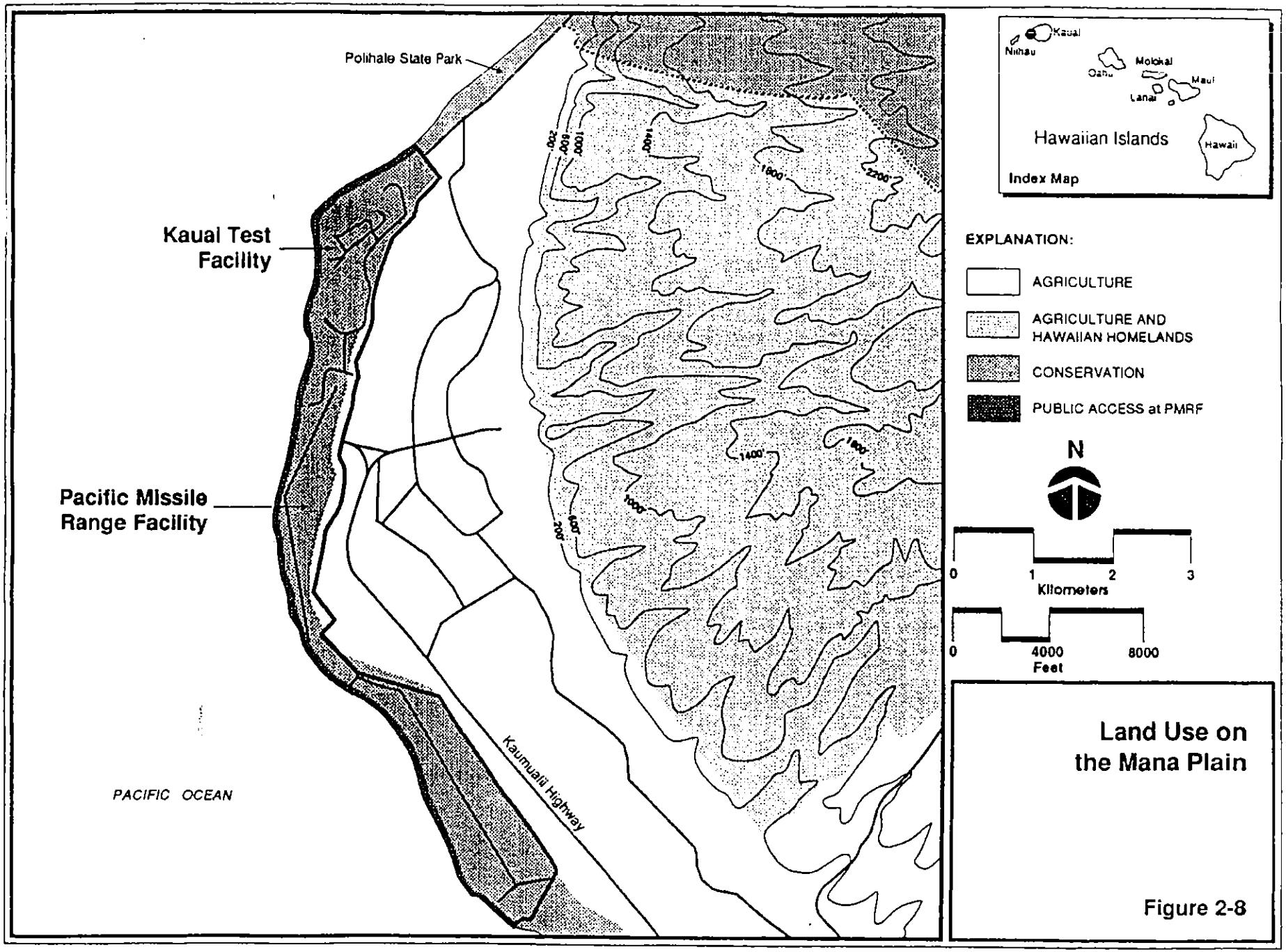
The information compiled thus far indicates that the area within the vicinity of the Nohili dune has been previously occupied. Thus, the potential for discovery of subsurface cultural resources anywhere within this area during ground disturbing operations is possible.

2.6.4 Land Use

Land use on Kauai is governed by both state and county land use controls. The state has created general land use districts, and the County of Kauai has detailed these general districts in its land use plan. The State of Hawaii has classified lands into four categories: urban, rural, agricultural, and conservation (Figure 2-8).

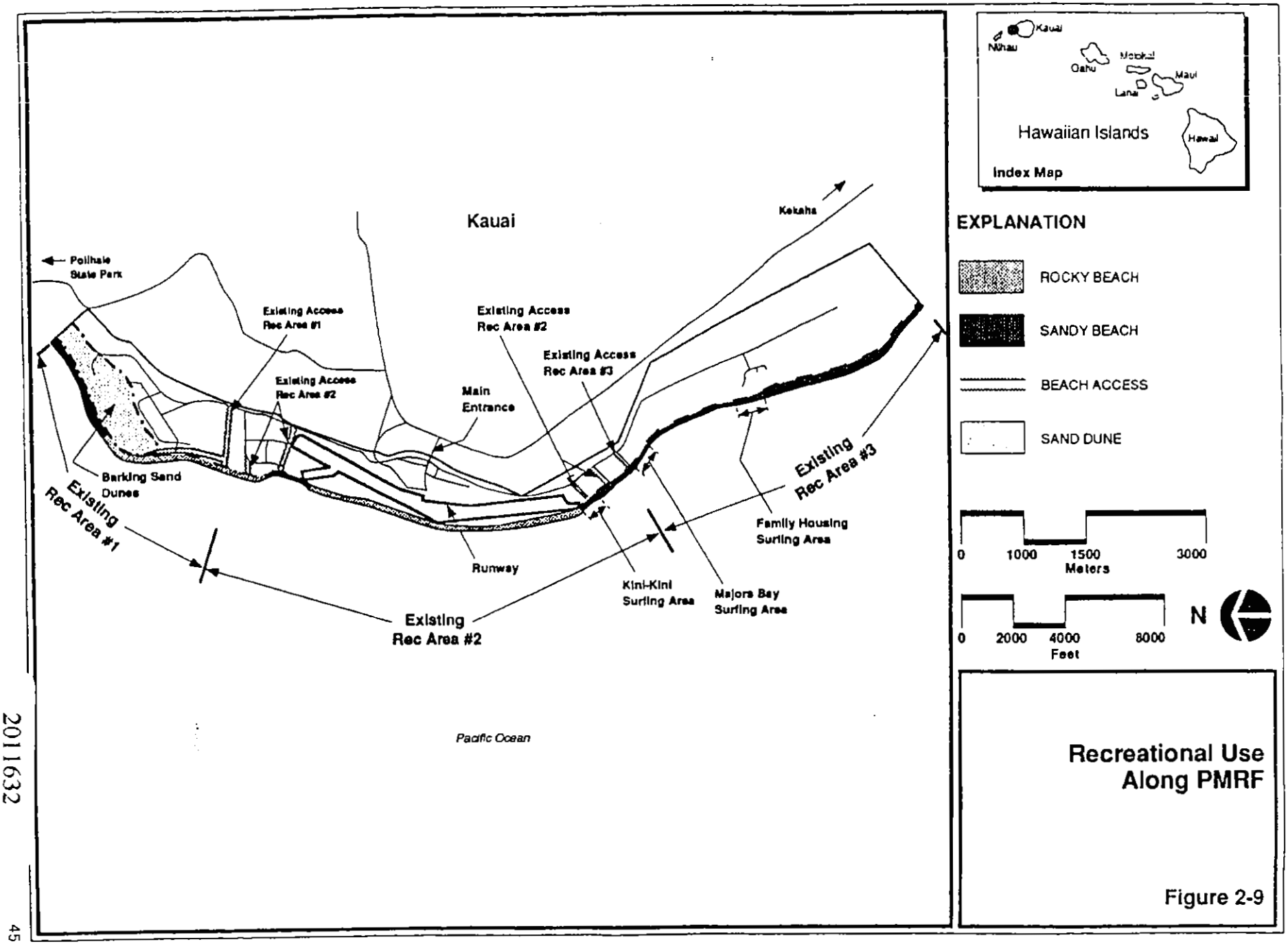
PMRF has been designated as conservation land in the state plan. Conservation lands include areas necessary for protecting watersheds, scenic and historic areas, parks, wildernesses, forest reserves, recreational areas, and habitats of endemic plants, fish, and wildlife. This district also includes lands subject to flooding and soil erosion (State of Hawaii, undated). PMRF occupies 779 hectares (1,925 acres) of state-owned land that was transferred to the installation under two executive orders (The Traverse Group, Inc., 1988). Both executive orders made the transfer conditional, with the understanding that public access to PMRF's coastline be allowed.

To maintain public access, PMRF has divided its coastline (approximately 30 meters [100 feet] wide and 13 kilometers [8 miles] long) into three recreational areas designated recreation areas 1, 2, and 3 (Figure 2-9). Except when closed for hazardous operations, Recreation Area 1 is open Monday through Friday from 4:00 pm to 6:00 am, Recreation Area 2 is open from 6:00 pm to 6:00 am, and Recreation Area 3 is open 24 hours a day. All three recreation areas are open 24 hours a day on weekends and holidays. Additional closure times occasionally occur when hazardous operations are being conducted. These additional closure times average 6 days per year for KTF operations (Talbert 1990) near Recreation Area 1. Most PMRF operations take place during the times these areas are normally closed.



Land Use on the Mana Plain

Figure 2-8



Recreational Use Along PMRF

Figure 2-9

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Table 2-1 displays the specific recreation area(s) on PMRF requested by visitors in the period between 9 November 1987 and 31 August 1989. Recreation Area 3 was requested most frequently (49.11 percent of the time), followed by Recreation Area 1 (10.25 percent) and Recreation Area 2 (6.40 percent). The most popular activities at these recreation areas are surfing (37.60 percent), fishing (31.40 percent), and general beach activities (14.75 percent).

Developed land on KTF contains launch complexes and support facilities. Navy support facilities in the central portion of the base include an aircraft maintenance hangar, an aircraft runway (1,828 meters [6,000 feet] long), storage facilities, administrative support and technical facilities, and the main entrance. Bachelor's quarters and family housing are in the southern portion of the facility (U.S. Department of the Navy, 1989) and the KTF Kokole Point launch facility is on the southernmost portion of PMRF.

Lands off base to the north and south are also designated as conservation land in the state plan. Polihale State Park (approximately 56.7 hectares [140 acres]), north of PMRF, is included in this conservation area and currently supports day-use (371,000 annual visitors in 1988) recreational activities and overnight camping (1,140 permits issued in 1988 [Niitini, 1989]). South of PMRF is the approximately 25-hectare (63-acre) Kekaha Sanitary Landfill (U.S. Department of the Navy, 1989). The land to the east of PMRF is designated as agricultural land and is currently owned by the state and leased to the Kekaha Sugar Company (11,220 hectares [27,724 acres]) for the production of sugar cane (The Traverse Group, Inc., 1988; Lee, 1990).

The leased Kekaha sugar cane fields in the mountains east of the Mana Plain are designated homelands by the state (Figure 2-8). The County of Kauai has designated PMRF a Federal facility. The land to the east of the base has been designated as agricultural land, and the lands to the north and south are designated as open space. The county also classified the sand dunes at the northern end of PMRF as a special treatment district because of potential paleontological remains. In addition, the dunes (Figure 2-7) are identified as a scenic ecological area because of their developed native strand community (The Traverse Group, Inc., 1988).

2.6.5 Noise

The primary noise sources on PMRF are aircraft operations and rocket launches. A review of PMRF facilities and surrounding land uses indicates that all facilities are sited in acceptable noise level areas. There are no nonconforming facilities in areas where day-night sound (Ldn) levels exceed 75 decibels on the A-weighted scale (dBA). However, all facilities in areas where the dBA levels are in the 65- to 75-Ldn contour range (surrounding the aircraft runway) have a noise level reduction of 25 to 35 dBA. Air Installation Compatible Use Zones have been established and noise associated with air operations has been monitored (U.S. Department of the Navy, 1979). Noise levels of rocket launches out of PMRF have not been monitored. The nearest off-base residential area is Kekaha, which is approximately 13 kilometers (8 miles) away; no noise complaints have been noted for previous launch operations (U.S. Department of the Navy, 1989).

TABLE 2-1. RECREATIONAL LAND USE AT PMRF

9 NOV 1987 - 31 AUG 1989

RECREATION AREA PERMIT REQUESTS*		RECREATION USE AT PMRF									
		CAMP	FISH	MODEL PLANE	SURF	VISIT	OTHER	BEACH	DIVING	FISH/ SURF	TOTAL
1	% USAGE	1.97%	38.32%	0.07%	10.21%	24.87%	0.76%	23.68%	0.13%	0.00%	100.00%
	PERSONS	88	1715	3	457	1113	34	1060	6	0	4476 (10.25%)
2	% USAGE	2.75%	68.23%	6.55%	7.55%	8.12%	1.61%	4.83%	0.36%	0.00%	100.00%
	PERSONS	77	1907	183	211	227	45	135	10	0	2795 (6.40%)
3	% USAGE	1.05%	10.44%	6.96%	57.66%	5.98%	0.93%	16.92%	0.02%	0.04%	100.00%
	PERSONS	226	2239	1494	12370	1282	199	3629	4	9	21452 (49.11%)
1 and 2	% USAGE	5.66%	84.73%	0.34%	1.72%	1.72%	0.00%	5.83%	0.00%	0.00%	100.00%
	PERSONS	33	494	2	10	10	0	34	0	0	583 (1.33%)
1 and 3	% USAGE	3.28%	55.33%	0.00%	4.51%	11.48%	1.64%	23.77%	0.00%	0.00%	100.00%
	PERSONS	8	135	0	11	28	4	58	0	0	244 (0.56%)
2 and 3	% USAGE	0.08%	37.99%	0.27%	48.35%	3.11%	1.94%	7.89%	0.34%	0.04%	100.00%
	PERSONS	2	1001	7	1274	82	51	208	9	1	2635 (6.03%)
1,2, and 3	% USAGE	1.02%	54.85%	0.58%	18.32%	7.37%	6.17%	11.62%	0.00%	0.07%	100.00%
	PERSONS	114	6157	65	2057	827	693	1305	0	8	11226 (25.70%)
OTHER	% USAGE	0.75%	32.96%	7.12%	11.61%	9.74%	32.96%	4.87%	0.00%	0.00%	100.00%
	PERSONS	2	88	19	31	26	88	13	0	0	267 (0.61%)
TOTAL	% USAGE	1.26%	31.45%	4.06%	37.60%	8.23%	2.55%	14.75%	0.07%	0.04%	100.00%
	PERSONS	550	13736	1773	16421	3595	1114	6442	29	18	43678 (100.00%)

* Recreation Area access permits were requested for a specific area or combination of areas. The usage shown in the table for a combination of areas is not cumulative.

Reference: PMRF Unofficial Visitor Pass Records 11/9/87 - 8/31/89

2.6.6 Public Health and Safety

PMRF contains an installation explosive storage area, launch facilities, aircraft restrictive zones, and a small arms range (Figure 2-10). The PMRF magazine (maximum 13,608 kilograms [30,000 pounds] explosive weight) area is located off base at Kamokala Ridge, approximately 3 kilometers (2 miles) east of the main gate. The launch facilities, explosive storage areas, small arms firing range, and aircraft restrictive zones have ESQDs or clearance areas identified (U.S. Department of the Navy, 1989).

The KTF self-sufficient launch complex includes launch sites, missile assembly buildings, and the rocket staging area. In addition, KTF operates one launch pad (Kokole Point) at the southern end of PMRF. These facilities are surrounded by 381-meter (1,250-foot) ESQD arcs when used for launches. Four of these arcs extend off base (Figure 2-10). Currently, 762-meter (2,500-foot) and 914-meter (3,000-foot) launch hazard arcs surround the rocket launch pads on KTF during hazardous operations (U.S. Department of the Navy, 1989) and all military personnel and the public are cleared from the area prior to launches (approximately nine times a year). A launch hazard arc is the radius beyond which no debris from a deliberate destruct action of a missile is expected to fall. No inhabited structures are located within the off-base section of the arc (Sandia National Laboratories, 1988).

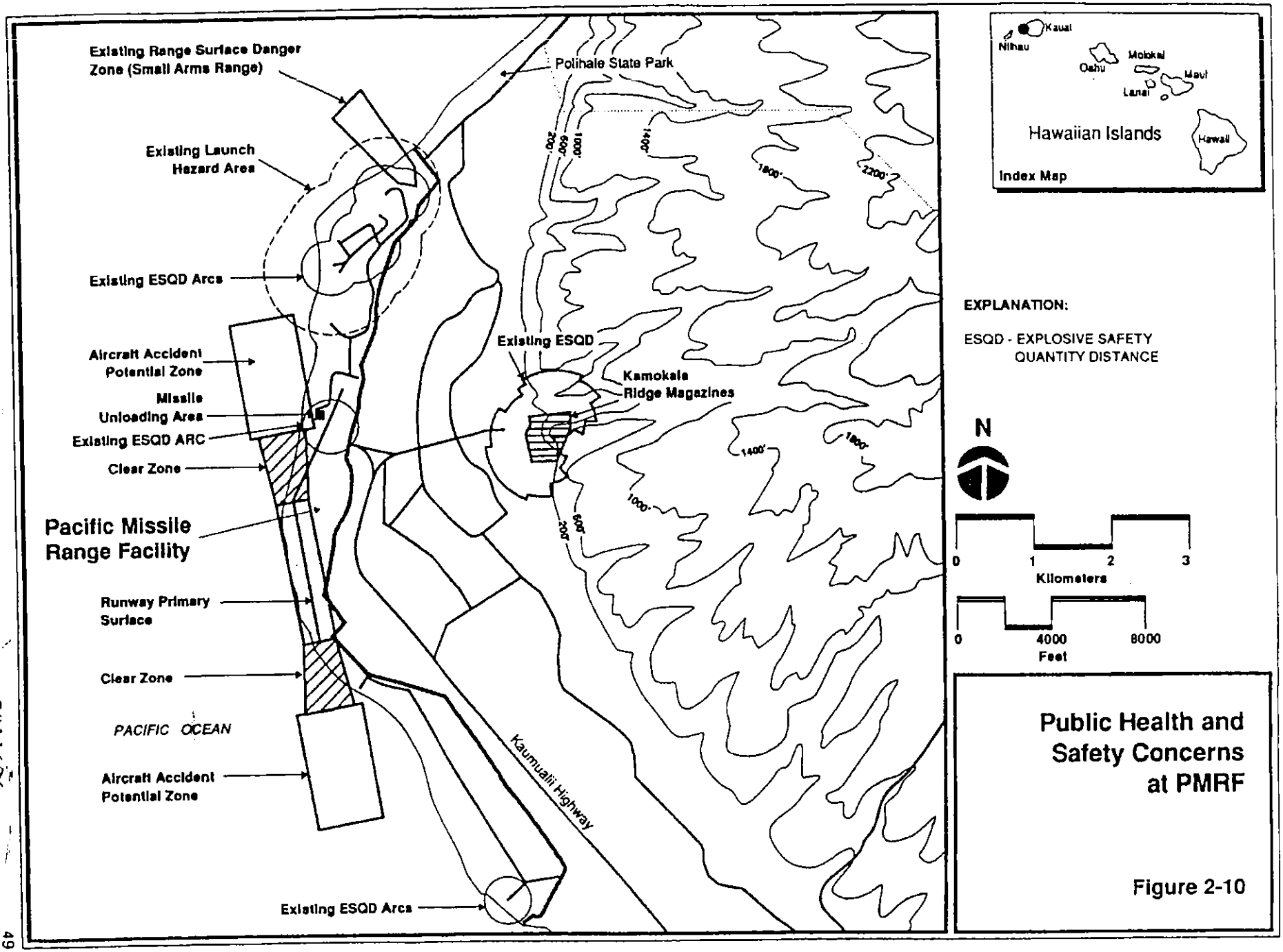
ESQDs are established in accordance with DOD Standard 6055.9. Hazardous operations are governed by existing PMTC/PMRF practices and must be in accordance with KTF Standard Operating Procedure No. 17700 8707, which defines operating requirements and responsibilities for all personnel on KTF.

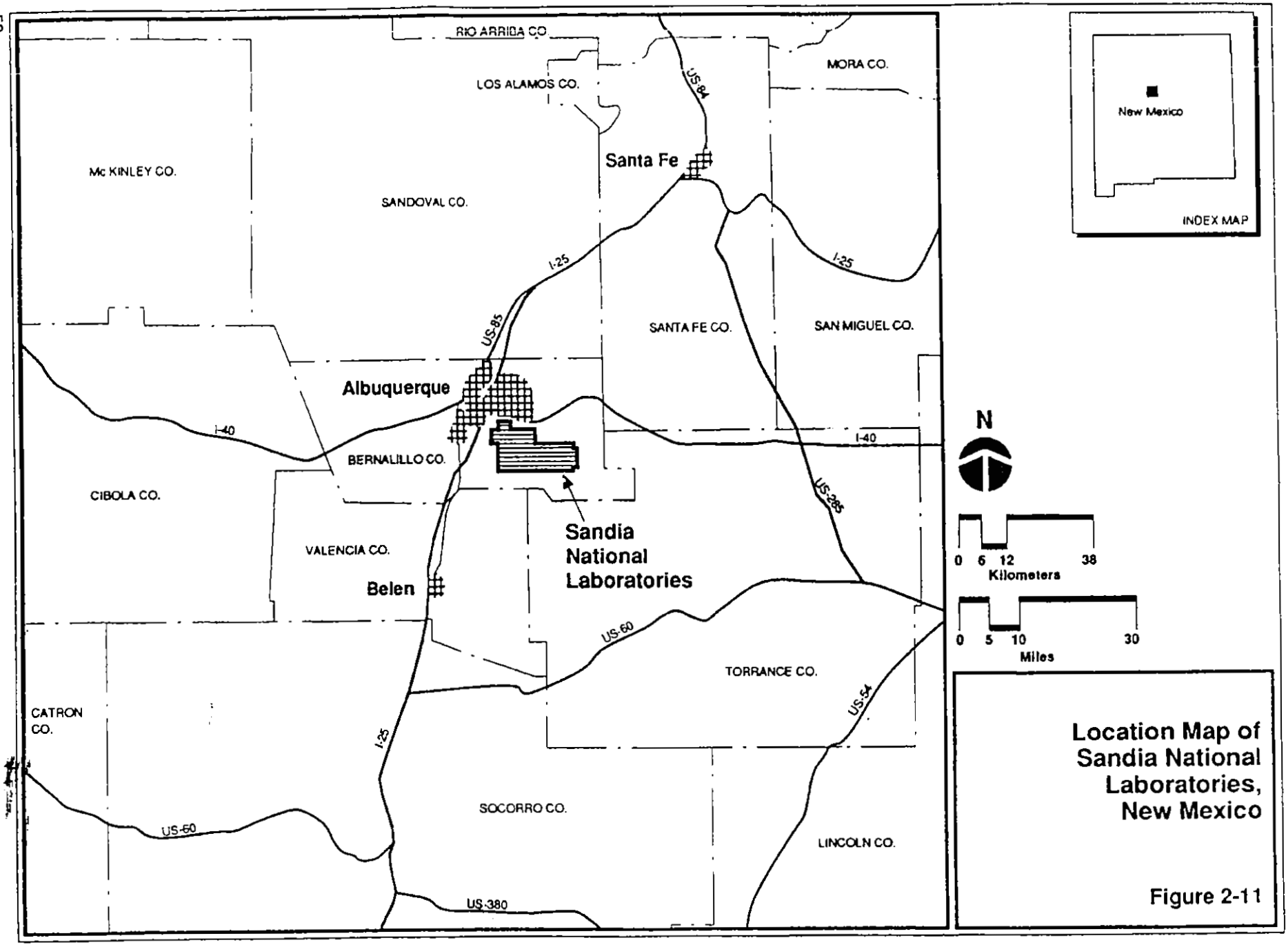
2.7 SANDIA NATIONAL LABORATORIES

SNL is on Kirtland AFB, south and east of Albuquerque, New Mexico (Figure 2-11). The laboratories consist of five technical areas where research and development of weapons systems, limited assembly of weapons system components, and other related activities are conducted (Millard et al., 1986). Approximately 7,300 personnel are currently employed at this facility.

The installation complies with all applicable Federal, state, and local permits and authorizations necessary for STARS operations. SNL complies with Federal standards for water quality, hazardous materials, and air quality, although it is located within a nonattainment area for carbon monoxide (Energy Research and Development Administration, 1977; Millard et al., 1986; Reddick, 1988b, 1989). No threatened or endangered species or cultural resources are known to exist on the installation (Advanced Sciences Inc., 1987; Burton, 1988; Energy Research and Development Administration, 1977). Infrastructure demands are within capacity (Advanced Sciences Inc., 1987; Energy Research and Development Administration, 1977; Millard et al., 1986; Burnett 1987a, 1987b; Easely 1987; Schaeffer 1987; Reddick, 1989).

The installation has no noise problems, but fire, explosions, release of toxic and radioactive materials, aircraft crashes, electrical failures, and high-power microwave emissions have been identified as public health and safety issues (Advanced Sciences Inc., 1987). The surrounding communities in Bernalillo County have a combined population of approximately 475,000 (U.S. Bureau of the Census, 1988).


Existing Range Surface Danger Zone (Small Arms Range)
Existing Launch Hazard Area
Existing ESQD Arcs
Aircraft Accident Potential Zone
Missile Unloading Area
Existing ESQD ARC
Clear Zone
Pacific Missile Range Facility
Runway Primary Surface
Clear Zone
PACIFIC OCEAN
Aircraft Accident Potential Zone
Existing ESQD Arcs
Polihale State Park
Existing ESQD
Kamokala Ridge Magazines
Kaumualii Highway
200'
600'
1000'
1400'
1800'
2200'
Kauai
Niihau
Oahu
Molokai
Maui
Lanai
Hawaii
Hawaiian Islands
Index Map
EXPLANATION:
ESQD - EXPLOSIVE SAFETY QUANTITY DISTANCE
N
0 1 2 3
Kilometers
0 4000 8000
Feet
Public Health and Safety Concerns at PMRF
Figure 2-10



Location Map of Sandia National Laboratories, New Mexico

Figure 2-11

2.8 U.S. ARMY KWAJALEIN ATOLL

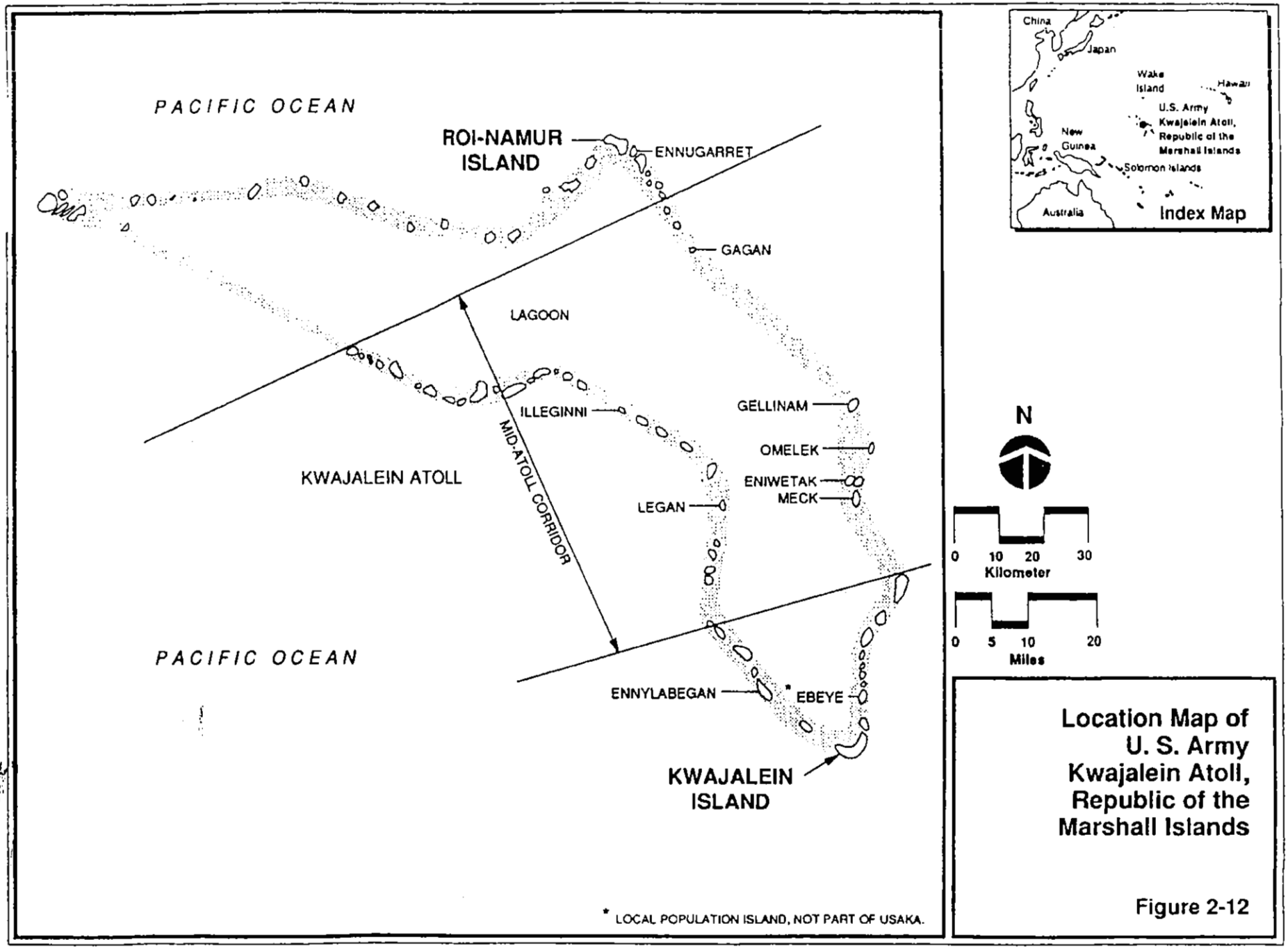
USAKA is within the Ralik Chain in the western portion of the Marshall Islands, in the west-central Pacific Ocean southwest of Hawaii (Figure 2-12). The Marshall Islands were previously administered by the United States under a strategic trust established by the United Nations (Office of Micronesian Status Negotiations, 1984). The Compact of Free Association between the United States and the Republic of the Marshall Islands (U.S. Public Law 99-239) was bilaterally implemented by the signatories on October 21, 1986, recognizing the sovereignty of the Republic of the Marshall Islands. The United States, in the conduct of its activities in the Marshall Islands, applies standards substantively similar to certain U.S. environmental standards; however, alternate standards that are fully protective to health, safety, and the environment are being developed in consultation with the Republic of the Marshall Islands and the EPA, as envisioned in Section 161 of the Compact.

Kwajalein Atoll consists of a very large interior lagoon (2,850 square kilometers [1,100 square miles]) surrounded by approximately 100 component islands/islets. USAKA includes 11 leased islands (Kwajalein, Roi-Namur, Ennylabegan, Meck, Gagan, Gellinam, Omelek, Enlwetak, Legan, Ennugarret, and Illeginni) and a mid-atoll corridor (Figure 2-12). This corridor and the islands/islets it contains are subject to certain safety restrictions on access during range up-time. Facilities are located on all USAKA-leased islands except Ennugarret. U.S. citizens live on Kwajalein and Roi-Namur Islands; the Marshallese residents live on several islands outside the mid-atoll corridor.

The primary mission of USAKA is to support operational and developmental missile flight testing for DOD research and development efforts. Technical facilities on USAKA include multiple launch facilities and numerous supporting elements, such as tracking radar, optical instrumentation, satellite communications, and telemetry stations (Pan Am World Services, Inc., 1988).

Air quality is generally good on Kwajalein and Roi-Namur islands because of their low profile, constant trade winds, and the few sources of air pollutants. USAKA's few stationary pollution sources cause localized air quality impacts (U.S. Army Strategic Defense Command, 1989). Solid and hazardous materials and waste handling and disposal practices are an acute problem at USAKA, as is adequate water supply. The installation infrastructure on both Kwajalein and Roi-Namur islands is operating at capacity, and land use is in accordance with the installation's Draft Master Plan (U.S. Army Corps of Engineers, 1988). Water quality is a constant concern because of the uncertainty of rainwater supply and the limited amount of fresh water in the groundwater lens. Water conservation practices are a necessary and routine part of life at USAKA. Marine water quality around USAKA has been satisfactory except in a few localized areas (U.S. Army Strategic Defense Command, 1989).

One Federally listed endangered species, the hawksbill turtle; one threatened species, the green sea turtle; and two rare species, the giant clam and sea grass, have been observed in Kwajalein Atoll. There are some known prehistoric sites on Kwajalein Island. Kwajalein and Roi-Namur islands are listed as World War II battlefields on the National Register of Historic Places, and both islands have been designated National Historic Landmarks (U.S. Army Strategic Defense Command, 1989).



Location Map of U. S. Army Kwajalein Atoll, Republic of the Marshall Islands

Figure 2-12

Noise is usually not a problem on Kwajalein and Roi-Namur islands. The principal noise sources are aircraft operations, power plant operations, and missile launches from several of the populated and unpopulated islands. Public health and safety at USAKA is of concern because USAKA encompasses the takeoff or splashdown zones for some of the most sophisticated weapons systems in the nation's arsenal. Electromagnetic radiation (EMR) is emitted from USAKA's many radar and communication facilities. A well-defined program to protect inhabitants from hazards and from EMR is in place at USAKA. All personnel at USAKA are either employed in support of the defense mission or are dependents of those employed at USAKA. Currently, there is a shortage of adequate family and unaccompanied personnel housing at USAKA.

A detailed discussion of existing environmental conditions at USAKA is presented in the Final Environmental Impact Statement, Proposed Actions at U.S. Army Kwajalein Atoll (U.S. Army Strategic Defense Command, 1989).

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3.0 ENVIRONMENTAL CONSEQUENCES AND MITIGATIONS

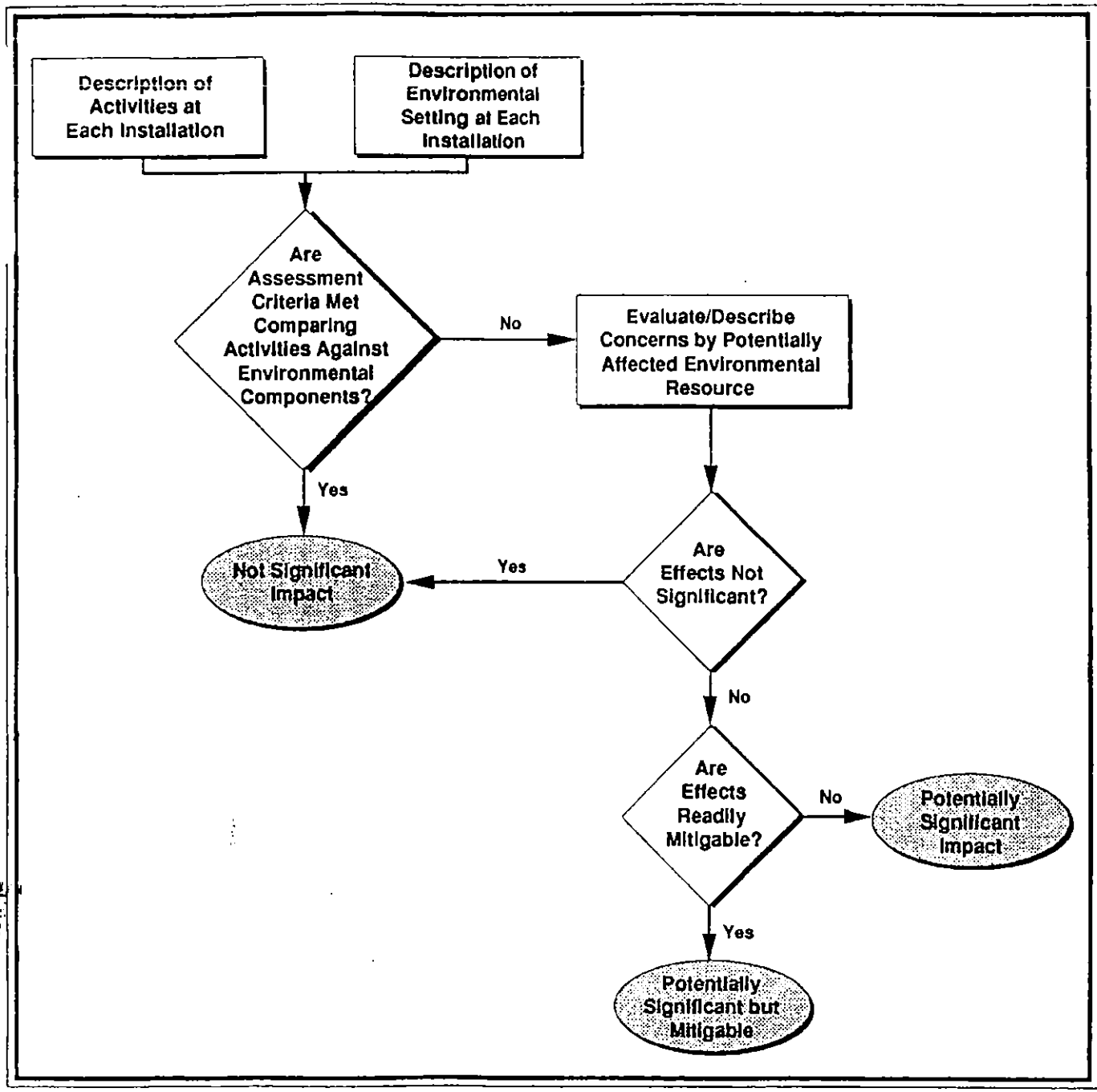
This section discusses the assessment of the significance of potential environmental consequences of the proposed STARS program activities and identifies appropriate mitigation measures. Any environmental documentation that addresses the type of activities proposed for the installations is identified and incorporated by reference.

A three-step approach was used in assessing the potential for and significance of the impacts from the STARS program activities (Figure 3-1): (1) describe the program activities proposed for each installation (Section 1.0), (2) compare program activities to the ten environmental components (described in Section 2.0) and apply the assessment criteria (see below), and (3) determine the potential that the proposed activities will cause significant impacts. Activities were determined to have no potential for significant environmental consequences if they met all of the following assessment criteria:

- The installation and its associated infrastructure are determined to be adequate to support the proposed activity (i.e., the test can be conducted without new construction, excluding minor modifications) and therefore no new emission to the air or water environments and no ground disturbance will occur.
- The current installation staffing is adequate to conduct the test(s), excluding minor staff-level adjustments.
- The resources of the surrounding community are adequate to accommodate the proposed testing.
- The activities do not constitute a violation of Federal, state, or local laws or regulations imposed for the protection of the environment (see Appendix A).
- The activities do not adversely affect public health or safety.
- The activities do not adversely affect or result in the loss of unique environmental, scientific, cultural, or historical resources (i.e., parklands, prime farmlands, wild and scenic rivers, ecologically critical areas, etc.).
- The activities are not highly uncertain and do not involve unknown risk.
- The activities do not result in irreversible and irretrievable commitments of unique or important environmental resources.

If it was determined that a proposed program activity presented a potential for impact, i.e., if one or more of the above criteria are not met, then the potential for the proposed activities to cause significant impacts was evaluated. The determination of significance included considering the intensity, extent, and context in which the impact occurs:

- **Intensity** is based on relative changes to the criteria noted above
- **Extent** is based on the relative amount of the change in the area/quantity and/or the duration of recovery from the impact



Approach for Assessing Impact Significance

Figure 3-1

- **Context** may be defined at the site-specific, local, regional, or national scale.

As a result of that evaluation, consequences were categorized as not significant, potentially significant but mitigable, or potentially significant. Environmental consequences were determined to be **not significant** if, in the judgment of the preparers of this document or as concluded in existing environmental documentation of similar actions, no potential for significant environmental impacts exists. Consequences were deemed **potentially significant but mitigable** if concerns exist but it was determined that all potential consequences could be readily mitigated through standard procedures or by measures recommended in this and previous environmental documentation. In this EA mitigation includes (1) avoiding the impact altogether by not taking action or parts of an action; (2) minimizing impacts by limiting the degree or magnitude of the action and its implementation; (3) rectifying the impact by repairing, rehabilitating, or restoring the affected environment; (4) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; or (5) compensating for the impact by replacing or providing suitable resources or environments. If consequences exist that could not be readily mitigated, the activity was determined to present **potentially significant** environmental impacts.

Federal environmental laws and regulations were reviewed to assist in developing criteria for determining the significance of environmental impacts (if any) under the NEPA. The relevant environmental regulations for the ten components studied in this EA are described in Appendix A.

A public information exchange meeting was held in Kekaha, Kauai, on June 14, 1990. The concerns expressed by the public at the meeting were considered in evaluating the potential impacts.

Cumulative impacts result from the incremental impacts of the proposed action when added to other past, present, and reasonably foreseeable future actions (40 CFR 1508.7). Thus, they are the combined impacts resulting from all programs occurring simultaneously at a given location or in the surrounding area. Therefore, for each location affected by the proposed action, care was taken to identify other past and ongoing, present, and planned actions that might also impact the environmental components potentially affected by the proposed action and thus require the consideration of cumulative impacts. Personnel at each installation provided information about past, current, and future projects. The potential for known non-Federal projects to contribute to the cumulative effects of the STARS program was also considered in the evaluation. The only potential for cumulative impacts identified was for construction, flight preparation, and launch/flight/data collection activities at PMRF and KTF. The potential for cumulative impacts was addressed for the appropriate environmental components for each STARS activity.

Sections 3.1 through 3.7 provide a discussion of the potential environmental consequences for each proposed STARS activity. The amount of detail presented in the following sections is proportional to the potential for impacts. Section 3.8 provides a cumulative impact summary. Sections 3.9 through 3.15 provide discussions of the following: environmental consequences of the no-action alternative; any conflicts with Federal, regional, state, local, or Indian

tribe land-use plans, policies, and procedures; energy requirements and conservation potential; natural or depletable resource requirements; adverse environmental effects that cannot be avoided; the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity; and any irreversible or irretrievable commitment of resources resulting from STARS program activities.

3.1 DESIGN

STARS design activities would involve the conceptualization and development of all features of the STARS program. These activities include the design of the third-stage ORBUS-1 motor by United Technologies and the development of the third-stage skin, payloads, and electronic components by SNL.

STARS design activities would take place in existing facilities routinely used for these types of operations. Because no ground disturbance would occur, there would be no indirect impacts to biological resources, cultural resources, or land use, and no indirect impacts have been identified for these resources for design activities. No additional personnel would be required for these activities; therefore, no infrastructure or socioeconomic impacts would occur. STARS design activities would not emit any air pollutants into the atmosphere or create any noise concerns. No hazardous waste, water quality, or public health and safety issues are expected from these activities.

All of the assessment criteria for a determination of no significant impacts are met for STARS design activities.

Cumulative Design Impacts - The design activities were reviewed in conjunction with current and planned actions and information regarding anticipated future projects, and no cumulative impacts were identified.

3.2 BOOSTER MOTOR REFURBISHMENT AND TESTING

Booster refurbishment would involve the refurbishment of the first stage of the STARS booster by Aerojet Solid Propulsion Division and of the second stage by Hercules Inc., and a routine static firing test of the first and second stages would be performed at an installation to be selected. These installations are routinely used for the types of activities planned for the STARS program. All STARS activities would be conducted in existing facilities. Because no ground disturbance would be involved, there would be no direct impacts on biological resources, cultural resources, or land use, and no indirect impacts have been identified. No additional personnel would be required for these activities; therefore, no infrastructure or socioeconomic impacts would occur.

No air quality or noise impacts have been identified for STARS refurbishment activities, except at the static testing installation. At that installation, static engine testing of the first- and second-stage boosters would result in the release of emissions. However, the installation would be required to meet all Federal, state, and local environmental and public health and safety standards, regulations, and permit requirements.

STARS refurbishment activities would involve the use of cleaning solvents at the installations (Section 1.3.2). However, these solvents are routinely used at the facilities for other programs and all solvents are disposed of in accordance

with the installation's RCRA permits. Therefore, no additional hazardous waste impacts would occur. All installations involved in STARS activities are currently in compliance with RCRA permits. Transportation of booster motors between the refurbishment and testing locations would be in accordance with BOE-6000-1.

All of the assessment criteria for a determination of no significant impacts are met for the STARS booster motor refurbishment and testing activities.

Cumulative Impacts - STARS activities were reviewed in conjunction with current and planned actions and information regarding anticipated future projects, and no cumulative impacts were identified.

3.3 FABRICATION/ASSEMBLY/TESTING

Fabrication/assembly/testing would involve the fabrication and assembly of the third-stage ORBUS-1 motor by United Technologies, assembly and testing of the first and second stages at Hill AFB, and the fabrication and assembly of the third-stage skin, payloads, and electronic components by SNL. The types of activities planned for the STARS program are routine at these installations and all STARS activities would take place in existing facilities. Because no ground disturbance would be involved, there would be no direct impacts on biological resources, cultural resources, or land use, and no indirect impacts have been identified. No additional personnel would be required for these activities; therefore, no infrastructure or socioeconomic impacts would occur. No air quality or noise impacts have been identified and no public health and safety or water quality issues are expected as a result of STARS fabrication/assembly/testing activities.

STARS fabrication/assembly/testing activities would involve the use of cleaning solvents at the installations (Section 1.3.3). However, these solvents are routinely used at the facilities for other programs and all solvents are disposed of in accordance with the installation's RCRA permits. Therefore, no additional hazardous waste impacts would occur. All installations involved in STARS activities are currently in compliance with RCRA permits. Booster motors and related components would be transported from Hill AFB to SNL in accordance with BOE-6000-1.

All of the assessment criteria for a determination of no significant impacts are met for the STARS fabrication/assembly/testing activities.

Cumulative Impacts - STARS activities were reviewed in conjunction with current and planned actions and information regarding anticipated future projects, and no cumulative impacts were identified.

3.4 CONSTRUCTION

The STARS program would require the construction of a new liquid propellant holding facility and interim hazardous waste staging area at PMRF. STARS construction activities would use existing KTF construction personnel; therefore, no impacts to existing infrastructure would occur. The new facilities would be adjacent to existing launch and support facilities and would be part of the installation's current mission; therefore, no land use impacts would occur.

No hazardous waste, public health and safety, or water quality issues have been identified.

The facility, which would be constructed in a previously disturbed area, would consist of three separate shelters. Preliminary design specifies two shelters (one for hydrazines and one for N_2O_4) to be approximately 2.4 by 3 meters (8 by 10 feet) and one shelter (decontamination pad and interim hazardous waste staging) to be approximately 3 by 6 meters (10 by 20 feet). The concrete holding pads would be open structures with shade covers to protect the materials from direct solar radiation. The pads would also be designed with catchment basins to contain any inadvertent spills to the pad area. A paved road would extend to each site and the area would be protected by security fencing.

Existing STARS launch and preflight facilities were constructed in accordance with the Preliminary Environmental Assessment Intermediate Range Booster System (IRBS) Facilities (Nevada Operations Office, 1986).

All of the assessment criteria for a determination of no significant impacts are met for the STARS construction activities, except for biological and cultural resources. Consequently, these issues are discussed in more detail below.

Cumulative Impacts - STARS construction activities were reviewed in conjunction with current and planned actions and information regarding anticipated future projects, and no cumulative impacts were identified.

3.4.1 Biological Resources

Vegetation - Construction of the payload liquid propellant holding area would affect non-native ruderal vegetation. Approximately 0.16 hectare (0.4 acre) would be removed by construction activities. The ruderal vegetation in the area of the proposed construction has been previously disturbed and is regularly mowed. Using data obtained during the field surveys and the significance criteria described in Section 3.0, the impact of STARS construction activities on this non-native vegetation is not expected to be significant.

The construction may potentially have impacts on *O. concinnum*. Based on data collected during field surveys, this species is known to occur in ruderal vegetation on the western end of KTF. These impacts could include the removal of individual plants during the construction of the concrete pads and the access road and compaction or trampling of individual plants adjacent to the construction site. The impacts would be mitigable by monitoring the proposed construction site following significant rainfall, siting the payload liquid propellant holding area to avoid any *O. concinnum* observed in the area, or transplanting the plants to another location with suitable habitat if individuals of the species are observed in the construction area. The STARS Biological Assessment (U.S. Army Strategic Defense Command, 1990) discusses in more detail the occurrence of *O. Concinnum* in the project area and the anticipated effects of the project on this species.

Wildlife - Loss of ruderal vegetation could affect local bird populations. However, the impact is not likely to be significant in terms of the total population distribution. Removal and destruction of habitat could reduce the amount of foraging sites in the immediate area, but would not measurably reduce the

availability of any of their food resources within the larger foraging areas. The migratory Laysan albatross is known to use the lawn-like portion of the ruderal vegetation within KTF for courtship and nesting. The removal of a relatively small amount of disturbed, ruderal vegetation is not expected to significantly reduce the total area available to the albatross for courtship and nesting.

None of the threatened or endangered wildlife species present in the PMRF area are known to use KTF for nesting. The kiawe/koa haole vegetation within KTF may provide roosting habitat for the Hawaiian hoary bat. However, the STARS construction activities would not affect any kiawe/koa haole vegetation.

The Newell's shearwater may be attracted to the project floodlights during construction. The lighting simulates moon/starlight reflection on the water. This causes disorientation of the birds and they fly low as if they were over the water, colliding with poles, power lines, trees, and buildings. Impacts on this species are expected to be potentially significant but mitigable. Mitigation measures to reduce impacts on the Newell's shearwater attributable to STARS activities include using a USFWS-approved lighting system, which requires special lenses and/or hoods to minimize upward glare.

The sand dunes immediately to the north of KTF are recognized by the State of Hawaii as sensitive habitat. STARS construction activities would not affect the dunes.

Overall, construction impacts on biological resources are considered potentially significant but mitigable.

Cumulative Impacts - The removal of 0.16 hectare (0.4 acre) of ruderal vegetation for the construction of the payload liquid propellant holding area, in addition to the 1.2 hectares (3 acres) of vegetation removed for the Exoatmospheric Discrimination Experiment (EDX) program (U.S. Army Strategic Defense Command, 1990), would create a cumulative loss of approximately 1.4 hectares (3.4 acres) of habitat. However, this acreage is not significant in terms of the total acreage of kiawe/koa haole and ruderal vegetation types present on PMRF. The cumulative impact to local bird species is not expected to be significant on a local or regional basis.

The construction activity has the potential to create a cumulative impact because the associated noise and human activities may disturb breeding activity of the Laysan albatross. Nesting albatross may be flushed off their nests by loud noise or the proximity of construction personnel. However, cumulative impacts to the albatross are not expected to be significant because the STARS construction is minimal and of short duration, and would take place approximately 0.8 kilometer (0.5 mile) from the EDX construction site.

Construction and other project lighting could potentially contribute to the cumulative impact on Newell's shearwaters. An increase in outdoor lighting within the PMRF area could potentially create an increased attraction for fledgling Newell's shearwaters, causing the birds to become disoriented, fly low, and collide with poles, power lines, buildings, etc. However, the implementation of mitigation measures using USFWS-approved lighting would reduce the cumulative impact on Newell's shearwaters to a level of no significance. The biology of Newell's shearwater and potential human-related

impacts to this species are discussed in greater detail in the STARS Biological Assessment (U.S. Army Strategic Defense Command, 1990).

The cumulative impacts associated with STARS construction activities are considered potentially significant but mitigable.

3.4.2 Cultural Resources

Existing information (Section 2.6.3) pertaining to archaeological site locations, coastal settlement patterns, and mortuary practices of native Hawaiians indicates that cultural resources, as well as human remains, may be present in the dune areas near the STARS launch facility. Proposed construction activities associated with the STARS project could potentially unearth subsurface cultural resources. With the implementation of appropriate mitigation, however, any impacts from future STARS program activities in the KTF would be reduced to a level of not significant.

In compliance with the Section 106 review procedures as established in 36 CFR 800, "Protection of Historic Properties" by the National Historic Preservation Act of 1966, both USASDC and DOE/SNL have formally consulted with the Hawaii SHPO to establish and implement mitigation programs that would reduce any adverse impacts that may occur to cultural resources within the STARS project area (U.S. Army Strategic Defense Command, 1989, 1990; U.S. Department of Energy/Sandia National Laboratories, 1990a, 1990b). These programs have included intensive surface inspections within the STARS project area (Advanced Sciences Inc., 1990a). Preconstruction testing would also be conducted at any area where construction-associated ground disturbance would take place. Monitoring would also be conducted during construction-related ground disturbance of the area.

No cultural resources have been found as a result of previous subsurface testing within the KTF area (Advance Sciences Inc., 1990a). However, informal discussions with the SHPO archaeologist for Kauai indicate that a limited subsurface testing program should be conducted in the areas of the proposed propellant holding facility prior to beginning construction (McMahon, 1990b). Any human remains that might be discovered or inadvertently disturbed during project activities would be treated in accordance with PMRF's draft burial treatment plan (Pacific Missile Range Facility, undated). This would include notifying the PMRF Environmental Engineer, the Navy's archaeologist, the OHA, Kauai Burial Council, and the SHPO of the discovery of human remains. A ceremony may also be conducted by a Hawaiian priest (*Kahuna pule*).

The decision as to final disposition of any human remains that may be encountered would be made in consultation with the above-mentioned agencies and individuals. Options for disposition of remains include:

- Avoidance of the burial site
- Repatriation of the remains to another area
- Curation of these remains.

Any analysis of human remains is to be performed with nondestructive methods.

Any activities related to cultural resources identification and evaluation would be conducted in compliance with the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation (Federal Register, 1983) and with the guidelines of the State of Hawaii (1989a).

Cumulative Impacts - By implementing existing mitigation procedures, it should be possible to prevent any cumulative effects on potential cultural resources.

3.5 FLIGHT PREPARATION

Flight preparation would involve the preflight checkout, simulations, and assembly of the STARS booster and payload as well as fueling the payload vehicle with liquid propellants at KTF. Additional activities would include radar system checks at PMRF (Range) and USAKA, and transportation of the STARS booster, payload ground support equipment, and liquid propellants. STARS flight preparation activities would take place at facilities that are currently used for rocket launching activities for other DOE and DOD programs.

Booster Flight Preparation - The STARS booster assembly, checkout, and simulation test would take place in existing facilities at the KTF. Because no ground disturbance would be involved, there would be no direct impacts to biological or cultural resources, and no indirect impacts have been identified. Booster flight preparation activities would not emit any air pollutants into the atmosphere or increase noise levels at this location.

Potential land use impacts could occur at PMRF while the missile is on the launch pad (see below). STARS operations would require approximately 45 additional personnel on temporary duty for a 1-month period for each launch. This 6-percent increase in base staff can be accommodated by the island's tourist-based economy (1.4 million visitors and hotel occupancy of 67.5 percent in 1988 [Uchiyama, 1989]) and is within the capacity of the base infrastructure. Although the main base sanitary system is operating above capacity, STARS activities would utilize the KTF sewer system, which is currently well within capacity. No water quality or hazardous waste issues associated with booster flight preparation activities at this location have been identified.

The STARS boosters would be transported on C-141 aircraft from Hill AFB to SNL, where the remaining ground support equipment, payload, and third-stage booster would be loaded on the aircraft for shipment to PMRF. Existing procedures would be followed and existing military facilities/equipment routinely used for these operations would be utilized. All transportation would be in accordance with BOE-6000-1.

Payload Flight Preparation - STARS payload operations utilizing liquid propellants would involve installing prepackaged propellant (less than 1,500 milliliters [51 ounces]) in the payload prior to shipment to KTF, and the temporary storage and transfer of hydrazines and N_2O_4 in other payloads at KTF. If a spill or leak should occur during these operations, potential impacts to air quality, biological resources, and public health and safety could occur. Air quality and biological resources, along with related human effects, are addressed in the public health and safety discussion (Section 3.5.1).

Communications Flight Preparation - Instrumentation system checks would be performed at PMRF, KTF, Hawaii support sites, and USAKA. Because this activity involves no ground disturbance, no direct impacts to biological resources, cultural resources, or land use would occur and no indirect impacts have been identified. In addition, this activity would not emit air pollutants or increase noise levels at these locations. No additional personnel would be required for instrumentation system checks at PMRF or USAKA; therefore, no socioeconomic or infrastructure impacts would occur. No hazardous materials or water quality issues have been identified for this activity at any of the locations.

All of the assessment criteria for a determination of no significant impacts are met for the STARS flight preparation activities, except for land use and public health and safety issues associated with booster flight preparation activities. Consequently, these areas are discussed in more detail below.

Cumulative Impacts - Flight preparation activities for the STARS program could coincide with those for the EDX program. The two programs would add approximately 90 temporary personnel to PMRF's existing base staff. However, most EDX operations are located on PMRF's main installation, and therefore would not use the same infrastructure as the STARS program (KTF infrastructure). These additional personnel can easily be accommodated by Kauai's tourist-based economy. No other potential cumulative impacts have been identified.

The cumulative environmental effects of STARS and other programs at USAKA are presented in the Final Environmental Impact Statement, Proposed Actions at U.S. Army Kwajalein Atoll (U.S. Department of the Army, 1989). The Record of Decision for the Proposed Actions at USAKA was listed in the Federal Register on December 13, 1989. Based on the findings of the FEIS, a mitigation plan has been developed that, when fully executed, would avoid negative environmental impacts resulting from implementation of the proposed action or reduce these impacts to levels of no significance. Moreover, mitigation efforts would reduce the negative environmental effects resulting from ongoing activities at USAKA.

3.5.1 Public Health and Safety

To avoid potential impacts on public health and safety during ground transportation, storage, and assembly of the STARS boosters at KTF, or from accidental preflight detonation on the launch pad at KTF, preflight hazardous operations would be carried out in accordance with SNL-approved safe operating procedures (SOP) and regulations from OSHA standards. SOP for all KTF activities are addressed in the Safety Assessment for Missile Launch Complex at Barking Sands (Sandia National Laboratories, 1988). This document states that SOP must be posted in all operating locations. In addition, safety regulations limit the number of personnel involved in hazardous operations.

Booster Flight Preparation - If preflight detonation of the STARS booster were to occur, fragments from the booster would impact within a 381-meter (1,250-foot) radius from the launch pad. An area of coastline (within PMRF's Recreation Area 1) approximately 30 meters (100 feet) wide by 608 meters (2,256 feet) long is within this radius, approximately 262 meters (800 feet) from

the launch pad. Established mitigation measures (NAVSEA OP-5 and KTF SOPs) require that while the boosters are on the launch pad, the 381-meter (1,250-foot)-radius area be cleared of all nonessential contractor and military personnel as well as the public. During this time (an average of 14 days), 24-hour security teams would restrict access to this portion of the coastline along PMRF to ensure public safety; therefore, impacts on public health and safety would not be significant.

Payload Flight Preparation - Some STARS payload operations would use liquid propellants. These propellants are hydrazines and N_2O_4, which are both highly toxic and can cause severe respiratory distress and possible lung damage if vapors are inhaled at concentrations higher than their Immediately Dangerous to Life and Health (IDLH) levels for public exposure for greater than 30 minutes (50 ppm for both hydrazines and N_2O_4). In the liquid form, these materials can cause severe burns and possibly blindness upon prolonged contact with skin and eyes. Hydrazines are also convulsive agents and can form carcinogenic nitrosamine compounds. Severe damage to vegetation can also result from long-term direct exposure to the liquids or high concentrations of hydrazine or N_2O_4 vapor. These impacts could occur during shipping, storage, or fueling procedures. However, such incidents are unlikely given the safety procedures described below.

Payloads with liquid propellants already installed would be flown to PMRF under BOE-6000-1, otherwise both hydrazines and N_2O_4 would be transported to the California coast by trucks, then to PMRF on separate ships to Nawiliwili harbor on Kauai. After arrival at Kauai, these materials would be transported in separate trucks to PMRF on State Highway 50, a distance of approximately 60 kilometers (37 miles). Hydrazines would be shipped in a 159-liter (42-gallon) drum with a plastic overwrap to protect against rust. N_2O_4 would be shipped in one 757-liter (200-gallon) steel cylinder. To ensure public safety, these propellants would be shipped in DOT-approved containers (49 CFR 173.276 and 49 CFR 172.102) and transportation would be in accordance with BOE-6000-1 and DOT regulations.

Prior to shipment to Kauai, a transportation safety plan would be developed by the STARS project office. The plan would include, but not be limited to, the following:

- Truck shipments on Kauai would have military escorts
- Shipments would be scheduled to avoid peak traffic periods
- All containers would be checked for leaks
- Truck drivers would be trained on recommended emergency procedures in the event of spills, leaks, or fires, and would be given telephone numbers of emergency response teams to call in case of an accident
- Local fire and police departments would be notified in advance of shipments, and informed by experienced personnel (and trained, if necessary) of existing safety procedures to be used during ground transportation on Kauai
- A PMRF emergency response team would be trained in proper procedures for handling liquid propellants.

In addition, the number of liquid propellant shipments and the amount of liquid propellants stored at KTF would be kept to a minimum, consistent with the needs of the project. Given the above safety precautions and the intermittent use of these materials, impacts to liquid propellant transportation are not expected to be significant.

Loading the propellant into the payload vehicle presents the greatest risk of leakage or spillage. The maximum probable spilled amount of either hydrazine or N_2O_4 is 946 milliliters (1 quart) during propellant loading at the launch pad. This quantity of spill may result in IDLH levels below the 50 ppm standard for hydrazine at a distance of 76 meters (250 feet). An N_2O_4 spill of this quantity would result in IDLH levels below the 50 ppm standard at a distance of 488 meters (1,600 feet). Because these levels would be contained within the KTF and all unprotected personnel would be excluded from this area, no significant impacts would occur.

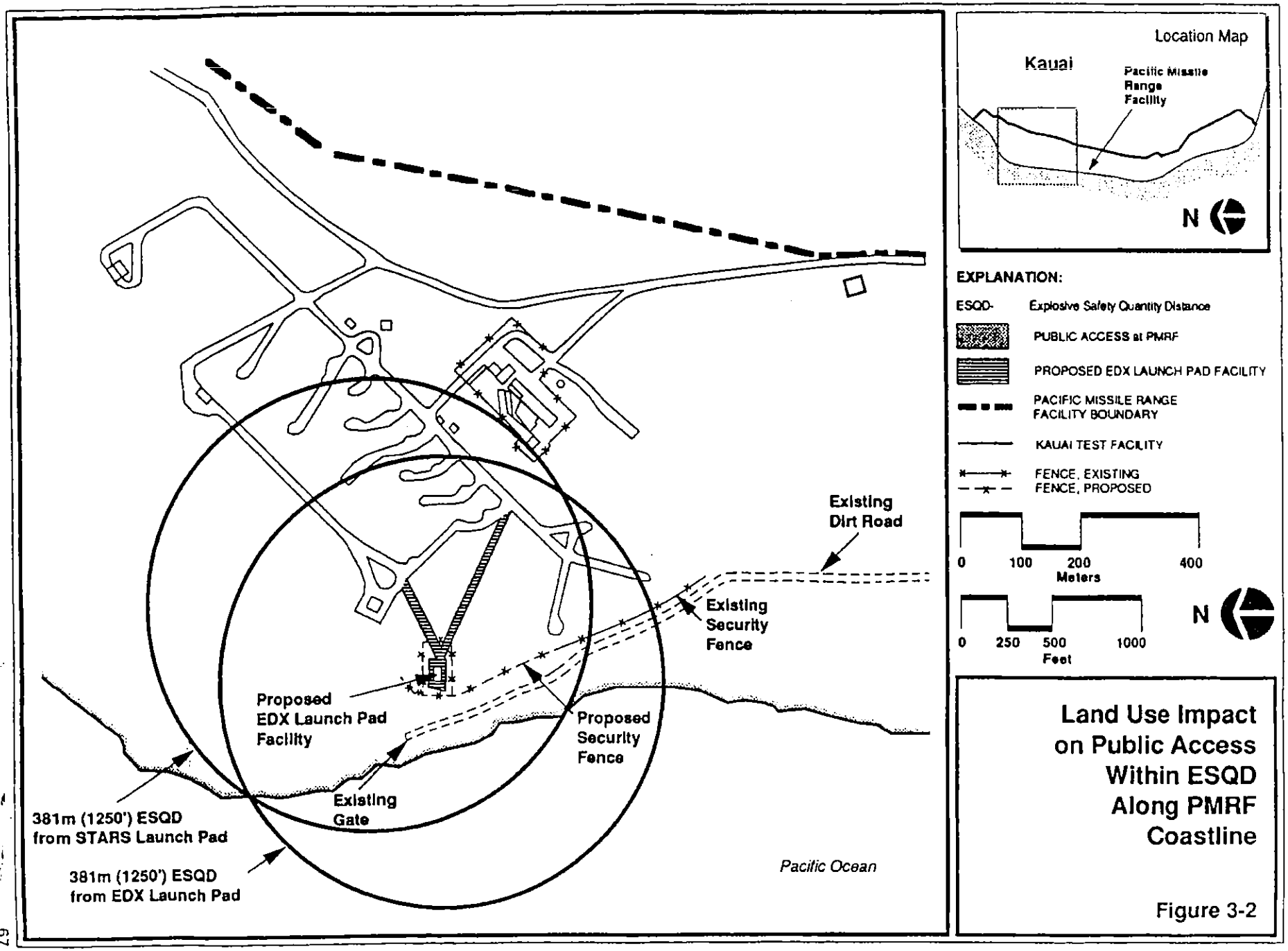
During fueling and defueling (if necessary) operations, the launch pad area would be monitored to detect leaks and fires. All operations would take place on specially designed concrete pads with catchment basins to contain any spilled propellants on the pad area. Propellant loading operations would be conducted by experienced personnel, who would be equipped with protective equipment. In addition, payload fueling would take place 8 meters (25 feet) from the booster on a concrete pad with a catchment basin. If a spill should occur, the area would be quickly washed down to dilute any concentrations of hydrazines and N_2O_4, and all material would be pumped off the concrete pad into hazardous waste containers. Hazardous waste would be stored on the installation for less than 90 days, following EPA guidelines (i.e., required permits and procedures). The containers would then be transported off base by an EPA-approved private contractor and delivered to the U. S. mainland by ship for treatment.

PMRF would review procedures for response to spills of hazardous substances and revise the oil/hazardous substance spill contingency plan at PMRF, which integrates base plans for emergency response.

During fueling procedures, all personnel would be cleared from the area or protected in the launch operations building 381 meters (1,250 feet) away. The propellant loading operation woud be monitored by safety personnel (loading director) in the launch operations building using a video camera and two-way communications. Prior to liquid propellant transfer operations, a safety plan would be developed that would contain safety provisions from Army Regulation 200-1, the Air Force, and those developed by NASA over 20 years of experience. In the event of a spill, the safety personnel would implement evacuation and clean up procedures in accordance with an approved safety plan. In view of these safety precautions, impacts to air quality, biological resources, and public health and safety would not be significant.

3.5.2 Land Use

Potential impacts on land use could occur while the STARS booster is on the launch pad. During this time (an average of 14 days), all nonessential contractor, civilian, and military personnel as well as the public would be cleared from the previously defined safety area (see Section 3.5.1). This safety area (Figure 3-2) has a radius of approximately 0 .8 kilometer (0.5 mile) and is



Land Use Impact on Public Access Within ESQD Along PMRF Coastline

Figure 3-2

located within PMRF's Recreation Area 1. This area represents a small portion of the 14 kilometers (9 miles) of beach along PMRF and the 35 kilometers (22 miles) of beach along western Kauai.

Recreation Area 1 consists of 4 hectares (10 acres) of rocky and sandy beaches and part of the Barking Sands dune area, which has been designated by theCounty of Kauai as a special treatment district because of the presence of paleontological remains and because it is a scenic ecological area. The STARS safety area includes 0.6 hectares (1.6 acres) of the beach in Recreation Area 1. During the time the STARS booster is on the launch pad, public access to the safety area in Recreation Area 1 will be restricted. The proposed action would impact the public's use of a portion of the area, denying them access for approximately 56 days of the year. This action constitutes a change in the use of the land that is incompatible with the current use by the public. Moreover, the closure of a portion of the beach would prevent the public from transiting (by four-wheel drive or on foot) from the southern end of Recreation Area 1 to the Polihale State Park north of PMRF, as well as preventing direct access along the beach from the park to beaches south of the closure area. The public would still be permitted, however, to enter Recreation Area 1 from PMRF and the state park during the time the area would normally be open.

As stated in Section 2.6.4, Recreation Area 1 is normally open on weekdays from 4:00 pm to 6:00 am and 24 hours per day on weekends. This gives the public access to the beach for a total of 6,150 hours during the year. The beach is currently closed for 2,610 hours per year, or 30 percent on an annual basis. The additional closure of the portion of Recreation Area 1 affected by the STARS booster safety area would add another 944 hours of closure, increasing the time to 3,554 hours or an additional 11 percent on an annual basis. Thus, the public would still have access to Recreation Area 1 for 5,206 hours per year. Moreover, for the 944 hours of additional closure time, 3 hectares (8.4 acres) of the beach would still be open to the public.

Approximately 10 percent of all public visitors (43, 678 for the survey period, see Section 2.6.4) who accessed the beach through PMRF requested direct use of Recreation Area 1. The only unique feature determined to exist in this area is the Barking Sands dunes. This beach area is currently open from 4:00 p.m. to 6:00 a.m. Monday through Friday and 24 hours a day on weekends, except when closed during hazardous operations. This portion of beach is used mainly for fishing (38 percent), with some overnight camping (2 percent) and general beach activities (49 percent). A higher percentage of requests indicated general use, but from the records it appears that this use is for less than 2 hours in duration. Because there is low use (primarily fishing and general use) of Recreation Area 1, and access to observe the Barking Sands area can be accommodated through the state park by Highway 50, use would only be slightly affected by the proposed action. Further, because there would be only an 11 percent increase in the beach closure time and other recreation areas would be open to the public, the amount of closure time is not considered to be significant.

Cumulative Impacts - Most PMRF and KTF activities take place during the weekday when the area is normally closed for operational reasons. Launch activities from the current KTF operations decrease the availability of Recreation Area 1 to the public by 82 hours. The proposed EDX activities

would also require the closure of the area (up to 30 days per launch three times per year) by an additional 1,460 hours, or an additional 17 percent annually. Thus, the total time of beach closure caused by STARS and EDX activities would be 2,404 hours, or 28 percent of the time. This represents a total closure time of 5,096 hours for the year of a total possible open time of 8,760 hours, although only 0.6 hectare (1.6 acres) of the total of 4 hectares (10 acres) of the beach would be affected. Based upon the analysis of the impact from STARS and EDX activities and given the availability of other beaches on PMRF and Kauai, and the low use of Recreation Area 1 by the public, the cumulative land use impacts of closing the beach were determined to be not significant.

3.6 LAUNCH/FLIGHT/DATA COLLECTION

The STARS launch/flight/data collection program would involve the launch of the payload vehicle by the STARS booster from KTF with tracking and flight safety being provided by PMRF. On the terminal end, tracking, flight safety, and data collection would be performed by USAKA.

Comparison of proposed launch activities at PMRF with launch activities at Vandenberg AFB and Cape Canaveral AFB shows that STARS activities at PMRF would cause fewer potential environmental impacts than those considered acceptable at Vandenberg AFB and Cape Canaveral AFB. Launches of the Titan IV and Space Shuttle use large quantities of deluge water (an average of 300,000 gallons per launch). STARS booster launches would not use a deluge system; therefore, the local water supply would not be depleted.

The other significant issue for comparison is launch exhaust emissions. At Cape Canaveral AFB, fish kills have resulted from high concentrations of HCl emitted during launches (acidic fallout). Because the quantities of HCl and other exhaust products from STARS booster launches at PMRF are much smaller (see Section 3.6.1), similar fish kills would not occur. Environmental consequences at Cape Canaveral AFB are the result of much larger and more frequent launches than are planned for PMRF.

Booster Launch/Flight - STARS launches would use facilites at KTF. Because no ground disturbance is involved, there would be no cultural resource impacts. STARS operations would require approximately 45 additional personnel for a 1-month period for each launch. This 6-percent increase in base staff is within the capacity of KTF infrastructure and the island's tourist-based economy. Therefore, no socioeconomic or infrastructure impacts would occur. No hazardous materials or water quality issues have been identified for booster launch/flight/data collection activities at PMRF. There is, however, some potential for impacts to local air quality from booster emissions during launches and flight (Section 3.6.1, Air Quality).

Payload Flight/Data Collection - Flight of certain experiment payloads would take place in the exoatmosphere. Emissions from the small quantities (approximately 57 liters [15 gallons] each of hydrazine and N_2O_4) of propellants would be dispersed (and thus diluted) over the vehicle's flight path approximately 100 kilometers (62 miles) or more above the earth. During re-entry, the liquid propellant tanks would break up, dispersing the remaining hydrazine and N_2O_4. Therefore, because payload flight takes place above the

earth's atmosphere and the amount of emissions is small, impacts on the global commons would not be significant.

If flight termination should occur, the payload propellant tanks and proposed fuel vent experiment canisters (see Section 1.3.6) would be ruptured, resulting in the ignition of hydrazine and N_2O_4. The effects of liquid propellant ignition would be negligible with flight termination of the STARS booster.

Other potential impacts unique to the proposed fuel vent experiment, in which approximately 114 liters (30 gallons) of hydrazine fuel would be released into the exoatmosphere are (1) temporary ozone depletion in the upper atmosphere, resulting in short durations of increased ultraviolet radiation reaching the earth's surface, and (2) the production of nitrosamines, a known carcinogen. An assessment of these and other potential environmental impacts associated with a similar proposed action is presented in the Environmental Assessment, Chemical Release Experiment (U.S. Department of the Air Force, 1987). Based on the findings of this EA, which found no significant environmental impacts from the proposed release of similar quantities of hydrazine into the exoatmosphere, the fuel vent experiment proposed for the STARS program is expected to result in a determination of no significant impacts.

Tracking and data collection activities at USAKA would use the existing instrumentation and make use of the BOA, which is part of routine operations at USAKA. PMRF range would also use existing radar assets to track the STARS boosters. Because no ground disturbance is involved, there would be no direct biological resource, cultural resource, or land use impacts, and no indirect impacts have been identified. No additional personnel would be required for these activities; therefore, no infrastructure or socioeconomic impacts would occur. No hazardous waste or water quality issues are expected from these activities at these locations.

All of the assessment criteria for a determination of no significant impacts are met for the STARS launch/flight/data collection activities, except for air quality, biological resources, public health and safety, land use, and noise at PMRF associated with booster launch/flight/data collection activities. Consequently, these areas are discussed in more detail below.

Cumulative Impacts - Launch activities for the STARS program would not take place on the same day as other KTF launches. Additional personnel impacts are addressed in Section 3.5. All other cumulative impacts are addressed by resource area in the following sections.

The cumulative environmental effects of STARS and other programs at USAKA are presented in the Final Environmental Impact Statement, Proposed Actions at U.S. Army Kwajalein Atoll (U.S. Department of the Army, 1989). The Record of Decision for the Proposed Actions at USAKA was listed in the Federal Register on December 13, 1989. Based on the findings of the FEIS, a mitigation plan has been developed that, when fully executed, would avoid negative environmental impacts resulting from implementation of the proposed action or reduce these impacts to levels of nonsignificance. Moreover, mitigation efforts would reduce the negative environmental effects resulting from ongoing activities at USAKA.

3.6.1 Air Quality

The primary STARS emission would be from the three solid propellant booster stages. The total emissions from a STARS booster are listed in Table 3-1. The emissions of concern are those that occur in the initial few seconds of launch, when the first-stage booster is near the ground and over land. The first-stage booster releases emissions at a rate of about 217 kilograms per second (kg/sec) (478.4 pounds/sec). The emission rates of the major components of the STARS first stage booster and the 8-hour average concentrations of these materials at a distance of 3,000 meters (9,842 feet) from the launch pad indicate that they are less than the applicable standards (Table 3-2). Because the island of Niihau is 26 kilometers (16 miles) away, concentrations would be below standards and, therefore, would not affect the open water catchment system on the island. Based on the short duration of the emissions and the limited number of launches per year, no significant impact from STARS launch emissions on air quality is expected.

The total emissions from the STARS first-stage propellant (9,424 kilograms [20,778 pounds]) represent only 2-percent of those released from the TITAN IV launched from Vandenberg AFB and the Eastern Test Range, and 1 percent of those from the Space Shuttle launched from Cape Canaveral AFB. Therefore, the HCl emissions from STARS would be well below the amount produced by these larger launches.

Less than 90 kilograms (198 pounds) of Freon would be released during second-stage flight. The quantities of Freon released during the second-stage boost would be small relative to world-wide release levels. For example, during 1986, approximately 635,040 kilograms (1,400,000 pounds) of Freon were released globally (Fisher, 1990); the annual release of the STARS program could be about 360 kilograms (792 pounds). On an annual basis, this would be about a 0.05 percent contribution to the world-wide Freon release rate. This release is minor. In addition, the STARS program office is in the process of evaluating alternatives to the use of Freon. If an alternative to Freon is determined to be feasible it would be implemented.

Although no significant air quality impacts are anticipated, an air quality monitoring program would be established for the initial launch to verify emission concentrations and to confirm the analysis.

In the event of a launch pad accident in which the entire missile detonates, the quantities of emissions would be greater than those during normal boost. However, all the propellant is not consumed during a rocket motor explosion and, although the emission levels might exceed acceptable levels for a short period, the potential impacts are not expected to be significant. The potential for a catastrophic launch is low because there have been no reported operational A3 booster aborted launches. The A3 booster has been very reliable (Eno, 1990). Overall air quality impacts from launch activities are not expected to be significant.

Cumulative Impacts - Impacts from four STARS, three EDX, five KTF, and various PMRF launches (Section 2.6.1) per year would not create cumulative impacts because of the limited quantity and prompt dispersion of exhaust products.

TABLE 3-1. TOTAL EMISSIONS FROM A STARS BOOSTER

	First Stage kg (lbs)	Second Stage kg (lbs)	Third Stage kg (lbs)
Water (H_2O)	598.16 (1,318.70)	252.02 (555.60)	22.62 (49.87)
Carbon Dioxide (CO_2)	211.34 (465.91)	171.46 (378.00)	9.03 (19.91)
Hydrogen (H_2)	219.83 (484.63)	58.87 (129.80)	9.48 (20.91)
Nitrogen (N_2)	894.42 (1,971.82)	741.64 (1,635.00)	47.37 (104.44)
Hydrogen Chloride (HCl)	1,576.55 (3,475.64)	62.05 (136.80)	23.56 (162.18)
Aluminum Oxide (Al_2O_3)	3,558.80 (7,845.67)	1,391.92 (3,068.60)	155.04 (341.82)
Carbon Monoxide (CO)	2,355.86 (5,193.70)	1,346.74 (2,969.00)	92.90 (204.80)
Chlorine	19.81 (43.68)	4.03 (8.90)	0.20 (0.45)
Other (long chain hydrocarbons)	0	0	0.29 (0.63)

Source: U.S. Army Strategic Defense Command, 1989.

TABLE 3-2. STARS EMISSION RATES AND CONCENTRATIONS

		8-Hour Average Concentration at 3,000 meters (mg/m^3)			
	Emission Rate kg/sec (lb/sec)	Winds at 5.5 km/hr (3.4 mi/hr)	Winds at 24 km/hr (15 mi/hr)	Winds at 48 km/hr (30 mi/hr)	Standard 8-HOUR TLV[(a)] mg/m^3
HCl	32.2 (70.9)	1.3	0.08	0.03	7.5
Al_2O_3	60.3 (132.9)	0.22	0.14	0.08	10
NO_2	42.5 (93.7)	1.6	0.10	0.05	5.6 [NAAQS annual average = 100]
CO_2	6 (13.2)	N/A	N/A	N/A	9,000
CO	77 (169.9)	N/A	N/A	N/A	N/A

(a) TLV = threshhold limit value published by American Conference of Governmental Industrial Hygenists (ACGIH)

3.6.2 Biological Resources

Potential impacts on marine mammals as a result of the launch of the STARS booster are not expected to be significant. Jet aircraft activities and ship traffic

generate noise on many Pacific islands, and it is difficult to determine the effect of these noise sources on whales. The launch noise may startle humpback whales and other marine mammals that may be directly off the beach, but noise disturbance would be of very short duration and launches would be infrequent (up to four per year). Therefore, impacts are not expected to be significant.

Potential impacts on local wildlife species as a result of STARS launches are not expected to be significant. The launch noise may startle any wildlife nearby and cause flushing behavior in birds. However, the noise would be infrequent and of short duration. Studies indicate that seabirds and songbirds may flush when loud booms occur, but return to normal behavior within a short time (Manci et al., 1988).

There is a slight potential that falling debris from a launch termination could strike sensitive marine species. However, based on the known reliability of the STARS first- and second-stage boosters, the potential for a catastrophic launch termination is very low. The use of most of the flight corridor and first-stage booster impact area by the humpback whale, the Hawaiian monk seal, and the green sea turtle is rare. Although the humpback whale uses the area between Kauai and Niihau, most of the humpback whales that winter in the Hawaiian Islands concentrate in the four-island area (Maui, Molokai, Lanai, and Kahoolawe). The Hawaiian monk seal rarely hauls out on the beaches of PMRF. The few seals that are regularly seen on the island of Kauai more frequently haul out on rocks off the northern side of Kauai, where there is less human disturbance (Naughton, 1990). The green sea turtle is known to feed in the shallow waters offshore of all the main Hawaiian Islands. Green sea turtles prefer sandy beaches and have not been recorded coming ashore on the beaches adjacent to KTF. A more detailed discussion of these marine species has been prepared in the STARS Biological Assessment (U.S. Army Strategic Defense Command, 1990).

In view of the infrequent use of the waters off the west side of Kauai by Hawaiian monk seals, and the infrequent and seasonal use of the area by the humpback whale and the green sea turtle, in addition to the very low probability of a launch termination occurring, the possibility of debris striking and injuring an individual is expected to be low. Therefore, the impacts on threatened and endangered marine species as a result of falling debris from an aborted flight or a catastrophic launch are not expected to be significant. In addition, when whales are observed to be present within the first stage booster impact area, Range Operations would delay launches until the payload and missile impact area is clear.

Because the high temperatures associated with a STARS launch could ignite adjacent vegetation, a portable blast deflector shield would be used in the vicinity of the launch pad to protect the vegetation on the adjacent sand dunes. The potential for starting a fire would be further reduced by clearing all dead brush from around the launch pad. Additional measures to avoid impacts on vegetation, wildlife, and cultural resources are:

- Spraying the vegetation adjacent to the launch pad with water just before launch to reduce the risk of ignition
- Having emergency fire crews available during all STARS launches to quickly extinguish any fire and minimize its effects

- Using an open (spray) fire nozzle, when possible, rather than a directed stream in extinguishing fires, to avoid erosional damage to the sand dunes and prevent possible destruction of cultural resources caused by water used to put out the fire.

Overall, impacts from flight activities on biological resources are not considered to be significant.

Cumulative Impacts - The disturbance resulting from the STARS launches, in addition to that from EDX launches and other KTF and PMRF launch activities, could potentially create a cumulative impact on sensitive marine species. PMRF flight operations, other program launch noise, and aborted launches could potentially produce acoustic disturbance affecting marine animals. There were a total of 1,036 launches from 1981 through 1989 as part of KTF and PMRF operations. Typical yearly activity at KTF is three launches. The addition of the EDX (three launches per year for 3 years) and STARS (average four launches per year for 10 years) programs will result in a minor increase in launch rate. The launches would still be infrequent on an annual basis. The maximum number of launches per year would occur when the EDX and STARS programs overlap for 3 years, during which time the two programs would add approximately seven launches for a total of ten per year from KTF.

The cumulative effect of acoustic disturbances on the humpback whale is not well known (Naughton, 1990). No data are available to determine impacts of acoustic disturbance on the Hawaiian monk seal and the green sea turtle. However, the use of PMRF and nearby coastal waters by these species is infrequent and discontinuous (seasonal) throughout the year. Therefore, any potential cumulative impacts from acoustic disturbance are not expected to be significant.

The disturbance caused by the STARS launches, in addition to that from EDX launches and other KTF and PMRF launch activities, could potentially create a cumulative impact on local bird and wildlife species. Frequent exposure to loud noise can have negative impacts on wildlife. However, the number of launches at KTF would remain infrequent. Therefore the cumulative impacts on local wildlife species as a result of the launch of the STARS booster are not expected to be significant.

Exhaust emissions from the launch of the STARS booster, in addition to the emissions from EDX launches and other KTF and PMRF launch activities, could potentially create a cumulative impact on biological resources. However, the number of launches at KTF would remain infrequent. In addition, local atmospheric conditions disperse the emissions. Therefore, the potential cumulative impact of exhaust emissions is not expected to be significant.

STARS flight program activities at KTF and PMRF have been considered in conjunction with current, planned, and anticipated future project activities, and any potential impacts to biological resources can be mitigated to a level of no significance.

3.6.3 Cultural Resources

Because of the STARS launch facility's proximity to the Nohili dune, precautions would be taken to prevent any physical disturbance to that area. A

portable blast deflector shield would be erected between the launch platform and the adjacent dune to reduce the potential for ignition of the kiawe vegetation. Should the vegetation ignite as a result of vehicle launch, fire suppression crews would be instructed to extinguish the flames with their fire-hose nozzles adjusted for an open spray rather than a direct stream output. This would prevent any ground cutting and subsequent erosion of the dune. If extensive burning of the dune vegetation should occur, post-burn monitoring would be conducted. Should any cultural resource materials or human remains be discovered as a result of project activities, a full or sample data recovery/research and documentation program (controlled excavation) would be implemented to mitigate any adverse effects.

Cumulative Impacts - By implementing existing mitigation procedures, erecting portable blast deflector shields, and exercising caution during fire suppression activities (should they occur), it should be possible to prevent any cumulative effects on potential cultural resources.

3.6.4 Public Health and Safety

Potential public health and safety impacts could result from the launch of the STARS booster and the possible destruct action during flight, which would cause debris to impact in a given area. To ensure the safety of military and civilian personnel and the public, the PMTC has proposed a 3,048-meter (10,000-foot) launch hazard arc within which any debris from a deliberate destruct action of the STARS booster would be expected to fall. No persons would be allowed in this radius during launch (Figure 3-3). If the guidance system were to fail, flight safety personnel would destroy the missile as part of safe operating procedures. Safety personnel from both PMRF and the PMTC are experienced in missile system launch and safety procedures. In addition, real-time computer plots of trajectory and range limits would aid the Range Safety Officer in assuring that flight operations would be carried out in a safe manner.

Off-base areas within the launch hazard arc include approximately 28 hectares (70 acres) of Polihale State Park, 688 hectares (1,700 acres) of the Kekaha Sugar Company land (not in the Hawaiian Homelands), and the coastline and offshore waters along PMRF. To eliminate risk to the public in these areas, PMRF security forces on the ground, in boats, and in helicopters (if necessary) would use sweep and search measures to ensure that these areas are evacuated 10 minutes before launch . In addition, control points would be set up by security forces along the road into the launch hazard arc area to monitor and clear traffic during launch operations.

There are no public buildings within this off-base area. All nonessential personnel on the installation would be cleared from the launch hazard arc, and launch personnel within the arc would be in buildings designed to withstand blast overpressure and fragments. Ten minutes after a successful launch, security personnel would give the all clear and the public would be allowed to re-enter the area. However, if the missile should detonate on or near the launch pad, the launch hazard arc would be kept cleared until public safety could be ensured. After such a flight termination, the debris from the booster would be cleared from the affected area.

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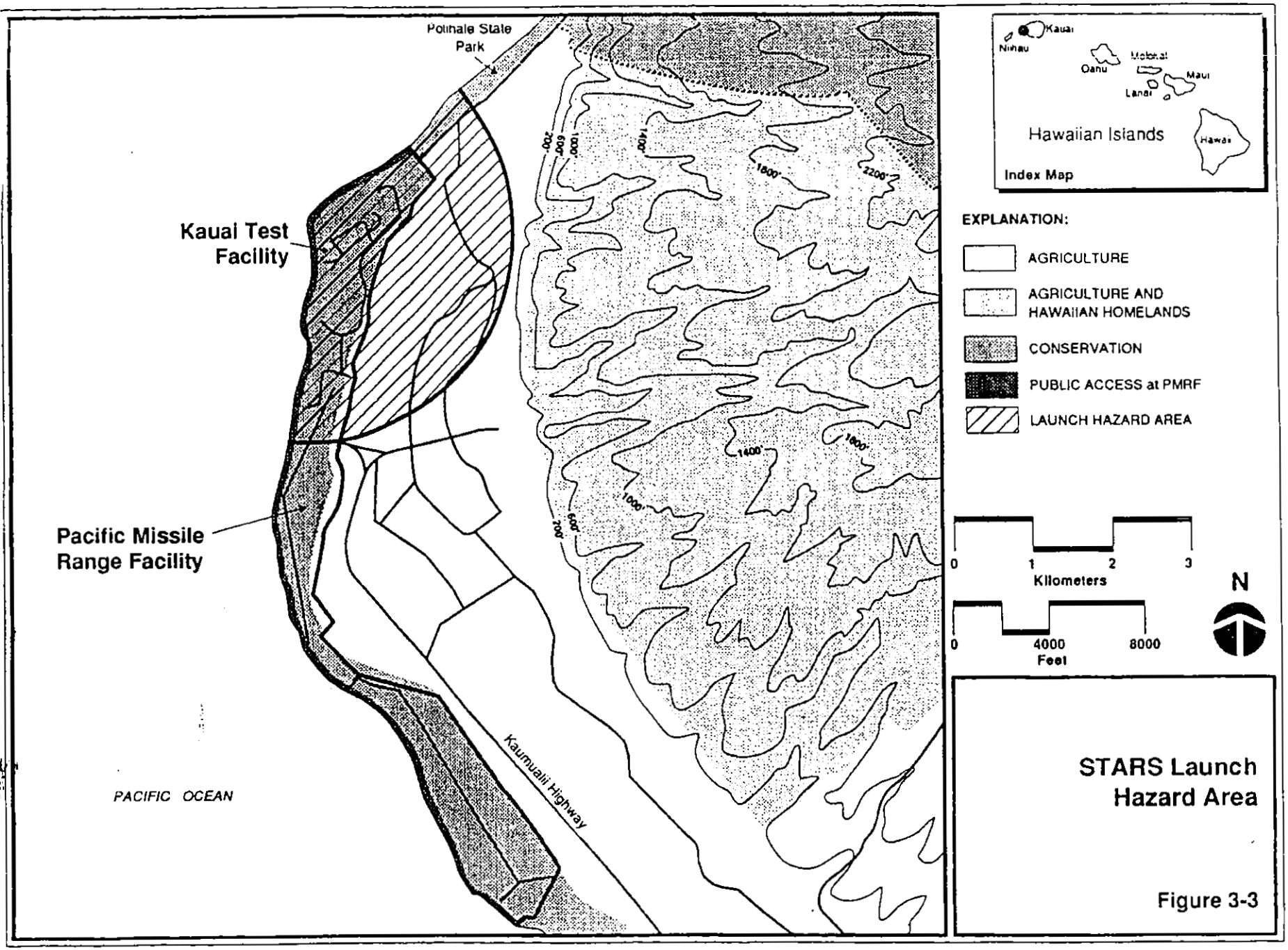
Polihale State Park
Kauai Test Facility
Pacific Missile Range Facility
PACIFIC OCEAN
Kaumualii Highway
200'
600'
1000'
1400'
1800'
2200'
Kauai
Niihau
Oahu
Molokai
Maui
Lanai
Hawaii
Hawaiian Islands
Index Map
EXPLANATION:
AGRICULTURE
AGRICULTURE AND HAWAIIAN HOMELANDS
CONSERVATION
PUBLIC ACCESS at PMRF
LAUNCH HAZARD AREA
0 1 2 3
Kilometers
0 4000 8000
Feet
N
STARS Launch Hazard Area
Figure 3-3

Commercial and private aircraft and ocean vessels would be notified in advance of launch activities by the PMRF Safety Office through NOTAM and NOTMAR, respectively, so that they may reschedule or choose alternate routes during the flight test (Dawson, 1989b).

Because launches would not take place until all public and nonessential military personnel are cleared from the 3,048-meter (10,000-foot) launch hazard arc (except for those in specially designed buildings or provided with personal protection equipment), impacts on public and military personnel would not be significant.

Cumulative Impacts - Impacts to public health and safety at PMRF and in the surrounding area may increase with the addition of the STARS program and other launch activities scheduled for PMRF/KTF, including EDX activities. However, the potential for impacts would be minimized by using safety procedures described in this document and existing safety procedures developed for other DOD and DOE launch programs.

3.6.5 Land Use

Existing lands within the proposed 3,048-meter (10,000-foot) launch hazard arc include PMRF and off-base lands. The off-base lands consist of 688 hectares (1,700 acres) of the 11,270-hectare (27,724-acre) state-owned land leased to the Kekaha Sugar Company for the production of sugar cane; 28 hectares (70 acres) of the 62-hectare (154-acre) Polihale State Park, which provides overnight camping (no campgrounds are within the launch hazard arc) and day-use recreational activities (e.g., fishing and swimming); and 5,251 meters (17,229 feet) of coastline along PMRF. In addition, the Barking Sands dune area (located on PMRF), which is designated by the County as a special treatment district because there are paleontological remains and as a scenic ecological area because of its developed native strand (vegetation) community, would also be within the launch hazard arc (Figure 3-3). Land uses within the off-base launch hazard arc would continue except during launch operations, when the area would be cleared for safety purposes for approximately 20 minutes four times a year for 10 years. Clearance would affect only 6 percent of the Kekaha Sugar Company leased land and interrupt transit to Polihale State Park and the beach access along PMRF. Therefore, current land use activities would continue and would be altered only by limiting travel and public access to these areas for a total of approximately 80 minutes per year for 10 years.

A Memorandum of Agreement is being developed among PMRF, the Hawaii Department of Land and Natural Resources, and the Kekaha Sugar Company. This agreement would allow PMRF security forces to request that the area be cleared of all nonessential personnel for approximately 20 minutes per launch. PMRF must notify the state in advance of evacuation. In addition, all activities for the STARS program would be in compliance with the State of Hawaii's Coastal Zone Management Program. Because current land use activities would continue and public access through these areas would be limited for a total of less than 1 day over a 10-year period, impacts on current sugar cane production, recreational activities, and the Barking Sands dune area would not be significant.

Cumulative Impacts - Portions of Polihale State Park and the Kekaha Sugar Company would be evacuated for a period of approximately 20 minutes for up to four STARS launches per year for 10 years. This represents a potential total of 80 minutes per year, and less than 1 day over 10 years. These evacuations, combined with similar evacuations for other PMRF/KTF and EDX program launches, could result in a total evacuation time of 5 hours per year. These activities would be allowed by the Memorandum of Agreement among PMRF, the Hawaii Department of Land and Natural Resources, and the Kekaha Sugar Company. These events are infrequent and of short duration, and do not represent a change in land use. Thus, the cumulative impacts on land use would not be significant.

3.6.6 Noise

The major operational noise source would be from the STARS booster during launch. For noise levels of short duration, dBA measurement units are used. Limits have been set to prevent damage to human hearing. The actual limit varies depending on the total time of daily exposure. The limit for an 8-hour exposure is a time-weighted average of 90 dBA. The limit for exposure of 15 minutes or less is 115 dBA. There are no standards for single-event noise exposure. All necessary noise control mitigation measures are accomplished at the launch area in accordance with OSHA standards.

Although the STARS vehicle has never been launched from KTF, and therefore its noise has never been measured, it is expected that noise levels in the immediate vicinity of the launch pad would be high during lift-off but of only a few seconds duration. Noise levels can be approximated based on the thrust levels of the rocket. It is reasonable to assume that the rate of conversion of chemical to acoustic energy is a function of the rate of energy expenditure, which is in turn a function of thrust. Approximately 22 STRYPI vehicles have been launched from KTF with no known noise complaints from the public. Because the thrust of the STARS vehicle (308,900 newtons [70,000 pounds]) is much less than that of the STRYPI (538,400 newtons[122,000 pounds]), it is anticipated that the STARS launch noise would be less than that of the STRYPI. In addition, the STARS booster would burn out in approximately 60 seconds at a high enough altitude that noise would be further reduced.

As part of the STARS safety requirements, all public, civilian, and nonessential military personnel would be required to be outside the 3,048-meter (10,000-foot) launch hazard arc, where it is expected that noise levels would be below the 90 dBA and 115 dBA limits for exposure. In addition, launches would be infrequent (four per year) and would not significantly affect ambient noise levels. Impacts on launch personnel within the launch hazard arc would be minimized by using personal noise protection devices and moving necessary launch site personnel into protective structures. The nearest on-base (8 kilometers [5 miles]) and off-base (Kekaha, 13 kilometers [8 miles] away) residential areas are well beyond the hazardous noise level limits. Therefore, noise impacts would not be significant.

Although no noise impacts are anticipated, a monitoring program would be established to verify noise levels. Noise monitoring of the initial STARS launch would include at least one monitoring station at the launch pad and monitoring at two distances and three locations from the launch pad, providing a total of seven monitoring locations. The program would be designed to take into

account the potential for reverberation or echoes from the cliffs to the east. A final noise monitoring plan would be prepared before beginning the payload flight program.

Cumulative Impacts - Cumulative impacts from other programs would have the potential to increase noise levels and the frequency of noise events. However, because (1) noise is a one-time event, (2) launches would not be simultaneous, and (3) the nearest noise sensitive area (residential) is 8 kilometers (5 miles) away (on base), cumulative noise impacts would not be significant. Overall, potential noise impacts resulting from STARS program activities are not considered significant.

3.7 DATA ANALYSIS

STARS data analysis activities would consist of evaluating data collected by the STARS program. Data analysis activities would utilize existing facilities at SNL routinely used for these types of operations. Payload contractors would analyze the data from their own experiment launches. Because no ground disturbance would occur, there would be no direct biological resources, cultural resources, or land use impacts, and no indirect impacts have been identified. No additional personnel would be required for these activities; therefore, no infrastructure or socioeconomic impacts would occur. Data analysis activities would not emit any air pollutants into the atmosphere or create any noise concerns. No hazardous materials, water quality, or public health and safety issues are expected from these activities.

All of the assessment criteria for a determination of no significant impacts are met for the STARS data analysis activities.

Cumulative Impacts - STARS activities were reviewed in conjunction with current and planned actions and information regarding anticipated future projects, and no cumulative impacts were identified.

3.8 CUMULATIVE IMPACTS SUMMARY

All activities associated with the STARS program were considered together with existing activities at the various locations affected by this program. No cumulative impacts were identified for any STARS activity except for some potential impacts identified at PMRF. These potential impacts at PMRF are associated with construction, flight preparation, and launch/flight/data collection activities at KTF. However, all available information indicates that none of these programs considered individually or in combination would significantly impact the environment at PMRF.

3.8.1 Construction

Biological Resources - STARS and EDX construction activities would result in the cumulative loss of 1.4 hectares (3.4 acres) of kiawe/koa haole and ruderal vegetation. This acreage is not significant in terms of the total amount of these habitat types present on PMRF. Therefore, the impact to wildlife species is not expected to be significant. The construction activity has the potential to create a cumulative impact because the associated noise and human activities may disturb the breeding activity of the Laysan albatross. Nesting albatross may be flushed off their nests by loud noise or the proximity of construction personnel.

However, cumulative impacts to the albatross are not expected to be significant because the STARS construction is minimal and of short duration, and would take place approximately 0.8 kilometer (0.5 mile) from the EDX construction site.

Cultural Resources - The potential for cumulative impacts to cultural resources exists. However, existing mitigation procedures (survey, testing, monitoring) would prevent any cumulative effects on potential cultural resources.

3.8.2 Flight Preparation

Public Health and Safety - The risk to public health and safety at PMRF and the surrounding area may increase with the addition of the STARS program and other launch activities scheduled for PMRF/KTF. However, the potential for impacts would be minimized by using safety procedures identified in this document and existing safety procedures developed for other DOD and DOE launch programs.

Land Use - The combination of STARS and EDX activities could reduce the public availability of a portion of Recreation Area 1. This cumulative impact is not expected to be significant because of the small size of the area, the relatively low use, and the availability of other areas on PMRF and in the western Kauai vicinity for recreational activities.

3.8.3 Launch/Flight/Data Collection

Air Quality - Impacts from four STARS, three EDX, five KTF, and various PMRF launches per year would not create cumulative impacts because of the limited quantity and prompt dispersion of exhaust products.

Biological Resources - STARS flight program activities at KTF and PMRF have been considered in conjunction with current, planned, and anticipated future activities and any potential cumulative impacts to biological resources can be mitigated to a level of no significance. In addition, the effect of noise is not expected to have significant cumulative impacts because the number of launches would remain infrequent.

Cultural Resources - By implementing existing mitigation procedures (survey, testing, monitoring), erecting a portable blast deflector shield, and exercising caution during fire suppression activities (should they occur), it should be possible to prevent any cumulative effects on potential cultural resources.

Public Health and Safety - Impacts to public health and safety at PMRF and the surrounding area may increase with the addition of the STARS program and other launch activities scheduled for PMRF/KTF. However, the potential for impacts would be minimized by using safety procedures described in this document and developing safety procedure manuals based on other DOD and DOE launch programs.

Land Use - Portions of Polihale State Park and the Kekaha Sugar Company that are within the launch hazard arc for STARS and other KTF/PMRF launches would be evacuated for a cumulative total of 5 hours per year. Because these activities would be allowed by the Memorandum of Agreement

among PMRF, the Hawaii Department of Land and Natural Resources, and the Kekaha Sugar Company, and because these events are infrequent and of short duration, the cumulative impacts on land use would not be significant.
Noise - Cumulative impacts from STARS and other programs would have the potential to increase noise levels and the frequency of noise events. However, because (1) the noise is a one-time short duration event, (2) launches would not be simultaneous, and (3) the nearest noise-sensitive area (residential) is 8 kilometers (5 miles) away (on base), cumulative noise impacts would not be significant.

3.9 ENVIRONMENTAL CONSEQUENCES OF THE NO-ACTION ALTERNATIVE

If the no-action alternative is selected, no additional environmental consequences are anticipated. Present activities would continue at the installations with no change in operations. If the no-action alternative is selected, however, there would be no boosters available to support the planned SDI experimental programs. Consequently, SDI program and national policy goals would not be met.

3.10 CONFLICTS WITH FEDERAL, REGIONAL, STATE, LOCAL, OR INDIAN TRIBE LAND-USE PLANS, POLICIES, AND CONTROLS

Because launch activities at KTF would be in compliance with the memorandum of agreement among PMRF, the Kekaha Sugar Company, and the State of Hawaii, activities would be consistent with the Hawaii Coastal Zone Management Program, and all other activities on Kauai and in the Continental United States are in compliance with Federal, regional, state, and local land use plans, policies, and controls, impacts to land use would not be significant.

3.11 ENERGY REQUIREMENTS AND CONSERVATION POTENTIAL

Anticipated energy requirements of each program activity at each location are well within the energy supply capacity of each installation. Energy requirements would be subject to the routine energy conservation practices at each installation. No new power generation capacity would be required for any of the STARS activities at any of the locations identified because the activities would be compatible with the installations' ongoing missions.

3.12 NATURAL OR DEPLETABLE RESOURCE REQUIREMENTS

Other than the various metallic and nonmetallic structural materials and fuel resources used in the program activities, there are no significant natural or depletable resource requirements associated with the program. The flight program would use refurbished A3 boosters.

3.13 ADVERSE ENVIRONMENTAL EFFECTS THAT CANNOT BE AVOIDED

In general, most known effects resulting from implementation of the proposed project would be mitigated to a level of no significance through project planning and mitigation prescribed in this document. Because of this, most potential adverse effects would be avoided, and those that could not be avoided would be not significant. Therefore, no significant unavoidable adverse effects would be associated with the proposed action.

3.14 RELATIONSHIP BETWEEN SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Activities at all locations involved in the proposed action, with the exception of KTF, would take advantage of existing facilities and infrastructure. Activities at KTF would necessitate the construction of a new liquid propellant holding facility. KTF has been dedicated to missile test programs since 1962. Therefore, the proposed action does not eliminate any options for future use of the environment for any of the locations under consideration.

3.15 IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF RESOURCES

The proposed action would result in minor loss of nonnative habitat for plants and animals, no loss or impact on threatened or endangered species, and no loss of cultural resources, such as archaeological or historic sites, that cannot be mitigated by avoidance or data recovery. Moreover, there would be no development of underground mineral resources that were not already precluded.

The amount of materials required for any program-related construction and energy use during the project would be small. However, the STARS program would result in irreversible and irretrievable commitment of insignificant quantities of resources, such as various metallic and nonmetallic structural materials, fuel, and labor. This commitment of resources is not different from that necessary for many other aerospace research and development programs; it is similar to the activities that have been carried out in previous aerospace programs over the past several years.

4.0 GLOSSARY

ACGIH:	American Conference of Governmental Industrial Hygienists.
AFB:	Air Force Base
Ambient Air Quality:	Standards established on a state or Federal level that define the limits for airborne concentrations of designated "criteria" pollutants to protect public health with an adequate margin of safety (primary standards) and to protect public welfare, including plant and animal life, visibility, and materials (secondary standards).
Archaeology:	A scientific approach to the study of human ecology, cultural history, and cultural process, emphasizing systematic interpretation of material remains.
Attainment Area:	An air quality control region that has been designated by the EPA and the appropriate state air quality agency as having ambient air quality levels better than the standards set by the National Ambient Air Quality Standards (NAAQS).
Azimuth:	A direction in angular degrees in a clockwise direction from the north point.
BOA:	Broad ocean area.
Candidate Species:	Species for which listing as threatened or endangered is possible, but for which more biological data are needed before a final determination is made.
Cultural Resources:	Prehistoric and/or historic districts, sites, structures, or other physical evidence of human use considered of some importance to a culture, subculture, or community for scientific, traditional, religious, or other reasons.
dBA:	Decibels - A (A-weighted)
DOD:	Department of Defense
DOE:	Department of Energy
EDX:	Exoatmospheric Discrimination Experiment
EMR:	Electromagnetic radiation
Endangered Species:	A species that is threatened with extinction throughout all or a significant portion of its range.
Environmental Assessment (EA):	A concise public document in which a Federal agency provides sufficient analysis and evidence for determining the need for an Environmental Impact Statement (EIS) or Finding of No Significant Impact (FNSI). EAs provide agencies with useful data regarding compliance with the NEPA and are an aid in the preparation of an EIS.
Environmental Impact Statement (EIS):	A detailed analysis of environmental aspects of a proposed project that is anticipated to have a significant effect on the human and natural environment.
EPA:	Environmental Protection Agency

ESQD:	Explosive safety quantity-distance
Exoatmosphere:	Outside the Earth's atmosphere; generally considered to be altitudes above 100 kilometers (62 miles).
FAA:	Federal Aviation Administration
Hazardous Waste:	The Resource Conservation and Recovery Act (RCRA) defines hazardous waste as any discarded material that may pose a substantial threat or potential danger to human health or the environment when improperly handled. Some of the characteristics of these wastes are toxicity, ignitability, corrosivity, and reactivity.
Hydrazine:	A colorless, fuming, corresive hygroscopic liquid used in jet and rocket fuels.
IDLH:	Immediately Dangerous to Life and Health. Concentration from which one could escape within 30 minutes without experiencing any escape-impairing or irreversible health effects.
Impact:	An assessment of the meaning of changes in all attributes being studied for a given resource; an aggregation of all the adverse effects, usually measured by a qualitative and nominally subjective technique.
Infrastructure:	The utility and transportation networks needed for the functioning of an installation.
IRP:	Installation Restoration Program
KTF:	Kauai Test Facility
Ldn:	The 24-hour average energy sound level expressed in decibels, with a 10-decibel penalty added to sound levels between 10 p.m. and 7 a.m.
Mitigation:	A method or action to reduce or eliminate adverse environmental impacts.
NAAQS:	National Ambient Air Quality Standard. EPA-promulgated allowable ambient air concentrations established to protect public health and welfare.
N_2O_4:	Nitrogen Tetroxide.
National Register of Historic Places:	The nation's master inventory of known historic properties worthy of preservation. The National Register of Historic Places is administered by the National Park Service on behalf of the Secretary of the Interior. National Register listings include buildings, structures, sites, objects, and districts that possess historic, architectural, engineering, archaeological, or cultural significance. Properties listed are not limited to those of national significance; most are significant primarily at the state or local level.
National Register - Eligible Property:	A property that has been determined eligible for National Register listing by the Secretary of the Interior, or one that has not yet gone through the formal eligibility determination process but which meets the National Register criteria. For Section 106 purposes, an "eligible" property is treated as if it were already listed.
NEPA:	National Environmental Policy Act
Nonattainment Area:	An air quality control region that has been designated by the EPA and the appropriate state air quality agency as having ambient air quality levels below the primary standards set by NAAQS.

NOTAM:	Notice to All Airmen
NOTMAR:	Notice to Mariners
OHA:	Office of Hawaiian Affairs
OSHA:	Occupational Safety and Health Administration
PMRF:	Pacific Missile Range Facility
PMTC:	Pacific Missile Test Center
Resource Conservation and Recovery Act (RCRA):	Established in 1976 to protect human health and the environment from improper waste management practices.
SDI:	Strategic Defense Initiative
SDIO:	Strategic Defense Initiative Organization
SDS:	Strategic Defense System
Sensitive Species:	Species listed by state and Federal agencies that are not listed as threatened or endangered but are of concern because of habitat or other reasons.
SHPO:	State Historic Preservation Office
SNL:	Sandia National Laboratories
SOP:	Safe operating procedures
STARS:	Strategic Target System
Tactical:	(As in tactical missiles). Of or pertaining to the technique of securing the objectives designated by strategy.
Target Complex:	The part of a ballistic missile that simulates a hostile missile. Target complexes are used to collect data on potential incoming missiles and develop possible defensive strategies.
Threatened Species:	Species likely to become endangered in the foreseeable future.
TLV:	Threshold Limit Value. Recommended guidelines published by ACGIH concerning airborne concentration of chemicals to which one could be exposed for an 8-hour time weighted average, without suffering any chronic exposure effects due to long-term, industrial exposure.
Trajectory:	The curved path of an object hurtling through space, especially that of a projectile from the time it is fired.
UDMH:	Unsymmetrical dimethylhydrazine
USAKA:	U.S. Army Kwajalein Atoll - USAKA includes 11 leased islands (Kwajalein, Roi-Namur, Ennylabegan, Meck, Gagan, Gellinam, Omelek, Eniwetak, Legan, Ennugarret, and Illeginni) in the Kwajalein Atoll, Republic of the Marshall Islands.
USASDC:	U.S. Army Strategic Defense Command
USFWS:	U.S. Fish and Wildlife Service

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5.0 AGENCIES CONTACTED

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U.S. DEPARTMENT OF ENERGY

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Walter Odening, Assistant Vice President, Advanced Sciences, Inc.
Ph.D, 1971, Botany (Ecology), Duke University, Durham, North Carolina
M.S., 1968, Biology, San Diego State University, California
B.S., 1963, Biology, San Diego State University, California
Area of Responsibility: Program Director
Years of Experience: 23

Leo Rahal, Senior Scientist, Advanced Sciences, Inc.
Ph.D., 1977, Physics, University of New Mexico, Albuquerque
M.S., 1964, Physics, University of Detroit, Michigan
B.S., 1962, Physics, University of Detroit, Michigan
Areas of Responsibility: Nuclear Physics, Flight Profile, Air Dispersion
Years of Experience: 26

Nelson Rodrigues, Director, Advanced Technology Group, Advanced Sciences, Inc.
M.S., 1968, Astronautical Engineering, Air Force Institute of Technology, Dayton, Ohio
B.S., 1966, Nuclear Engineering, Lowell Technical Institute, Lowell, Massachusetts
Area of Responsibility: Technical Director, Launch Operations
Years of Experience: 23

John D. Throckmorton, Systems Engineer, Advanced Sciences, Inc.
B.S., 1988, Mechanical Engineering, Northwestern University, Evanston, Illinois
Area of Responsibility: Systems Analysis
Years of Experience: 1

Tambrey Tosk, Senior Staff Geologist, The Earth Technology Corporation
M.S., 1986, Geology, Loma Linda University, Loma Linda, California
B.S., 1983, Geology, Loma Linda University, Loma Linda, California
Area of Responsibility: Hazardous Waste, Water Quality
Years of Experience: 4

George Wandler, Senior Project Manager, Advanced Sciences, Inc.
M.B.A., 1978, Business Administration, University of Tennessee, Knoxville
B.B.A., 1969, Business Administration, Memphis State University, Tennessee
Area of Responsibility: Project Manager, Technical Development
Years of Experience: 20

Daniel D. Young, Product Manager, U.S. Army Strategic Defense Command
M.S., 1988, Public Administration, Shippensburg University, Shippensburg, Pennsylvania
B.S., 1978, Forestry, West Virginia University, Morgantown, West Virginia
Area of Responsibility: Product Manager
Years of Experience: 12

Barbara Zeman, Technical Editor, The Earth Technology Corporation
M.S., 1979, Biomedical Engineering, University of Southern California, Los Angeles
B.S., 1976, Electrical Engineering, Rutgers University, New Brunswick, New Jersey
Area of Responsibility: Technical Editing
Years of Experience: 11

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APPENDIX A

ENVIRONMENTAL ATTRIBUTES, APPLICABLE LAWS AND REGULATIONS, AND COMPLIANCE REQUIREMENTS

APPENDIX A
ENVIRONMENTAL ATTRIBUTES, 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 NEPA.

Air Quality - The *Clean Air Act* seeks to achieve and maintain air quality to protect public health and welfare. To accomplish this, Congress directed the EPA to establish *National Ambient Air Quality Standards (NAAQS)*. Primary standards protect public health; secondary standards protect public welfare (vegetation, property damage, scenic value, etc.). Standards cover sulfur dioxide, particulates, carbon monoxide, ozone, hydrocarbons, and nitrogen dioxide. The NAAQS for these pollutants are described in Table A-1.

Primary responsibility to implement the Clean Air Act rests with each state. However, each state must submit a state implementation plan outlining the state's strategy for attaining and maintaining the NAAQS within the deadlines established by the Act.

The Clean Air Act mandates establishment of performance standards, called *New Source Performance Standards*, for 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 air emission standards for beryllium, mercury, asbestos, vinyl chloride, and other hazardous materials including radioactive materials.

The Clean Air Act also seeks to *"prevent significant deterioration"* (PSD) of air quality in areas where the air is cleaner than that required by the NAAQS. Areas subject to PSD regulation 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. Nonattainment polices 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.

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." Further, the Act directs Federal agencies to "use their authorities in furtherance of the purposes of the 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.

TABLE A-1. NATIONAL AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging Time	Primary Standard[1]	Secondary Standard[2]	General Objectives
Ozone	1 hr	235 $\mu g/m^3$ (0.12 ppm)	235 $\mu g/m^3$ (0.12 ppm)	To prevent eye irritation and possible impairment of lung functions in persons with chronic pulmonary disease, and to prevent damage to vegetation.
Carbon monoxide	8 hr	10 mg/m^3 (9 ppm)	10 mg/m^3 (9 ppm)	To prevent interference with the capacity to transport oxygen in the blood.
	1 hr	40 mg/m^3 (35 ppm)	40 mg/m^3 (35 ppm)	
Nitrogen dioxide	Annual average	100 $\mu g/m^3$ (0.05 ppm)	100 $\mu g/m^3$ (0.05 ppm)	To prevent possible risk to public health and atmospheric discoloration.
Sulfur dioxide	Annual average	80 $\mu g/m^3$ (0.03 ppm)	...	To prevent pulmonary irritation.
	24 hr	365 $\mu g/m^3$ (0.14 ppm)	...	
	3 hr	...	1300 $\mu g/m^3$ (0.5 ppm)	To prevent odor.
Suspended particulate matter	Annual geometric mean	50 $\mu g/m^3$	...	To prevent health effects attributable to long continued exposures.
	24 hr	150 $\mu g/m^3$	...	
Hydrocarbons (corrected for methane)	3 hr	160 $\mu g/m^3$ (0.24 ppm)	160 $\mu g/m^3$ (0.24 ppm)	To reduce oxidant formation.

[1] National Primary Standards: The levels of air quality necessary, with an adequate margin of safety, to protect public health.

[2] National Secondary Standards: The levels of air quality necessary to protect public welfare from any known or anticipated adverse effects of a pollutant.

hr = hour
$\mu g/m^3$ = micrograms per cubic meter
mg/m^3 = milligrams per cubic meter
ppm = parts per million

Sources: Rau, J. G., and D. C. Wooten (editors), 1980. Environmental Impact Analysis Handbook, McGraw Hill.

U.S. Department of the Air Force, 1989. Draft Environmental Impact Statement, Construction and Operation of Space Launch Complex 7 Vandenberg Air Force Base, California, July 20.

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The key provision of the 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 carrying out) is "not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species."

The *Bald and Golden Eagle Protection Act* establishes penalties for the unauthorized taking, possession, selling, purchase, or transportation of bald or golden eagles, their nests, or their eggs. Any Federal activity that might disturb eagles requires consultation with the USFWS for appropriate mitigation.

The *Marine Mammal Protection Act* restricts the taking and importing of marine mammals. Although it has no direct effect on Federal activities, the Act reflects Congress' intent to afford protection to "certain species and population stocks of marine mammals [which] are, or may be, in danger of extinction or depletion as a result of man's activities."

In the *Fish and Wildlife Conservation 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 to promote conservation of nongame fish and wildlife and their habitats." Further, the Act encourages each state to develop a conservation plan.

Whenever a Federal department or agency proposes or authorizes the modification, control, or impoundment of the waters of any stream or body of water (greater than 10 acres), including wetlands, that agency must first consult with the USFWS under the *Fish and Wildlife Coordination Act*. 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. 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.

Cultural Resources - Under the *National Historic Preservation Act*, the Secretary of the Interior has authority "to expand and maintain a National Register of Historic Places composed of districts, sites, buildings, structures and objects significant in American history, architecture, archeology, engineering and culture." Section 106 of the National Historic Preservation Act requires Federal agencies to consider the effects of their action and seek comments from an independent reviewing agency, the President's Advisory Council on Historic Preservation. The purpose of the section 106 consultation is to avoid unnecessary harm to historic properties from Federal actions.

By Executive Order, Federal agencies must "initiate measures and procedures to provide for the maintenance or restoration of federally owned and registered sites." Specifically, a Federal agency must consult with the Secretary of the

Interior, the Advisory Council on Historic Preservation, and the State Historic Preservation Officer when a project or activity involves an historic site.

The *Historic Sites Act* declares that it is "a 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." In administering the Act, the Secretary of the Interior "may seek and accept the assistance of any Federal, State or municipal department or agency."

Under the *National and International Monuments Act*, the President may declare historic landmarks and structures on Federal government-controlled land to be national monuments. As part of the designation, the President may reserve a further area "compatible with the proper care and management of the objects to be protected."

The *Antiquities Act* permits the Secretaries of the Interior, Agriculture, and Army to issue permits "for the examination of ruins, the excavation of archaeological sites and the gathering of objects of antiquity upon lands under their respective jurisdictions." Such permits must serve educational or scientific purposes.

The *American Indian Religious Freedom Act* states that it is the policy of the United States to protect and preserve the rights of American Indians to believe, express, and exercise tribal religious beliefs.

The *Archaeological and Historic Preservation Act* provides for the preservation of historical and archaeological data that might otherwise be lost as a result of "any alteration of the terrain caused as a result of any Federal construction project or federally licensed activity or program." Under the Act, the Secretary of the Interior can require a survey of an affected site and can require the recovery, protection, and preservation of data.

The *Archaeological Resources Protection Act's (ARPA)* purpose is "to secure for the present and future benefit of the American people the protection of archaeological resources and sites which are on public lands and Indian lands." ARPA provides for the excavation and removal of archaeological resources prior to surface-disturbing activities. A cultural resources management survey or plan may precede a removal.

The ARPA requires a permit from the Department of the Interior for any excavation or removal of archaeological resources from public or Indian lands. Excavations must be undertaken for the purposes of furthering archaeological knowledge in the public interest. On Indian lands, the Indian tribe must grant consent prior to issuance of a permit, and can request that the permit contain certain conditions.

Hazardous Materials and Wastes - Under the *Resource Conservation and Recovery Act (RCRA)*, Congress declares the national policy of the United States to be that, wherever feasible, the generation of hazardous waste is to be reduced or eliminated as expeditiously as possible. 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.

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

RCRA also establishes a specific permit program for the treatment, storage, and disposal of hazardous wastes. 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.

RCRA defines solid waste as "any garbage, refuse, 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, RCRA provides for the development of state plans for waste disposal and resource recovery. RCRA encourages and affords assistance for solid waste disposal methods that are environmentally sound, maximize the utilization of valuable resources, and encourage resource conservation.

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.

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 Superfund program 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* is a freestanding legislative program known as the *Emergency Planning and Community Right-to-Know Act of 1986*. The Act requires (1) immediate notice for accidental releases of hazardous substances and extremely hazardous substances; (2) information to local emergency planning committees for the development of

emergency plans; and (3) Material Safety Data Sheets, emergency and hazardous chemical inventory forms, and toxic release forms.

The law requires each state to designate a state emergency response commission. In turn, the state must designate emergency planning districts and local emergency planning commissions. The primary responsibility for emergency planning is at the local level.

The *Toxic Substances Control Act* authorizes the Administrator of the EPA to protect health and the environment from harmful chemicals and mixtures. The Act regulates chemicals without regard to specific use or area of application.

Health and Safety - The *Occupational Safety and Health Act's (OSHA)* purpose is to "assure so far as possible every working man and woman in the Nation safe and healthful working conditions and to preserve our human resources."

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 Superfund Amendments and Reauthorization Act requires the Occupational Safety and Health Administration to issue regulations specifically designed to protect workers engaged in hazardous waste operations. The OSHA hazardous waste rules include requirements for hazard communication, medical surveillance, health and safety programs, air monitoring, decontamination, and training.

Land Use - Congress enacted the *Coastal Zone Management Act* to stimulate land use planning in coastal areas. The statute provides Federal grants as a voluntary inducement to the development and adoption of state management programs. Under the Act, the Secretary of Commerce through the Office of Coastal Zone Management in the National Oceanic and Atmospheric Administration exercises Federal administrative responsibility for the program.

The Act specifies that any Federal agency conducting activities, supporting activities, or undertaking any development project within the coastal zone must ensure that those activities or projects are "to the maximum extent practicable, consistent with approved state management programs."

Executive Order 11990, Protection of Wetlands, seeks "to avoid to the extent possible the long and short term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative."

In particular, the President directs each Federal agency to minimize the loss or degradation of wetlands when: (1) acquiring, managing, and disposing of

Federal lands and facilities; (2) providing Federally financed or assisted construction and improvements; and (3) conducting Federal activities and programs affecting land use.

Executive Order 11988 (Amended by Executive Order 12148), Floodplain Management, seeks "to avoid to the extent possible the long and short term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative."

In particular, the President directs each Federal agency to take action to reduce the risk of flood loss when: (1) acquiring, managing, and disposing of Federal lands and facilities; (2) providing Federally financed or assisted construction and improvements; and (3) conducting Federal activities and programs affecting land use.

Before taking an action, a Federal agency must determine whether the proposed action will occur in a floodplain. If so, the agency must consider alternatives to avoid adverse effects and incompatible development in the floodplains. If an agency will be undertaking new construction, the agency must apply accepted flood-proof and other flood-protection measures.

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 for all Americans free from noise that jeopardizes their health or welfare."

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."

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

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 waters of the United States to comply with applicable Federal, interstate, state, and local requirements.

NPDES permit requirements typically include (1) effluent limitations (numerical limits on the quantity of specific pollutants allowed in the discharge); (2) compliance schedules (abatement program completion dates); (3) self-monitoring and reporting requirements; and (4) miscellaneous provisions governing modifications, emergencies, etc.

The Clean Water Act also creates a permit system for the discharge of dredge and fill material in waters of the United States, including their wetlands. The U.S. Army Corps of Engineers administers the *Dredge and Fill Permit* program.

The *Rivers and Harbors Act of 1899* is one of our country's oldest pollution laws. The Act prohibits the unauthorized obstruction or alteration of any navigable water. Moreover, the Act prohibits the discharge of "any refuse matter of any kind or description" into any navigable water.

The *Safe Drinking Water Act* sets primary drinking water standards for owners/operators of public water systems and seeks to prevent underground injection that can contaminate drinking water sources.

The EPA has adopted *National Primary Drinking Water Regulations*, 40 CFR 141, that define maximum contaminant levels in public water systems. Further, 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.

The *Marine Sanctuaries Act* regulates ocean dumping. The Act regulates the dumping of material into ocean waters "which would adversely affect human health, welfare, or amenities, or the marine environment, ecological systems, or economic potentialities." Any ocean dumping requires an *Ocean Dumping Permit* from the EPA. Additionally, this Act designates and protects "areas of the marine environment of special national significance due to their resource or human-use values." Activity within a national marine sanctuary requires a Special Use Permit from the Secretary of Commerce.

APPENDIX B

CORRESPONDENCE

United States Department of the Interior
FISH AND WILDLIFE SERVICE
PACIFIC ISLANDS OFFICE
P O BOX 50167
HONOLULU, HAWAII 96850

January 31, 1990

Dr. Walter Odening
Advanced Sciences, Inc.
4455 Murphy Canyon Road
Suite 120
San Diego, California 92123

Dear Dr. Odening:

This follows up our telephone conversation of earlier today and your discussions with Dr. Derral Herbst of this office regarding plans to construct a launching pad at the Pacific Missile Range Facility, Barking Sands, Kekaha, Kauai, Hawaii. Specifically, you informed us that a species of plant that is a candidate for listing as an endangered species grows in an area which is to be cleared as part of the project.

The plant, Ophioglossum concinnum (also known as adder's-tongue), has been classified as a "Category 1" species. Category 1 taxa are defined as taxa for which this Service currently has on file substantial information on biological vulnerability and threats to support the proposal to list them as endangered or threatened, but because of the large number of such taxa, actual listing could take some years. Section 7 (Interagency Cooperation) of the Endangered Species Act does not require that Federal agencies consult with this Service on their actions which may affect candidate species; they are required to contact us should their actions affect proposed or fully listed species. As such, you are not in violation of any provisions of the Endangered Species Act in proceeding to clear the area for the launching pad.

We appreciate your efforts to protect Ophioglossum. Your consideration of alternative sites for the project and your proposal to transplant the individuals which are in the area to be cleared are commendable. We do request that you let us know the number of plants transplanted, where they are transplanted to, and their success in surviving.

Thank you for allowing us to review the project with you.

Sincerely yours,

William R. Kramer

William R. Kramer
Deputy Field Supervisor
Fish and Wildlife Enhancement

B-1

2011702

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

REPLY TO ATTENTION OF
Environmental Office

June 29, 1990

Mr. Ernest Kosaka
U.S. Fish & Wildlife Service
Office of Endangered Species
P.O. Box 50167
Honolulu, Hawaii 96859

Dear Mr. Kosaka:

In a letter dated March 23, 1990, the U.S. Army indicated it is proposing to expand its testing capabilities at the U.S. Naval Pacific Missile Range Facility at Barking Sands on the island of Kauai (enclosure).

The letter outlined a project requiring construction of new facilities at the Pacific Missile Range Facility and requested an informal compliance list for the Section 7 consultation process. The Biological Assessment for that list is nearing completion and will be transmitted to you in the near future.

Subsequently, a second project has been identified for the same general area of the Pacific Missile Range Facility (Kauai Test Facility). This second program will use existing facilities with minor construction requirements. The only new construction at the Pacific Missile Range Facility will be three small storage buildings in the eastern part of the Kauai Test Facility. Up to four launches a year will be made from the existing facilities.

The U.S. Army Strategic Defense Command's Environmental Office is requesting an informal list for the new project or a letter of concurrence that the earlier list still applies. Based on the assumption that the two compliance lists will be the same, a biological assessment is being prepared for delivery in the mid to late July timeframe.

Your expeditious response to this request would be appreciated. If you have any questions please call Mr. Randy Gallien at (205) 895-3294.

Sincerely,

Arnold H. Gaylor
Colonel, U.S. Army
Deputy for Operations

Enclosure

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

REPLY TO ATTENTION OF

March 23, 1990

Environmental
Office

Mr. Ernest Kosaka
U.S. Fish & Wildlife Service
Office of Endangered Species
P.O. Box 50167
Honolulu, Hawaii 96850

Dear Mr. Kosaka:

The U.S. Army is proposing to expand its testing capabilities at the U.S. Naval Pacific Missile Range Facility (PMRF) at Barking Sands (enclosure 1). This will require construction of new facilities at the PMRF. Therefore, the USASDC Environmental Office is requesting an informal section 7 consultation list for this project.

Construction will be confined to the north and central sections of the PMRF and will include a Payload Assembly Building (PAB), and Mission Control Complex (MCC). These two facilities will be interconnected forming one building. The PAB will be approximately 80 feet by 36 feet by 24 feet in height. The MCC will be approximately 60 feet by 80 feet.

The PAB/MCC facilities will be constructed in an open, grassy area east of South Nohili Road and south of the existing sewage treatment plant (enclosure 2). A concrete pad for mission equipment trailers, paving for an access drive and parking, sewer, water and electrical connections, support equipment, security fence, guard house, and two tracking towers will also be part of the proposed action. The total area required for these facilities will be approximately 1.5 acres. A proposed construction staging area about 1 acre in size will be located adjacent to the PAB/MCC area (enclosure 2).

In addition, a new launch pad is proposed for construction within the Department of Energy's Sandia National Laboratory Kauai Test Facility (KTF) located in the northern end of the PMRF (enclosure 1). The launch pad will be approximately 24 feet by 26 feet. Other associated mission structures/equipment in KTF will require construction activities that will disturb about 2.5 acres. A construction staging area about 0.2 acre in size will be located nearby.

2011704

B-3

Enclosure 1

Construction activities will also include placing 2 miles of fiber optic line that will connect the launch pad to the PAB/MCC facility. The bulk of the fiber optic line will be installed in existing ducts or overhead on existing poles. Where underground installation is required, the lines will be placed along the shoulder of existing or new roads adjacent to other utilities if possible.

The nine launches of the sensor payload vehicle from PMRF would be from the new launch pad. The launches would take place along a north-by-northwest trajectory. This launch corridor is within PMRF's Range Surveillance and Control Warning Area (enclosure 3). After the data are collected by the sensors, the sensor payload vehicle would descend, landing approximately 40 miles from PMRF. The sensor would then be retrieved and refurbished for the next launch. The booster would fall within 2 miles of the sensor payload vehicle (enclosure 3).

If you have any questions please call Mr. Randy Gallien at (205) 895-3294.

Sincerely,

Arnold H. Gaylor
Colonel, U.S. Army
Deputy for Operations

Enclosures

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

REPLY TO ATTENTION OF
Environmental Office

June 29, 1990

Mr. John Naughton
Pacific Area Office
National Marine Fisheries
2570 Dole Street
Honolulu, Hawaii 96822-2396

Dear Mr. Naughton:

In a letter dated March 23, 1990, the U.S. Army indicated it is proposing to expand its testing capabilities at the U.S. Naval Pacific Missile Range Facility at Barking Sands on the island of Kauai (enclosure).

The letter outlined a project requiring construction of new facilities at the Pacific Missile Range Facility and requested an informal compliance list for the Section 7 consultation process. The Biological Assessment for that list is nearing completion and will be transmitted to you in the near future.

Subsequently, a second project has been identified for the same general area of the Pacific Missile Range Facility (Kauai Test Facility). This second program will use existing facilities with minor construction requirements. The only new construction at the Pacific Missile Range Facility will be three small storage buildings in the eastern part of the Kauai Test Facility. Up to four launches a year will be made from the existing facilities.

The U.S. Army Strategic Defense Command's Environmental Office is requesting an informal list for the new project or a letter of concurrence that the earlier list still applies. Based on the assumption that the two compliance lists will be the same, a biological assessment is being prepared for delivery in the mid to late July timeframe.

Your expeditious response to this request would be appreciated. If you have any questions please call Mr. Randy Gallien at (205) 895-3294.

Sincerely,

Arnold H. Gaylor
Colonel, U.S. Army
Deputy for Operations

Enclosure

2011706

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

REPLY TO ATTENTION OF

March 23, 1990

Environmental
Office

Mr. John Naughton
Pacific Area Office
National Marine Fisheries
2570 Dole Street
Honolulu, Hawaii 96822-2396

Dear Mr. Naughton:

The U.S. Army is proposing to expand its testing capabilities at the U.S. Naval Pacific Missile Range Facility (PMRF) at Barking Sands (enclosure 1). This will require construction of new facilities at the PMRF. Therefore, the USASDC Environmental Office is requesting an informal section 7 consultation list for this project.

Construction will be confined to the north and central sections of the PMRF and will include a Payload Assembly Building (PAB), and Mission Control Complex (MCC). These two facilities will be interconnected forming one building. The PAB will be approximately 80 feet by 36 feet by 24 feet in height. The MCC will be approximately 60 feet by 80 feet.

The PAB/MCC facilities will be constructed in an open, grassy area east of South Nohili Road and south of the existing sewage treatment plant (enclosure 2). A concrete pad for mission equipment trailers, paving for an access drive and parking, sewer, water and electrical connections, support equipment, security fence, guard house, and two tracking towers will also be part of the proposed action. The total area required for these facilities will be approximately 1.5 acres. A proposed construction staging area about 1 acre in size will be located adjacent to the PAB/MCC area (enclosure 2).

In addition, a new launch pad is proposed for construction within the Department of Energy's Sandia National Laboratory Kauai Test Facility (KTF) located in the northern end of the PMRF (enclosure 1). The launch pad will be approximately 24 feet by 26 feet. Other associated mission structures/equipment in KTF will require construction activities that will disturb about 2.5 acres. A construction staging area about 0.2 acre in size will be located nearby.

2011707

Construction activities will also include placing 2 miles of fiber optic line that will connect the launch pad to the PAB/MCC facility. The bulk of the fiber optic line will be installed in existing ducts or overhead on existing poles. Where underground installation is required, the lines will be placed along the shoulder of existing or new roads adjacent to other utilities if possible.

The nine launches of the sensor payload vehicle from PMRF would be from the new launch pad. The launches would take place along a north-by-northwest trajectory. This launch corridor is within PMRF's Range Surveillance and Control Warning Area (enclosure 3). After the data are collected by the sensors, the sensor payload vehicle would descend, landing approximately 40 miles from PMRF. The sensor would then be retrieved and refurbished for the next launch. The booster would fall within 2 miles of the sensor payload vehicle (enclosure 3).

If you have any questions please call Mr. Randy Gallien at (205) 895-3294.

Sincerely,

Arnold H. Gaylor
Colonel, U.S. Army
Deputy for Operations

Enclosures

United States Department of the Interior
FISH AND WILDLIFE SERVICE
PACIFIC ISLANDS OFFICE
P O BOX 50167
HONOLULU HAWAII 96850

May 9, 1990

Colonel Arnold H. Gaylor
Deputy for Operations
U. S. Army Strategic Defense Command - Huntsville
P. O. Box 1500
Huntsville, Alabama 35807-3801

Dear Colonel Gaylor:

This replies to your March 23, 1990 request for information concerning listed, proposed, or candidate endangered or threatened species which may be found in the vicinity of, or may be affected by, the proposed construction and operation of various new facilities at the Naval Pacific Missile Range Facility (PMRF) at Barking Sands, Kauai, Hawaii.

One such plant, Ophioglossum concinnum (also known as adder's-tongue), has been classified as a "Category 1" species. Category 1 taxa are defined as taxa for which this Service currently has on file substantial information on biological vulnerability and threats to support the proposal to list them as endangered or threatened, but because of the large number of such taxa, actual listing could take some years. It is likely that we will propose Ophioglossum for listing within the next two years. Section 7 (Interagency Cooperation) of the Endangered Species Act does not require that Federal agencies consult with this Service on their actions which may affect candidate species; they are required to contact us should their actions jeopardize "proposed" species or affect fully listed species.

The threatened green sea turtle (Chelonia mydas) may nest on the beaches at Barking Sands, and the effects of any construction, vehicular traffic, or floodlights on the beach should be considered in your evaluation.

The threatened Newell's Townsend's shearwater nests in higher interior portions of the island. Young leaving their nests fly over coastal regions of the island at night, frequently becoming confused by lights and crashing into wires or the ground. This is a significant factor in their endangered status. If the project requires floodlights, formal consultation with this Service is warranted.

Thank you for the opportunity to comment on the proposed project. If we can be of further assistance, please contact us again.

Sincerely yours,

William R. Kramer

for Ernest Kosaka
Field Office Supervisor
Fish and Wildlife Enhancement

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Pacific Area Office - Southwest Region
2570 Dole St. - Honolulu, HI 96822

April 20, 1990 F/SWR14:ETN

Colonel Arnold E. Gaylor
Deputy for Operations
U.S. Army Strategic Defense
Command - Huntsville
P.O. Box 1500
Huntsville, AB 35807-3801

Dear Colonel Gaylor:

This responds to your letter of March 23, 1990, to John Naughton regarding a proposed expansion of U.S. Army testing capabilities at the U.S. Navy Pacific Missile Range Facility (PMRF) at Barking Sands, Kauai, Hawaii. As described in your letter much of the construction of new facilities will occur in areas removed from the shoreline at Barking Sands, except for a launch pad within Sandia Laboratory's Kauai Test Facility (KTF) near the beach crest.

Listed species which may be found near or around the construction sites and missile impact areas include the endangered humpback whale (Megaptera novaeangliae), endangered Hawaiian monk seal (Monachus schauinslandi), and the threatened green turtle (Chelonia mydas).

Humpback whales can be found in Hawaiian waters during the period December through May usually in waters less than 100 fathoms depth around the main Hawaiian Islands. The Hawaiian monk seal is usually distributed among the islands and atolls of the Northwestern Hawaiian Islands (NWHI) from Kure Atoll to Nihoa Island. Sightings of individual animals have been recently increasing on the main Hawaiian Islands, especially Kauai, Oahu, and Molokai. Green turtles are distributed throughout the Hawaiian Archipelago. Their primary breeding grounds and nesting beaches are located in the NWHI at French Frigate Shoals while foraging and resting areas are found at every island in the chain. Background material and information for these species have been provided directly to the consultants for the project, Advanced Sciences, Inc., in San Diego, CA.

Please foward a copy of the environmental documentation for the project to me when it is completed so that I may complete the consultation. I can be reached at the address above or at 808/955-8831 should there be any further questions.

Sincerely yours,

Eugene T. Nitta

Eugene T. Nitta
Protected Species Branch

cc: F/SWR13, Naughton

2011711

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

REPLY TO
ATTENTION OF

Environmental Office

9 JUL 1990

Mr. William W. Paty
Board of Land and Natural Resources
State of Hawaii
P.O. Box 621
Honolulu, Hawaii 96804

Dear Mr. Paty:

The U.S. Army Strategic Defense Command (USASDC) is in the process of performing environmental assessments for the Exoatmospheric Discrimination Experiment (EDX) and the Strategic Target Systems (STARS) programs at the Pacific Missile Range Facility (PMRF), Kauai, Hawaii (Figure 2). Each program will require a separate launch pad due to the lack of similarity of their respective launch vehicles. Each EDX and STARS launch vehicle has an associated safety radius that would limit public access to a small section of beach along PMRF (Figure 1).

Both the EDX and STARS program activities would take place within the Kauai Test Facility (KTF) at the northern end of PMRF. The EDX program will require construction of a new launch pad, whereas the STARS program will use an existing launch pad on the KTF (Figure 1). To ensure public safety, both programs require a 1,250 foot Explosive Safety Quantity Distance (ESQD) arc from the center of each launch pad (Figure 1).

The ESQD requirement has been established in accordance with Department of Defense (DoD) Standard 6055.9 (DoD Ammunition and Explosive Safety Standards), which requires that all nonessential personnel be cleared from within the ESQD while a launch vehicle is on the launch pad. Within the ESQDs for the proposed EDX and STARS programs there would be approximately 2,500 feet and 1,800 feet (all of which is within the EDX ESQD) of beach, respectively, that would be restricted to the public. This area would be closed for 16 to 30 days three times a year for 3 years for the EDX program and 14 days four times a year for an estimated 10 years for the STARS program. Total closure time of this area for the two programs could reach a maximum of 146 days per year. The first launch for the STARS program is planned for the spring of 1991 and the first launch for the EDX program is proposed for the fall of 1993.

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To determine the potential significance of these programs on public access to the beach area, a land use study on the recreational activities along PMRF's coast (Recreation Areas, 1, 2, and 3 [Figure 2]) was conducted by USASDC. The ESQDs for both programs included portions of Recreation Area 1. Existing data were gathered; specifically, the unofficial PMRF Visitor Control records from November 09, 1987 to August 31, 1989. These records note which Recreation Area was visited or if a combination (i.e., Recreation Area 1 and 2) of recreation areas were requested. These data also note whether the purpose of the visit was surfing, fishing, camping, or general use. In addition, the land use survey examined if activities available along the beach within the ESQDs were considered unique versus the activities available along the remainder of PMRF's coastline.

The results of this study indicate that only approximately 6 percent of the total 8 miles of PMRF beach area would be temporarily closed for safety reasons. This 6 percent represents only 2 percent of the coastline from Salt Pond Beach Park to the northern end of Polihale State Park. Information gathered from the unofficial recreational control records (Table 1) indicates that only 10 percent of the total public visitors (43,678 for the survey period) who access the beach through PMRF requested direct use of Recreation Area 1. The only unique feature determined to exist in this area is the "Barking Sands" dunes and this beach area is currently only open from 4:00 p.m. to 6:00 a.m. Monday through Friday and 24 hours a day on weekends, except when closed during hazardous operations. This portion of beach is mainly used for fishing (38 percent), with some overnight camping (2 percent) and general beach activities (49 percent). A higher percentage of requests indicated general use but from the records it appears this use is for less than 2 hours in duration. Because fishing and general use in Recreation Area 1 are the most popular activities, but fishing here represents only 12 percent of all fishing along PMRF and access to observe the "Barking Sands" dunes is still available through the state park; land use impacts to Recreation Area 1 for the maximum temporary closure time of 146 days a year would be insignificant.

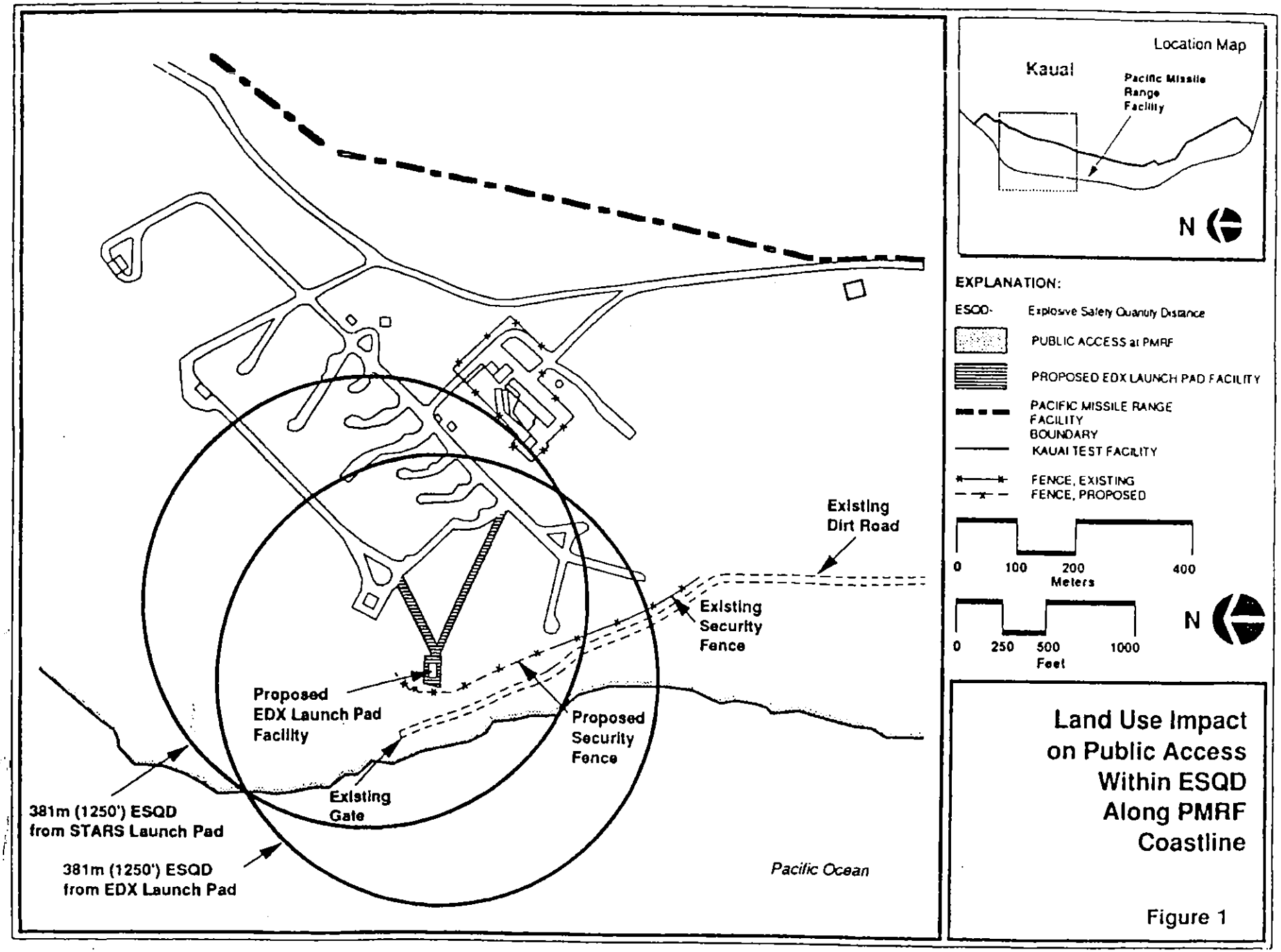
Based on the study results, USASDC believes that impact to land use within this limited access area would be insignificant because the beach area that would be temporarily restricted to the public represents a small

percentage of the overall available beach area within PMRF, and because other equally acceptable recreation areas within PMRF are available for public use. In addition, the area's only unique characteristic will still be available for viewing by access through the state park and closures of the beach will be minimized as much as possible.

If you should have any questions or comments, please contact Randy Gallien at (205) 895-3294.

Sincerely,

Arnold H. Gaylor
Colonel, U.S. Army
Deputy for Operations



Land Use Impact on Public Access Within ESQD Along PMRF Coastline

Figure 1

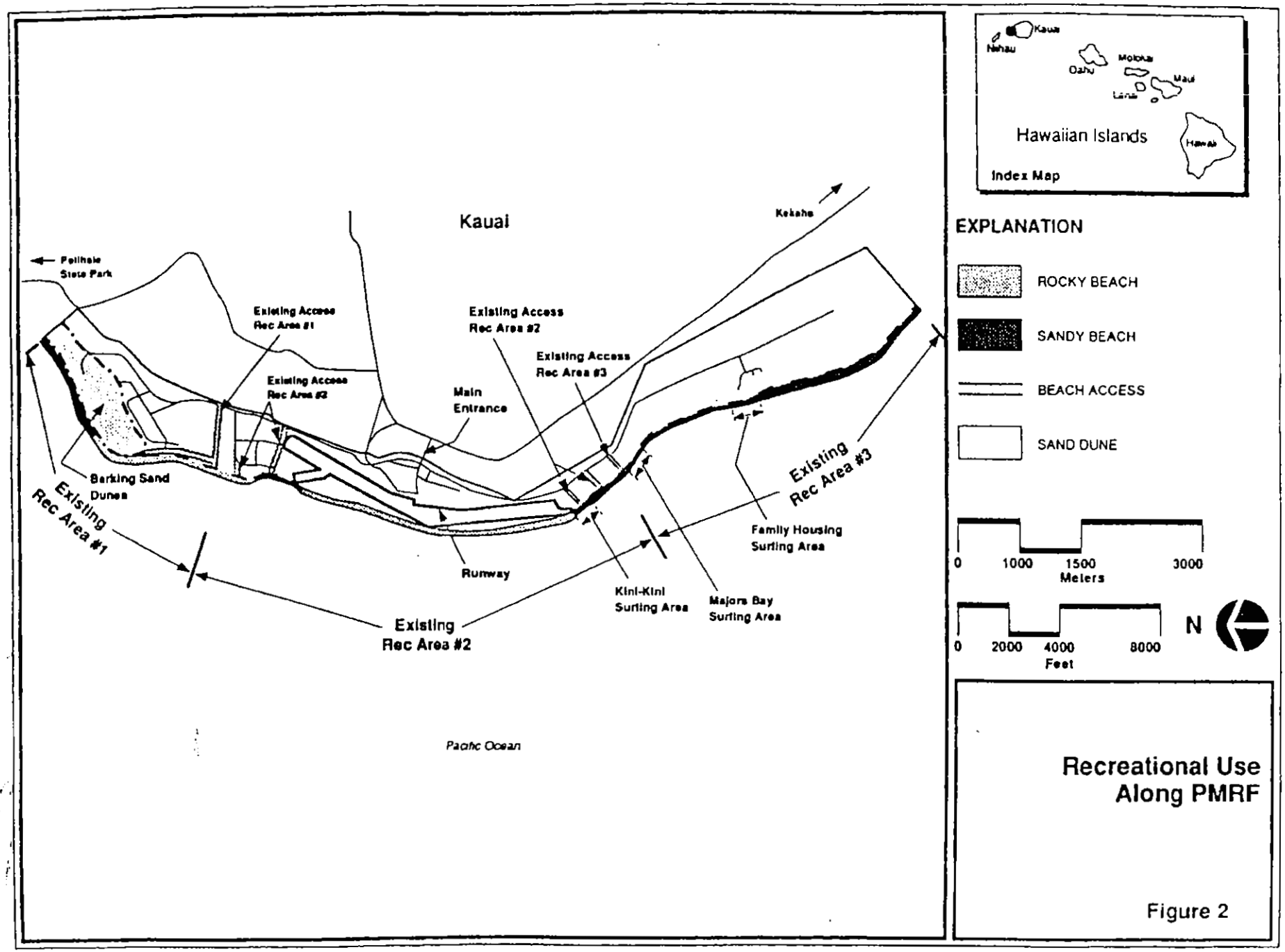

Kauai
Kekaha
Polihale State Park
Existing Access Rec Area #1
Existing Access Rec Area #2
Existing Access Rec Area #3
Existing Access Rec Area #2
Main Entrance
Barking Sand Dunes
Existing Rec Area #1
Existing Rec Area #3
Family Housing Surfing Area
Runway
Kini-Kini Surfing Area
Majors Bay Surfing Area
Existing Rec Area #2
Pacific Ocean
Hawaiian Islands
Index Map
EXPLANATION
ROCKY BEACH
SANDY BEACH
BEACH ACCESS
SAND DUNE
0 1000 1500 3000
Meters
0 2000 4000 8000
Feet
N
Recreational Use Along PMRF
Figure 2

TABLE 2-1. RECREATIONAL LAND USE AT PMRF

YEARS: 09 NOV 1987 - 31 AUG 1989

RECREATION AREA PERMIT REQUESTS*		RECREATION USE AT PMRF									
		CAMP	FISH	MODEL PLANE	SURF	VISIT	OTHER	BEACH	DIVING	FISH/ SURF	TOTAL
1	% USAGE	1.97%	38.32%	0.07%	10.21%	24.87%	0.76%	23.68%	0.13%	0.00%	100.00%
	PERSONS	88	1715	3	457	1113	34	1060	6	0	4476 (10.25%)
2	% USAGE	2.75%	68.23%	6.55%	7.55%	8.12%	1.61%	4.83%	0.36%	0.00%	100.00%
	PERSONS	77	1907	183	211	227	45	135	10	0	2795 (6.40%)
3	% USAGE	1.05%	10.44%	6.96%	57.66%	5.98%	0.93%	16.92%	0.02%	0.04%	100.00%
	PERSONS	226	2239	1494	12370	1282	199	3629	4	9	21452 (49.11%)
1 and 2	% USAGE	5.66%	84.73%	0.34%	1.72%	1.72%	0.00%	5.83%	0.00%	0.00%	100.00%
	PERSONS	33	494	2	10	10	0	34	0	0	583 (1.33%)
1 and 3	% USAGE	3.28%	55.33%	0.00%	4.51%	11.48%	1.64%	23.77%	0.00%	0.00%	100.00%
	PERSONS	8	135	0	11	28	4	58	0	0	244 (0.56%)
2 and 3	% USAGE	0.08%	37.99%	0.27%	48.35%	3.11%	1.94%	7.89%	0.34%	0.04%	100.00%
	PERSONS	2	1001	7	1274	82	51	208	9	1	2635 (6.03%)
1,2, and 3	% USAGE	1.02%	54.85%	0.58%	18.32%	7.37%	6.17%	11.62%	0.00%	0.07%	100.00%
	PERSONS	114	6157	65	2057	827	693	1305	0	8	11226 (25.70%)
OTHER**	% USAGE	0.75%	32.96%	7.12%	11.61%	9.74%	32.96%	4.87%	0.00%	0.00%	100.00%
	PERSONS	2	88	19	31	26	88	13	0	0	267 (0.61%)
TOTAL	% USAGE	1.26%	31.45%	4.06%	37.60%	8.23%	2.55%	14.75%	0.07%	0.04%	100.00%
	PERSONS	550	13736	1773	16421	3595	1114	6442	29	18	43678 (100.00%)

*Recreation Area access permits were requested for a specific area or combination of areas. The usage shown in the table for a combination of areas is not cumulative.

**These are inconsistences in the data base, and are being incorporated into a designated recreation area for the final EA.

Reference: PMRF Unofficial Visitor Pass Records 11/9/87 - 8/31/89

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

REPLY TO ATTENTION OF

July 9, 1990

Environmental Office

Mr. John Naughton
Pacific Area Office
National Marine Fisheries
2570 Dole Street
Honolulu, Hawaii 96822-2396

Dear Mr. Naughton:

Enclosed for your use and information is the Biological Assessment for the Strategic Target System.

If you have any questions please call Mr. Randy Gallien at (205) 895-3294. Requests for additional copies should be addressed to U.S. Army Strategic Defense Command, ATTN: CSSD-EN, P.O. Box 1500, Huntsville, Alabama 35807-3801.

Sincerely,

Arnold H. Gaylor
Colonel, U.S. Army
Deputy for Operations

Enclosure

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
300 South Ferry Street
Terminal Island, CA 90731

July 24, 1990 F/SWR14:ETN

Colonel Arnold H. Gaylor
Deputy for Operations
U.S. Army Strategic Defense
Command - Huntsville
P.O. Box 1500
Huntsville, AB 35807-3801

Dear Colonel Gaylor:

This responds to your requests of July 9, 1990 to review the Biological Assessments (BA) for the Strategic Target System (STARS) and the Exoatmospheric Discrimination Experiment (EDX) under Section 7 of the Endangered Species Act of 1973, as amended, for potential impacts to listed species. The species list provided to you on April 20, 1990 for these projects and used in the Assessments remains valid for the purposes of this evaluation.

Humpback whales (Megaptera novaeangliae) are found around the main Hawaiian Islands during the winter breeding season from December through May, usually in waters less than 100 fathoms. Although humpback whales have been observed from Barking Sands, they can be found throughout the 100 fathom isobath around Kauai.

Hawaiian monk seals (Monachus schauinslandi) are occasionally reported from the main Hawaiian Islands. Consistent sightings of 1 to 3 monk seals have been reported from Kauai over the past four years. Solitary animals typically haul out at sites randomly around the Island.

Green turtles (Chelonia mydas) are distributed throughout the main Hawaiian Islands. While green turtles are commonly observed in waters around Kauai little is known about benthic resting habitat and intertidal and subtidal foraging areas there. Occasional nesting also occurs on Kauai, and one confirmed nesting was reported from the beach fronting base housing at the Pacific Missile Range Facility (PMRF), which is located at the opposite end of the base from the proposed projects.

The EDX program involves the use of the ARIES booster to launch optical sensing packages into the exoatmosphere to observe target vehicles during the mid-course of their trajectory. There would be a total of nine launches over a three year period from the Kauai Test Facility at the PMRF, Barking Sands, Kauai. A new launch pad, mission control center/payload assembly building and other associated infrastructure would be built within the Sandia Laboratory's Kauai Test Facility which houses similar launch

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facilities. This new construction is sufficiently removed from known terrestrial and aquatic habitats of Hawaiian monk seals and green turtles that it is not likely to affect either species. Launches of the booster and sensor packages would not likely affect these species for the same reason. The proposed impact area is sufficiently distant from known winter habitat of humpback whales around Kauai that booster impact and payload recovery activities would not likely affect humpback whales.

The STARS project consists of surplus Polaris A3 first and second stage motors, various payloads such as sensors, interceptors, or target simulators, and the necessary infrastructure at the Kauai Test Facility to support an average of four launches per year for ten years beginning in 1991. The project is part of a larger research program within the Strategic Defense Initiative to determine the feasibility of developing an effective ballistic missile defense system. New construction to support this project would be within the Kauai Test Facility at PMRF and would not affect any of the species listed above. Launches of the STARS systems will not likely affect these same species. As with the EDX system, the impact area for the first stage booster from the STARS vehicle is sufficiently removed from known winter habitat of humpback whales around Kauai so that first stage booster impact at approximately 74 miles from PMRF would not likely affect humpback whales.

Based on the best available information and that provided in the Biological Assessments we concur with your findings that the EDX and STARS projects as described will not likely adversely affect humpback whales, Hawaiian monk seals, or green turtles. The inclusion of impact area monitoring by PMRF and delaying the launch if humpback whales are observed in the zone will further ensure that humpback whales are not adversely affected by these projects. This concludes the Section 7 consultation process for these projects. Please contact Mr. Eugene T. Nitta, Protected Species Branch, Pacific Area Office, 2570 Dole St., Honolulu, HI 96822-2396 (Tel. 808/955-8831) should there be any further questions.

Sincerely,

for E.C. Fullerton
Regional Director

cc: F/SWR14, Nitta

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

REPLY TO ATTENTION OF

July 9, 1990

Environmental Office

Mr. Ernest Kosaka
U.S. Fish & Wildlife Service
Office of Endangered Species
P.O. Box 50167
Honolulu, Hawaii 96859

Dear Mr. Kosaka:

Enclosed for your use and information is the Biological Assessment for the Strategic Target System.

If you have any questions please call Mr. Randy Gallien at (205) 895-3294. Requests for additional copies should be addressed to U.S. Army Strategic Defense Command, ATTN: CSSD-EN, P.O. Box 1500, Huntsville, Alabama 35807-3801.

Sincerely,

Arnold H. Gaylor
Colonel, U.S. Army
Deputy for Operations

Enclosure

2011721

United States Department of the Interior
FISH AND WILDLIFE SERVICE
PACIFIC ISLANDS OFFICE
P.O. BOX 50167
HONOLULU, HAWAII 96850

July 20, 1990

Colonel Arnold H. Gaylor
Deputy for Operations
U. S. Army Strategic Defense Command - Huntsville
P. O. Box 1500
Huntsville, Alabama 35807-3801

Attention: Environmental Office

Dear Colonel Gaylor:

This replies to your July 9, 1990 request for our review of the Biological Assessment for the Strategic Target Systems (STARS) project. It was delivered here on July 17, 1990 by Mr. Randy Gallien of your staff.

As noted in the Assessment, there are eight endangered and one threatened species (all animals) which can be found in the general area of the Pacific Missile Range Facility on Kauai. Eight of the species are under this Service's jurisdiction and are the subject of this response; the ninth species, the humpback whale, is under the jurisdiction of the National Marine Fisheries Service.

Two plants that are candidates for listing can also be found within the general project area.

We concur with your determination that the construction and operation of the STARS project will not affect seven of the eight species. These are the:

Hawaiian coot	Hawaiian hoary bat
Hawaiian common moorhen	Hawaiian monk seal
Hawaiian stilt	Green sea turtle
Hawaiian duck	

We also concur with your determination that although the eighth listed species, the threatened Newell's Townsend's shearwater, may fly over the site and may be affected by the lights as described in the Assessment, the mitigation offered of shading the lights and other measures to reduce upward light will greatly reduce the chances for birds being adversely affected to any appreciable degree. We recommend that the following mitigation be implemented to further reduce the chances for any adverse impact on shearwaters:

1. Unless absolutely necessary, flood lights and other non-essential lights should be extinguished during the few weeks each year when fledgling shearwaters fly from the upper interior portions of Kauai to the sea. This period is usually in the early Fall (October). The State's District Wildlife Biologist in Lihue can be consulted annually for more specific dates.

2. Although the security fence planned as part of the project will aid any shearwaters which may land within fenced areas by excluding such predators as dogs, the birds may fly into the fences if they are flying at low elevations. Security guards and other appropriate staff should be instructed to inspect fence lines during the fledging season and pick up any grounded shearwaters. Shearwaters can be turned over to "aid stations" established around the island during those weeks to collect, treat, and release "fallout" fledglings. A record of any such birds collected should be provided to the State's District Biologist and to this office.

The Assessment also identified that two species of plants which are Category 1 candidates for listing as endangered (Ophioglossum concinnum and Sesbania tomentosa) can be found within the Barking Sands facility. Of these, only Ophioglossum will be affected by the proposal. We were pleased that you adjusted your project design so that as few of these plants as possible will be adversely affected. The transplanting program helps to mitigate the loss of plants which will be destroyed during construction.

Both of the candidate plants are scheduled to be proposed for listing as endangered in 1992. Once a species is proposed for listing, you must consider the possible impacts of any further federal actions on them and may be required to formally confer with this Service.

Thank you for allowing us to review your proposal. Should you have any questions or comments, please contact us again.

Sincerely yours,

William R. Kramer
Acting Field Office Supervisor
Fish and Wildlife Enhancement

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

REPLY TO ATTENTION OF

July 20, 1990

Environmental Office

Mr. William W. Paty
Board of Land and Natural Resources
and State Historic Preservation Officer
State of Hawaii
P.O. Box 621
Honolulu, Hawaii 96804

Dear Mr. Paty:

The U.S. Army Strategic Defense Command is proposing a new project, the Strategic Target System (STARS) within the Kauai Test Facility on the U.S. Navy's Pacific Missile Range Facility. The project will involve a series of vehicle launches from an existing launch facility within the Kauai Test Facility. This facility is situated adjacent to the Nohili Dune.

This command recognizes the ethnographic significance of this area as well as its potential for cultural resources. Though no project construction is slated for this area, it is our intention to avoid any action which may cause an impact to the dune area.

At some future point the STARS project will necessitate construction of a small, above-ground fuel storage facility within the Kauai Test Facility. No decision has been made on the exact location for the proposed fuel storage pad at this time. However, we believe that an area where the proposed fuel storage pads might be sited has a low potential for containing significant cultural materials. This is based on the lack of significant archaeological findings presented in the Exoatmospheric Discrimination Experiment Archaeological Survey and Testing Report.

Should cultural depositions, materials or remains be found during any ground disturbing activities, your office will be notified immediately. Avoidance of any archaeological site areas will be the primary method of mitigation.

We trust that this method will be satisfactory to your office. Any questions or comment may be discussed with Mr. Randy Gallien at (205) 895-3294.

Sincerely,

for Arnold H. Gaylor
Colonel, U.S. Army
Deputy for Operations

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

REPLY TO ATTENTION OF

July 23, 1990

Environmental Office

Mr. John Nakagawa
Office of State Planning
State Capitol
Honolulu, Hawaii 96813

Dear Mr. Nakagawa:

The U.S. Army Strategic Defense Command is preparing environmental assessments for the Exoatmospheric Discrimination Experiment and the Strategic Target Systems programs at the Pacific Missile Range Facility. A small section of Polihale State Park is within the launch hazard zone for each program and will be affected by the proposed action. Enclosed is a completed Coastal Zone Management Assessment Form for your review. The Strategic Target Systems environmental assessment is being provided under separate cover.

Both the Exoatmospheric Discrimination Experiment and Strategic Target Systems program activities would take place within the Kaua'i Test Facility at the northern end of Pacific Missile Range Facility. The Exoatmospheric Discrimination Experiment program will require construction of a new launch pad, whereas the Strategic Target Systems program will use an existing launch pad within the Kaua'i Test Facility. To ensure public safety, both programs require a 1,250 foot explosive safety quantity distances arc from the center of each launch pad (see section 3.5.1 of the Strategic Target Systems environmental assessment).

A launch hazard arc extending 10,000 feet from the launch pad would be required for each of these programs. The launch area would be cleared for safety reasons for 20 minutes during each launch activity. This area would be evacuated three times a year for 3 years (1993-1996) for the Exoatmospheric Discrimination Experiment program and up to four times a year for 10 years for the Strategic Target Systems program beginning in the spring of 1991. The launch hazard area would include approximately 70 acres of the southern end of Polihale State Park. The clearing procedures will require visitors to move north of

Queens Pond, and will not affect the camping area at the park (see Section 3.4.4 and 3.6.5 of the Strategic Target Systems environmental assessment).

The proposed action will cause temporary impact to recreational resources by restricting access to the Barking Sands area of the park and closing a dedicated right-of-way for brief periods. However, no permanent impacts to the recreational resources will result. No ground disturbances will occur in the coastal zone, so the archaeological resources at Barking Sands will not be affected and no scenic and open space resources or coastal ecosystems would be impacted. Economic resources could be minimally affected by the highway closure. Coastal hazards and development management will not be significant to the proposed action in that no construction is planned in the Hawaiian Coastal Zone. Therefore, the proposed activity is consistent with and will be conducted in a manner which is consistent to the maximum extent practicable with the Hawaii Coastal Zone Management Program.

Meetings have been held with Mr. William Paty of the Department of Land and Natural Resources concerning this temporary closure of the state park. Any questions or comments can be directed to Randy Gallien at (205) 895-3294.

Sincerely,

for Arnold A. Gaylor
Colonel, U.S. Army
Deputy for Operations

Enclosure

2011727

APPENDIX C

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DISTRIBUTION LIST

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CSSD-RM
Crystal Mall, Bldg. 4
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Washington, DC 20310-1000

Deputy Director for Environment
Office of Director of Installations and Facilities
Department of the Navy
Crystal Plaza, Bldg. 5
Arlington, VA 20360

Environment, Safety and Occupational Health
(OP-45)
Crystal Plaza, Bldg. 5, Room 644
Arlington, VA 20360

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Scott AFB, IL 62225-5000

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Hill AFB, UT 84056-5000

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1606 ABW/PA
Kirtland AFB, NM 87117-5000

Base Civil Engineer
1606 ABW/DE
Kirtland AFB, NM 87117-5000

Commander Pacific Division
Naval Facilities Engineering Command
Pearl Harbor, Hawaii 96860-7300

Pacific Missile Range Facility
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FINAL

SUPPLEMENT TO THE STRATEGIC TARGET SYSTEMS (STARS) ENVIRONMENTAL ASSESSMENT

July 1991

U.S. Army Strategic Defense Command
STARS Program Office
P.O. Box 1500
Hunstsville, Alabama 35807-3801

EXECUTIVE SUMMARY

An environmental assessment (EA) was prepared for the Strategic Target System (STARS) in July 1990 that resulted in a finding of no significant impact (FNSI) in August 1990. In October and November 1990, lawsuits were filed against the United States by the Sierra Club and the State of Hawaii challenging the adequacy of the STARS EA and the decision not to prepare an environmental impact statement (EIS). On May 9, 1991, the Federal District Court in Hawaii determined that no EIS needed to be prepared but that the STARS EA must be supplemented on the issues of the potential effects on the Kauai environment from HCl released during STARS launches and that a determination be made as to whether the release of freon from the second stage of the STARS would violate the Hawaii Ozone Layer Protection Statute. Moreover, the judge indicated the STARS EA may not have adequately described the various computer models used to predict the dispersion or movement of air pollutants from the rocket ignition.

The supplement to the STARS EA discusses three areas: 1) the two predictive dispersion models, 2) the potential effects of HCl and carbon monoxide (CO) from the rocket launches on the Kauai environment, and 3) whether the release of freon from the second-stage booster of the STARS violates the Hawaii Ozone Protection Statute.

Two predictive dispersion modeling techniques, the Rocket Exhaust Effluent Dispersion Model (REEDM) and Trinity Consultants modification to the EPA Puff Model (TRPUF), were used for estimating pollutant emissions from the proposed STARS missile launches. The TRPUF model results were presented in the environmental assessment because it provides a highly conservative (higher) estimate of emissions. This supplement to the STARS EA describes in more detail the assumptions and variables that were used in both REEDM and TRPUF models, and it gives a more detailed description of the findings of the two models for HCl and CO.

A detailed search of existing literature on environmental effects of HCl was conducted to determine if there were specific studies of HCl effects on the Hawaiian environment. The only study found specific to Hawaii was a study of HCl emissions at the ocean/lava interface on the island of Hawaii. The literature review identified some studies on the effects of various levels of HCl and the corresponding effects on some representative species of plants and animals. The studies indicate environmental injury from HCl occurs primarily when the HCl is released in a moist or wet environment, such as when a deluge water system is used or the gas comes in contact with precipitation (in moist conditions, the HCl mixes with water to form hydrochloric acid, which may damage plants on contact). HCl from the STARS launches will not come in contact with such a moist or wet environment since no deluge water is used, and due to operational constraints, the missile will not be launched when it is raining. In addition, the launch hazard area (LHA) extends 10,000 feet from the launch site, and the safety procedures associated with the launch require nonessential personnel to be evacuated from the LHA. The two modeling techniques produced different pollutant dispersion results. TRPUF indicated that HCl concentrations at the LHA boundary would exceed the State of Hawaii public exposure guideline. REEDM indicated that the guideline would not be exceeded. Based on REEDM, which is believed to predict more realistic and valid field concentrations than does TRPUF, it is

highly unlikely that HCl releases from STARS will cause adverse human health or environmental effects on Kauai. A violation of the State of Hawaii 1-hour Ambient Air Quality Standard for carbon monoxide is highly unlikely.

Since no specific literature was available, original field research was conducted on the island of Kauai. Control areas (areas not exposed to rocket exhaust but which were otherwise environmentally similar to the Kauai Test Facility [KTF]) were identified and compared to areas of the KTF that have been routinely exposed to missile exhaust for a period of 28 years. No physical or chemical differences were identified that could be correlated to exposure to HCl. The vegetation within the KTF did not exhibit any damage due to past launches. In addition, the rare adder's tongue fern occurs near existing launch areas and does not appear to be affected.

On January 1, 1991, the Hawaii Ozone Layer Protection Statute went into effect. This law is designed to regulate the release of chlorofluorocarbon (CFC) chemicals from such sources as air conditioners or mobile air conditioners. Specifically, it regulates CFCs consisting of certain chlorine, fluorine, carbon, and hydrogen compounds. The listed regulated compounds are CFC-11, CFC-12, CFC-13, CFC-112, CFC-113, CFC-114, and CFC-115. The type of freon used in the STARS second-stage motor is Freon 114B2, a brominated fluorocarbon compound; it is not a chlorofluorocarbon. Since the Hawaii statute only regulates CFCs, bromine compounds, such as Freon 114B2, do not fall within its purview. Therefore, the STARS activities do not threaten a violation of the Hawaii statute.

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1.0 INTRODUCTION

The Strategic Target System program (STARS) uses a three-stage solid propellant guided missile under development by the U.S. Army Strategic Defense Command (USASDC). The missile integrates selected parts of the Navy retired Polaris A3 fleet ballistic missile with a substantial number of newly developed subsystems. STARS will be used for testing various developmental elements of the Strategic Defense Initiative System. STARS will fly a payload of either single or multiple reentry vehicles to the Broad Ocean Area or will be targeted for impact or for reentry near the U.S. Army Kwajalein Atoll (USAKA). The missile with its payload will be launched from the Department of Energy/Sandia National Laboratory-managed Kauai Test Facility (KTF) located on the Pacific Missile Range Facility (PMRF), Kauai, Hawaii. A detailed discussion of the proposed action for the STARS program is available in the STARS Environmental Assessment (EA) (USASDC 1990).

As part of the STARS development process, an EA was prepared by the USASDC and completed in July 1990. It concluded with a finding of no significant impact (FNSI). The Army determined that the STARS program would have no significant environmental impacts and that any potential impacts could be mitigated. However, as a result of lawsuits filed with the U.S. District Court, District of Hawaii, by the Sierra Club and the State of Hawaii, the court ordered that a supplemental study be conducted of the potential effects on the Kauai environment from HCl released during STARS launches and that a determination be made as to whether the release of freon from the second stage of the STARS would violate the Hawaii Ozone Layer Protection Statute.

A series of meetings were held on June 20 and 21 at the PMRF. This provided a variety of public officials, organizations, and individuals an opportunity for input of public concerns into this supplemental EA.

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2.0 AFFECTED ENVIRONMENT

The existing environment at the KTF is described in Section 2.6 of the STARS EA (USASDC 1990a). This section will provide a brief summary of that information and will supplement it with details of the particular environment of the KTF potentially subject to the STARS exhaust emissions.

2.1 AIR QUALITY

This section supplements Section 2.6.1 Air Quality of the STARS EA.

Air quality in the vicinity of the KTF is generally excellent. The area is in attainment for the State of Hawaii and all National Ambient Air Quality Standards (NAAQS). The practice of agricultural burning of sugar cane fields produces periods of heavy smoke and ash. During these activities, visibility can be reduced over a wide area, sometimes several miles.

2.2 BIOLOGICAL RESOURCES

The biological resources within and adjacent to the KTF are discussed in Section 2.6.2 Biological Resources in the STARS EA.

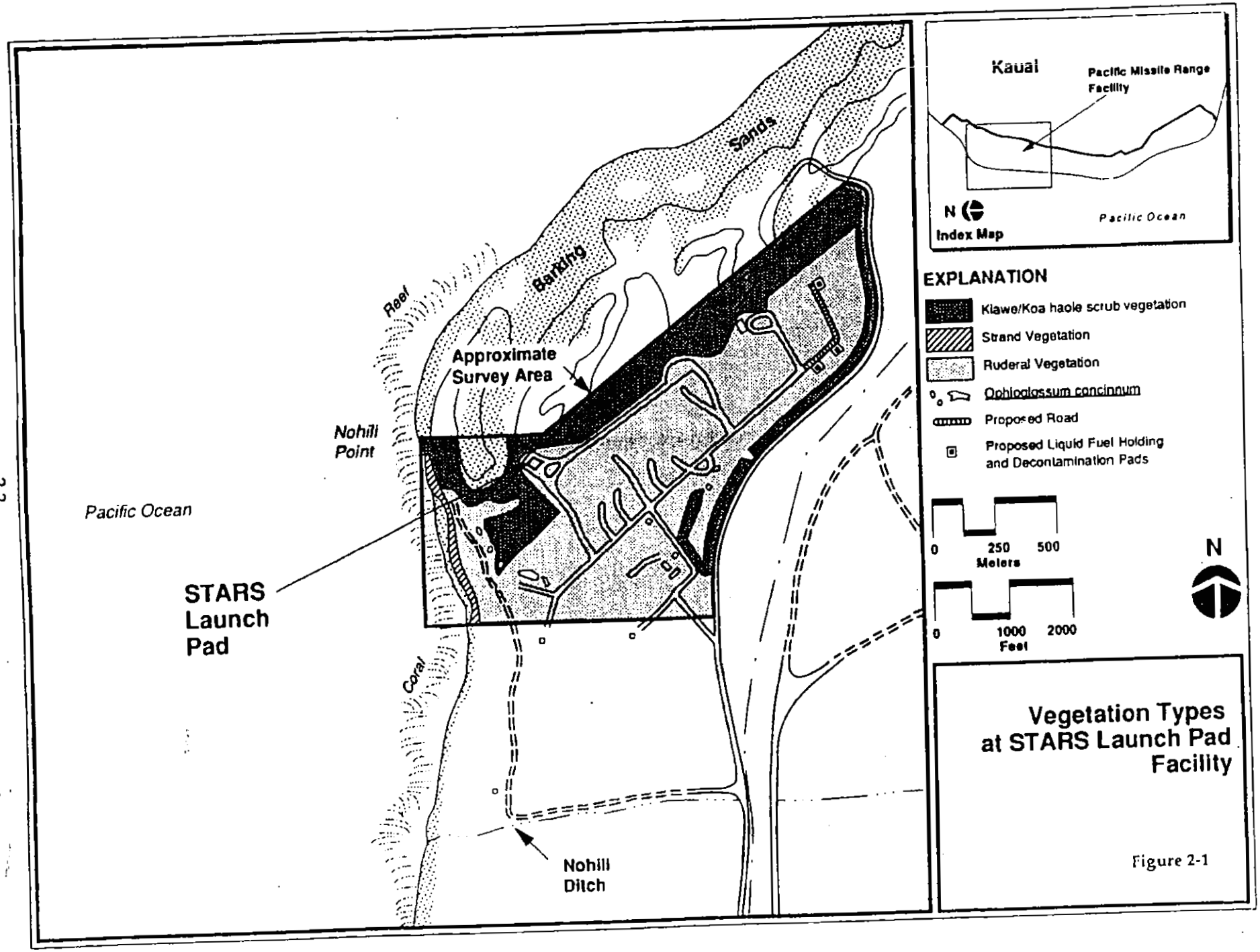
2.2.1 Vegetation

This section supplements Section 2.6.2 Vegetation of the STARS EA.

The area most likely to be affected by the exhaust cloud is within the KTF and PMRF boundaries. Vegetation types in the potential zone of influence of STARS activities can generally be described as being dominated by naturalized, exotic species. In addition to sugar cane, there are three types of vegetation on and adjacent to the KTF (Figure 2-1) kiawe/koa haole scrub, ruderal, and strand vegetation (USASDC 1990). Within KTF, the predominant vegetation is a mowed ruderal type with unmowed areas dominated by the kiawe/koa haole type. The kiawe/koa haole vegetation is characterized by kiawe (*Prosopis pallida*) and koa haole (*Leucaena leucocephala*) and has replaced native shrubland and dryland forests throughout Hawaii (Shomer and Gustafson 1987). The strand vegetation associated with the dunes (Botanical Consultants 1985) includes a common native vine *Vittex rotundifolia* as well as kiawe and koa hoale on the more stable slopes.

The small adder's tongue fern (*Ophioglossum concinnum*) is the only uncommon species of concern known to occur in the area potentially affected by the STARS exhaust cloud. This species is a category 1 candidate for being listed as a federally endangered species. A population of this species occurs in openings in the kiawe/koa haole scrub and in the mowed ruderal areas about 200 – 300 meters west and southwest of the STARS launch area near Launch Pad 1.

The KTF is bordered to the east and north primarily by sugar cane fields within the Kekaha Sugar Company lease hold. Within the sugar cane areas, a variety of agricultural ponds support


Kauai
Pacific Missile Range Facility
N
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EXPLANATION
Klawe/Koa haole scrub vegetation
Strand Vegetation
Ruderal Vegetation
Ophioglossum concinnum
Proposed Road
Proposed Liquid Fuel Holding and Decontamination Pads
0 250 500
Meters
0 1000 2000
Feet
N
Vegetation Types at STARS Launch Pad Facility
Figure 2-1
Sands
Barking
Reef
Approximate Survey Area
Nohili Point
Pacific Ocean
STARS Launch Pad
Coral
Nohili Ditch

a mix of naturalized exotic species including kiawe, koa haole, castor bean (*Ricinus communis*), monkey pod tree (*Samanea saman*), ficus (*ficus* spp.), and cherry tomato (*Lycopersicon pimpinellifolium*), among others. The vegetation associated with the ponds tends to be more diverse than the kiawe/koa haole scrub on the KTF.

O. concinnum is a diminutive, ephemeral fern. Its known range includes dry coastal habitats on the islands of Hawaii, Lanai, Maui, Molokai, Oahu, and Kauai (St. John 1957; Clausen 1954; Botanical Consultants 1985). The presence of *O. concinnum* on the island of Kauai was first recorded in 1985 (Botanical Consultants 1985) during a study of floral, faunal, and water resources present on the PMRF. Groups of *O. concinnum* were observed at the west end of the KTF in openings in the kiawe/koa haole scrub and in mowed, ruderal vegetation north and northeast of launch pad 1 (Figure 2-1).

O. concinnum is a nonseasonal, ephemeral species (Brauggman 1990). It is dormant underground until there is sufficient rainfall to send up leaves. The leaves are present for only a few weeks. The required quantity of rainfall is not known. Observations of *O. concinnum* in January and February 1990 followed 12 to 15 consecutive days of rain during which the KTF received approximately 12 inches of rain.

2.2.2 Wildlife

This section supplements Section 2.6.2 Wildlife in the STARS EA.

The wildlife resources present on the KTF, and in adjacent areas, are discussed in the EA. Of the 40 bird species known to occur in the area of the KTF, four (4) are of concern because of their endangered status, including the American (Hawaiian) coot (*Fulica americana alai*), the common moorhen (*Gallinula chloropus sandvicensis*), the black-necked (Hawaiian) stilt (*Himantopus mexicanas knudseni*), and the Hawaiian duck (*Anas wyvilliana*). All four species may occur in the drainages and ponds in the Mānā Plain area. The coot, moorhen, and the stilt were observed during field studies in 1990 and 1991. Four migratory and 8 indigenous species also may occur in the KTF region, although no rookeries or raptor nest sites were observed in 1985 (Botanical Consultants 1985) or during field studies in 1990 and 1991. The 24 exotic bird species generally are common field and urban birds.

2.2.3 Soil

This section is a supplement to Section 2.6.2 in the STARS EA.

The soils within the Mānā coastal plain are composed of alluvium washed in from uplands, calcareous clayey lagoon deposits and dunes, and beach rock.

Within the Mānā plain to the east of PMRF, the soils are dominated by a mosaic of clayey to silty clay loam soils of the kekaha-nohili association. There are areas within the Mānā plain that are fill-land. However, along the base of the Mānā cliffs, the soils are of the clayey series.

2.2.4 Water

This section is a supplement to Section 2.6.2 in the STARS EA.

Surface water in the area of the KTF and the Mānā Plain is restricted to drains, agricultural irrigation ponds, and the Mānā base pond wildlife area. The waters in the agricultural ponds along the Mānā cliffs generally do not meet drinking water standards for chlorides but are near neutral to slightly alkaline. The Mānā base pond has a high chloride level near to that of seawater. This may be due to the infiltration of brackish to saline groundwater into the pond basin or due to excessive evaporation to a low-surface level.

2.3 PUBLIC AREAS

Developed land on the KTF and PMRF contains launch complexes and support facilities. Bachelor's quarters and family housing are in the southern portion of the facility (U.S. Department of the Navy 1989) over three miles from the STARS launch facility. The next residential area is located about 12 miles away in the town of Kekaha.

Lands off the base to the north and south are designated as conservation lands in the state plan. Polihale State Park (approximately 56.7 hectares (140 acres)), north of PMRF is included in this conservation area and currently supports day-use (371,000 annual visitors in 1988) recreational activities and overnight camping (1,140 permits issued in 1988) (Niitini 1989). South of PMRF is the approximately 25-hectare (63 acre) Kekaha Sanitary Landfill (U.S. Department of the Navy 1989). The land to the east of PMRF is designated as agricultural and currently is owned by the state and leased to the Kekaha Sugar Company. Portions of the PMRF are in a tsunami flood zone, but the KTF administrative area and most of the KTF, including the STARS facilities, is not in the tsunami susceptible zone (Federal Emergency Management Agency (FEMA) 1987).

3.0 ENVIRONMENTAL CONSEQUENCES AND MITIGATIONS

This section discusses the assessment of the significance of potential environmental consequences of STARS program activities in areas that have a potential to affect Kauai's air quality. It also identifies appropriate mitigation measures. This information is supplemental to the more detailed STARS EA, Section 3.0 (USASDC, July 1990). The methodology used to predict HCl and CO contaminant levels, the field surveys conducted to assess effects of previous exposures, and the standards used to determine significance are described. In addition, an assessment to determine the applicability of the Hawaii Ozone Protection Statute to STARS activities is provided.

3.1 AIR QUALITY

This section supplements Section 3.6.1 Air Quality of the STARS EA.

Although the federal district judge's opinion did not address the adequacy of the STARS EA in the area of air pollutant dispersion modeling, this supplement to the EA describes in more detail the assumptions and variables used in the models and how the models were used to determine the potential significance of air quality impacts. This section also discusses the results of the modeling and assesses the potential for human health effects in the areas of HCl and CO in more detail and addresses the applicability of the Hawaii Ozone Protection Statute.

3.1.1 Air Quality Dispersion Modeling

Dispersion modeling techniques were used to predict concentrations of air pollutants downwind from a STARS missile launch. These calculated concentrations were compared with exposure guidance criteria (to assess potential human effects) and with published experimental and observational results (to evaluate effects on biological resources).

In order to estimate levels of pollutant emissions from STARS missile launches, two predictive air dispersion computer models, REEDM and TRPUF, were used. REEDM was selected because of its proven utility in predicting emission dispersion from rocket launches. TRPUF was chosen because of its application to emission sources that characteristically are brief in duration. Because the TRPUF model calculates potential emission levels more conservatively, the TRPUF model was selected to assess potential air quality and biological effects in the STARS EA (USASDC 1990). The results of this modeling are contained on page 72, Table 3-2 of the STARS EA and in Tables 3-1 and 3-2 of this section.

The TRPUF computer model is based on the EPA puff model, modified for easier use and extra calculations. The TRPUF model calculates downwind concentrations from a sudden release of emissions that lasts a few seconds (Trinity Consultants Inc. 1990). A missile launch acts like a puff release. The TRPUF model requires several source-specific input parameters, such as puff release altitude, quantity, and velocity. Since the exhaust from the missile is downward, a release velocity of zero is used and provides another high degree of conservatism because the dispersion due to heat for the exhaust and the resulting turbulence is ignored. Since the typical puff release (exhaust vent or smoke stack) would have an exit velocity upwards and because a missile has an exit velocity downwards, zero exit velocity was used for STARS, making the

Table 3-1. Modeled ambient hydrogen chloride concentrations from a STARS launch[1]

Downwind Distance (meters)	TRPUF					
	Peak Instantaneous Concentration (ppm)		30-Minute Average Concentration (ppm)		8-Hour Average Concentration[2] (ppm)	
	Wind Speed: 0.46 m/s	Wind Speed: 1.58 m/s	Wind Speed: 0.46 m/s	Wind Speed: 1.58 m/s	Wind Speed: 0.46 m/s	Wind Speed: 1.58 m/s
250	230	230	16.3	4.7	9.8	2.8
500	166	166	14.2	4.1	8.5	2.5
1,000	116	116	12.4	3.6	7.4	2.7
2,000	39	39	7.6	2.2	4.6	1.3
3,000 (LHA)	18	18	4.9	1.4	2.9	0.8
4,000	10	10	3.6	1.0	2.2	0.6
5,000	6	6	2.7	0.8	1.6	0.5

Downwind Distance (meters)	REEDM		
	Peak Instantaneous Concentration (ppm)	60-minute Average Concentration (ppm)	8-Hour Average Concentration[3] (ppm)
	Wind Speed: 2 m/s		
250	ND	ND	ND
500	ND	ND	ND
100	0.027	0.002	0.001
2,000	0.083	0.006	0.004
3,000 (LHA)	0.117	0.010	0.007
4,000	0.125	0.013	0.009
5,000	0.116	0.014	0.010
6,000	0.102	0.014	0.010
7,000	0.087	0.014	0.010
8,000	0.074	0.013	0.009

[1]ACGIH TLV is 5 ppm (see text pg. 3-6).
[2]Multiply 30-minute average concentration by 0.6 to obtain 8-hour average concentration.
[3]Multiply 60-minute average concentration by 0.7 to obtain 8-hour average concentration.

Table 3-2. Modeled ambient carbon monoxide concentrations from a STARS launch[1]
60-minute average concentrations (mg/m^3)

Downwind Distance (meters)	TRPUF				REEDM	
	Wind Speed: 0.46 m/s		Wind Speed: 1.58 m/s		Wind Speed: 2 m/s	
	STARS Contribution	Resulting Total[2]	STARS Contribution	Resulting Total[2]	STARS Contribution	Resulting Total[2]
1,000	38.4	38.6	11.2	11.4	0.003	0.233
3,000 (LHA)	15.4	15.6	4.4	4.6	0.022	0.252
5,000	8.5	8.7	2.5	2.7	0.031	0.261
6,000	ND	ND	ND	ND	0.031	0.261

[1]State of Hawaii one-hour ambient air quality standard is 10 mg/m^3. National Ambient Air Quality Standard is 40 mg/m^3.
[2]Total estimated 60-minute concentration is the sum of the STARS contribution and background levels of CO. Background is assumed to be 0.23 mg/m^3 (Stern et al. 1984).

model more conservative. The primary assumption used in the TRPUF model for STARS was that the entire inventory of pollutants from the motor would be released as puffs at various altitudes. Thus, the model gives a very conservative prediction for the amount of pollutants during the missile flight.

A mean wind speed of 1.69 m/s for 4,342 observations at the KTF has been reported (Range Commander Council, Meteorology Group 1983) and served as the basis for the air quality evaluations performed. The TRPUF model was used without historical wind direction data for three reasons. First, the flat-terrain assumption in the TRPUF model means that pollutant concentrations directly downwind will be the same regardless of wind direction. Second, the use of no wind direction allows the model to predict concentrations downwind in unusual wind-direction conditions. Third, because the wind direction at the time of any particular launch cannot be predicted, the modeling without a specified wind direction allows evaluation of impacts in all directions.

The REEDM computer model calculates concentrations of ground cloud constituents downwind from normal rocket launches and launch failures. REEDM has been used extensively at major launch sites to predict the direction and amount of pollutant deposition from missile launch ground clouds (Schmalzer, Hinkle, and Dreschel 1986; United States Air Force (USAF), Los Angeles Air Force Base 1991). The model can be adapted to the launch of a specific vehicle at designated weather and site conditions (USAF 1991). In order to apply the model to the A3 booster system of the STARS, specific A3 launch information was put into the REEDM model (e.g., types of pollutants, emission rate). REEDM programs were run with empirical meteorological data collected at the KTF. REEDM programs were run for both over-water and over-land conditions. The model was operated in a "no-terrain mode" for STARS since this mode assumes a flat-terrain condition that approximates the movement of pollutants over the ocean or flat agricultural land such as will be encountered at the KTF.

3.1.2 Results of Air Dispersion Modeling

Both the REEDM and TRPUF models provided ground-level pollutant estimates in terms of peak instantaneous concentrations and time-mean concentrations. REEDM provided 60-minute average concentrations, and TRPUF gave 30-minute average concentrations. Time-mean concentrations for other time periods than those produced by a computer model can be estimated by a power law equation (Turner 1970). For example, an 8-hour average concentration can be estimated from 30-minute or 1-hour average concentration by using the power law relationship, $x \propto t^{-0.20}$. Peak instantaneous concentrations and 30-minute average concentrations for HCl (Table 3-1) and 60-minute average concentrations for CO (Table 3-2) decrease with distance from the launch site. Both models predicted higher downwind concentrations at the lower wind speeds (0.46 – 2 m/s). A range of wind speeds was modeled, from 0.46 m/s to 13.9 m/s (approximating calm to high wind conditions). For HCl, model predictions were converted to 8-hour average concentrations so that comparison would be made to the public exposure guideline applied by the State of Hawaii (time weighted average $(TWA)_{8\text{-hr}}$ 0.025 ppm). Background levels were estimated and model predictions were converted to 60-minute averages for CO so that comparison could be made to the 60 minute Hawaii State Ambient Air Quality Standard (10 mg/m^3) and the NAAQS (40 mg/m^3). A screening method was applied to assess

potential levels of nitrogen dioxide (NO_2) and total suspended particulates (TSP) generated by the STARS program. These NO_2 and TSP estimates were compared with applicable state and federal standards.

3.1.2.1 Hydrogen Chloride

Neither the U.S. Environmental Protection Agency (USEPA) nor the State of Hawaii has promulgated ambient air quality standards for HCl, and no federal guideline for exposure of the general public to HCl under ambient conditions has been established. In cases of HCl emissions, the Hawaii Clean Air Branch refers to the American Conference of Governmental Industrial Hygienists (ACGIH) threshold limit value (TLV) for occupational workplace settings. TLVs refer to airborne concentrations of substances and represent conditions under which it is believed that nearly all workers may be repeatedly exposed day after day without adverse effect (ACGIH 1987). The TLV-Time Weighted Average (TLV-$TWA_{8\text{-}hr}$) is the 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 (ACGIH 1987). A TLV-Ceiling Limit (TLV-C) is a concentration that should not be exceeded during any part of the working exposure (ACGIH 1987). The State of Hawaii Clean Air Branch interprets the ACGIH TLV for HCl, 5 ppm (ACGIH 1987), to be a TLV-$TWA_{8\text{-}hr}$ (Hawaii Clean Air Branch 1991a). Furthermore, in order 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 (Hawaii Clean Air Branch 1991b). The resulting public exposure criteria used by the Clean Air Branch for HCl is a $TWA_{8\text{-}hr}$ of 0.025 ppm. This is a reference value to which concentrations for 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. TRPUF modeling results of estimated 8-hour equivalent average concentrations of HCl at the LHA boundary under low wind speed conditions range from 0.8 ppm to 2.9 ppm. REEDM modeling results of estimated 8-hour equivalent concentrations are 0.007 ppm at the LHA boundary under low wind speed conditions and 0.010 ppm at 5,000 – 7,000 m downwind.

It is important to understand that exposure evaluation criteria developed by ACGIH and other agencies are 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 (ACGIH 1987). Although the ACGIH guideline is not directly applicable to exposure of the public to STARS emissions, it is being used as an indicator of a level of significance.

Concentrations of HCl below 5 ppm show no lasting effects, and concentrations at 5 ppm or above are immediately irritating to the nose and throat. A concentration of 10 ppm is considered the maximal concentration acceptable for prolonged exposures (Sittig 1985). A concentration of 35 ppm causes irritation of the throat after brief exposures. Human male volunteers found 50 – 100 ppm barely tolerable for one hour (Sittig 1985). Indications are that recovery from brief exposures to these concentrations is expected. The Agency for Toxic Substances and Diseases Registry (ATSDR) at the Centers for Disease Control (CDC) has advised that under the maximum peak instantaneous (18 ppm) and 30-minute average (4.9 ppm) concentrations modeled by either the REEDM or TRPUF models for the LHA boundary, no adverse human health effects will result (ATSDR, CDC 1991).

The National Institute for Occupational Safety and Health (NIOSH) has published another guideline, the Immediately Dangerous to Life and Health (IDLH) level, that can be used to

evaluate the potential for adverse human effects of exposure to HCl emissions. An IDLH represents a maximum concentration from which, in the event of respirator failure, one could escape within 30 minutes without experiencing any escape-impairing or irreversible health effects. The NIOSH IDLH value for HCl is 100 pm (150 mg/m^3) (U.S. Department of Health and Human Services 1987). However, this guideline also does not directly apply to a STARS launch because of the brief duration of the release (seconds). Nevertheless, the results of modeling STARS emissions indicate that the 30-minute average concentrations of HCl do not exceed the NIOSH IDLH at any distance from the launch pad at any wind speed.

HCl gas is known to dissipate rapidly from the point of origin. HCl gas concentrations in mist plumes produced by molten lava flowing into the ocean were highest (7.1 ppm) within 11 m (12 yards) of the sea and dissipated to less than 1 ppm at distances of approximately 365 m (400 yards) or greater (U.S. Department of Health and Human Services 1991). Peak instantaneous concentrations of HCl from a STARS launch could exceed 100 ppm within a distance of 1,000 m (3,280 ft) downwind at low wind speeds (Table 3-1). However, this concentration would drop to less than 15.5 ppm at a distance of 100 m within 10 minutes. Since unauthorized personnel are restricted within the 3,000 m (10,000 ft) LHA boundary, since HCl emissions dissipate quickly at typical wind speed conditions, and since HCl levels predicted by a reliable dispersion model (REEDM) are low, no adverse effects to human health and safety will result from a STARS launch. An additional consideration is the distance to populated areas, 3 miles to on-base housing and approximately 12 miles to Kekaha. In these areas as well, REEDM-modeled concentrations of HCl are far below the State of Hawaii public exposure guideline.

Four (4) discrete launch events a year will result in an annual total of 40 seconds of launch emissions that impact the ground-level environment. No long-term cumulative air quality effects will result.

3.1.2.2 Carbon Monoxide, Nitrogen Dioxide, and Particulates

As with the air dispersion modeling for HCl, potential air quality impacts of CO emissions were estimated by both REEDM and TRPUF (Table 3-2). Background levels were estimated to be 0.2 ppm (0.23 mg/m^3) (Stern et al. 1984). STARS emissions were added to background levels, and the totals were compared with the 1-hour State of Hawaii Ambient Air Quality Standard and NAAQS, 10 mg/m^3 and 40 mg/m^3, respectively. TRPUF modeling results of 60-minute average concentrations at the LHA boundary (10,000 feet) were 15.6 mg/m^3 at low wind speed conditions (0.46 m/s) (Table 3-2) and well below 8.7 mg/m^3 at the nearest populated areas. It should be noted, however, that wind speeds of 0.46 m/s are not representative of the normal meteorological environment at KTF and that most, if not all, of the launches should occur at wind speeds at or above 1.6 m/s. A wind speed of 1.6 m/s would result in a TRPUF-generated 60-minute average concentration of CO of 4.6 mg/m^3 at the LHA boundary. REEDM modeling results of 60-minute average concentration at the LHA boundary was 0.252 mg/m^3. Maximum 60-minute average concentration downwind (6,000 m) was 0.261 mg/m^3. Concentrations decreased at greater distances.

An emission above the 60-minute Hawaii Ambient Air Quality Standard for CO, 10 mg/m^3, by a STARS launch is considered unlikely, especially beyond the LHA. The impact of CO emissions due to STARS launches is not expected to be significant over the short or long term. No significant cumulative effects are expected.

An initial screening technique was exercised to assess the potential impacts of NO_2 and TSP from the STARS program on the ambient air quality of the KTF environment. The State of Hawaii and the USEPA have promulgated air quality standards for these pollutants. This screening method assumed a short-term, discrete, discontinuous source, no pollutant emissions at other times, and compete atmospheric ventilation before and after the time period averaged by the computer model. An average time-mean concentration for the source was calculated and then extrapolated by the power law to a longer term concentration (annual or 24-hour).

The maximum 30-minute average concentration of NO_2 at the LHA boundary was 5.2 ppm (TRPUF). Four discrete STARS launches a year emitted NO_2. These four 5.2 ppm 30-minute average concentration events were averaged with 17,516 30-minute average concentration intervals when the STARS contribution would be zero (there are 17,520 30-minute intervals in a year). The resulting estimate of the average 30-minute average concentration over a 1-year period was 0.00119 ppm. Using the power law, the contribution of the STARS program to the annual average of NO_2 in the KTF area was 0.000166 ppm (0.31 $\mu g/m^3$). The State of Hawaii annual NO_2 ambient air quality standard is 70 $\mu g/m^3$. The NO_2 annual NAAQS is 100 $\mu g/m^3$. The STARS program would contribute less than one percent of either annual NO_2 standard in the KTF area, where the background NO_2 value approaches zero. Therefore, the STARS activities would not violate the State standards for NO_2 emissions.

The maximum 30-minute average concentration of aluminum oxide (Al_2O_3) at the LHA boundary was 3.4 ppm (TRPUF). All Al_2O_3 was assumed to be TSP. Following the same screening technique as applied for NO_2, the estimate of the average TSP 30-minute average concentration over a 1-year period was 0.000776 ppm (approximately 3.2 $\mu g/m^3$). The contribution of the STARS program to annual TSP average in the KTF area was estimated at approximately 0.45 $\mu g/m^3$. The State of Hawaii annual TSP ambient air quality standard is 60 $\mu g/m^3$. The estimate of the average TSP 30-minute average concentration over a 24-hour period was 0.0708 ppm (294 $\mu g/m^3$). The contribution of the STARS program to the 24-hour TSP average would be 135 $\mu g/m^3$. The State of Hawaii 24-hour TSP ambient air quality standard is 150 $\mu g/m^3$. The STARS program would contribute less than one percent of the annual Hawaii TSP standard and approximately 90 percent of the 24-hour Hawaii TSP standard four times a year in the KTF area. Therefore, the STARS activities would not violate the state standards for TSP.

3.1.3 Assessment of the Applicability of the Hawaii State Ozone Protection Statute to STARS Activities

The second air quality area which the federal district judge in Hawaii addressed in his opinion was freon. The judge determined there was sufficient data in the administrative record to support the Army's original conclusion that the use of freon in the second-stage motor would not significantly impact the human environment. Nonetheless, the judge determined there was a substantial gap in the Army's original freon analysis, in that the STARS environmental assessment did not address whether the release of freon from the second stage of the STARS would violate the Hawaii Ozone Layer Protection Statute. This section of the EA supplement will address only the applicability of the Hawaii statute to the STARS program for the purpose of determining whether one of the criteria for significant impact has been triggered under the National Environmental Policy Act (NEPA).

On January 1, 1991, the Hawaii Ozone Layer Protection Statute went into effect (Hawaii Revised Statutes, Section 342C-1-5). This law is designed to regulate the release of CFC chemicals from such sources as air conditioners or mobile air conditioners. The statute specifically prohibits any

person in the state from wilfully causing or allowing release of CFCs into the air from any source or process regulated under Chapter 342C, other than through the common use of the product or in the course of recovery, recycling, or safe disposal of the CFCs. The regulation of CFCs does not apply to refrigerators or freezers, and violations of the prohibitions are subject to civil penalties of $100 for each release.

Freon 114B2 is used in the second-stage STARS motor as a material in the thrust vector control system. Basically, the freon is used to guide the second stage in its flight as opposed to redirecting the rocket nozzles. The release of freon in the second stage will begin somewhere between 11 and 13 miles downrange and at an altitude of 94,000 feet, ending with second-stage burnout downrange an altitude of 555,000 feet. While most of the freon 114B2 is decomposed in the hot exhaust gases from the rockets, some of the freon 114B2 would be released without being decomposed.

The Hawaii statute regulates only certain types of freon. Specifically, it regulates CFCs consisting of certain chlorine, fluorine, carbon, and hydrogen compounds. The listed compounds which are regulated are CFC-11, CFC-12, CFC-13, CFC-112, CFC-113, CFC-114, and CFC-115. All of these compounds are chlorine and fluorine based; none have any bromine atoms. As indicated above, the type of freon used in the STARS second-stage motor is Freon 114B2. The "B" designator in the name indicates the compound is bromine-based and does not contain any chlorine. Freon 114B2 is a bromine compound; it is not a CFC. Since the Hawaii statute only regulates CFCs, bromine compounds, such as Freon 114B2, do not fall within its purview. Therefore, the STARS second-stage release of freon 114B2 does not threaten a violation of the Hawaii Statute.

Moreover, the Hawaii statute only applies to sources and processes that are regulated under Chapter 342C. Chapter 342C specifically lists activities that it regulates and that it does not regulate. First, it regulates the sale or offer for sale of "CFC refrigerants suitable for use in air conditioners of mobile air conditioners." Second, it regulates activities associated with CFCs such as recovery, recycling, and disposal. Third, the chapter does not regulate the use of CFCs in refrigerators or freezers. Since the use of freon in STARS does not involve CFCs, nor does it involve any of the listed sources or processes under Chapter 342C, the chapter does not apply to STARS activities. Therefore, STARS activities would not threaten to violate the chapter.

There are two additional reasons the Hawaii Ozone Layer Protection Statute does not apply to STARS. First, the release of the Freon 114B2 will occur at 94,000 feet in altitude and at least 11 miles from the launch pad on Kauai. Thus, the release will take place outside of the State of Hawaii. Second, Title II of the Clean Air Act regulates air emissions from mobile sources. Since STARS is a mobile source of air pollution, any regulation of it must flow from Title II. Title II contains several provisions for regulating mobile sources, but it only allows regulations on a national basis for air pollutants from mobile sources. The reason for limiting the regulation of mobile sources to national rules is to reduce restrictions on interstate commerce. Because STARS is a mobile source of air pollution, only national regulations can apply to its use; state and local regulations do not apply. Since the Hawaii law is a state-based regulation, the Hawaii Ozone Layer Protection Statute does not apply to STARS. Therefore, STARS activities do not threaten to violate the statute.

3.2 BIOLOGICAL RESOURCES

This section will supplement Section 3.6.2 of the STARS EA by providing an assessment of the potential effects of HCl emissions from STARS launches on the particular biological environment of Kauai. Literature search results and field survey sampling results are used to clarify the evaluation criteria used for the analysis of the effects of STARS launches. Then a discussion of the evaluation of HCl emissions against these criteria with regard to the particular vegetation, wildlife, soil, and water found in the region of influence is provided.

3.2.1 Literature Search

The review of available literature on the environmental effects of HCl was conducted using the DIALOG computer search service, library search, and contacts with individuals and agencies conducting research on HCl. Most of the available HCl literature was related to areas within the continental U.S. Only one article specific to Hawaii was available; no literature was available for Kauai.

Much of the available literature on the environmental effects of HCl due to rocket launches addresses the Space Shuttle launches at the Kennedy Space Center in Florida (Schmalzer et al. 1985, 1986; Dreschel and Hall 1985, 1990; Hawkins et al. 1984; Granett 1983; Milligan and Hubbard 1983; Heck et al. 1980; NASA 1979; U.S. Department of the Air Force 1978). One monitoring study of a Titan 34-D test (Rinehart and Berlinrut 1988) and a monitoring study of Titan III launches (Pellet et al. 1983) were also reviewed.

HCl is known to cause leaf injury in plants. Laboratory and field testing have been conducted to determine the effects of solid rocket motor (SRM) exhaust products on vegetation (Schmalzer et al. 1985; Granett 1983; Heck et al. 1980; U.S. Department of the Air Force 1978). Heck et al. (1980) observed that spotted areas on both sides of leaves was the typical symptom of injury from HCl. Granett (1983) also observed spots on the leaves as well as leaf wilting when plants were sprayed with a one-percent solution (pH 0.8) of HCl.

The concentration at which damage occurs varies depending on the species. Cosmos is the most sensitive plant species for which data are available in the literature (USAF 1978). Cosmos, a commercial flower crop, exhibited traces of leaf discoloration and tip burning following a controlled 20-minute exposure to 2 ppm of HCl vapor in air (USAF 1978). Heck et al. (1980) reported that orange and grapefruit plants experienced less than 0.5 percent foliar injury after a 20-minute exposure to 80 ppm HCl, indicating these species are more tolerant of exposure to HCl.

The effects of HCl on some animal species has been documented. Controlled experiments have been conducted to determine the effects of HCl gas on animal species (USAF 1978). Domestic pigeons displayed slight unrest, irritation of eyes and nasal passages, and slightly reduced hemoglobin concentrations when exposed to 100 ppm HCl for 6 hours per day for 50 days. Laboratory mice experienced 50 percent morality when exposed to HCl gas at 14,000 ppm for 5 minutes and at 2,600 ppm for 30 minutes. HCl aerosol exposure caused 50 percent mortality of laboratory mice when exposed to 11,000 ppm for 5 minutes and 2,100 ppm for 30 minutes. The cotton mouse (*Peromyscus gossypinus*) exhibited respiratory distress when exposed to 80 ppm HCl per gram of body weight (USAF 1978). Fish kills were identified as resulting from large missile launches using water deluge systems. Deluge systems spray large quantities of cooling and sound suppression water, which interacts with the HCl gas emissions, resulting in the

formation of aqueous HCl, which may run off to bodies of water and cause acid deposition in the nearfield environment (Schmalzer et al. 1980, 1986; Dreschel and Hall 1985, 1990; Hawkins et al. 1984; Granett 1983; Milligan and Hubbard 1983; U.S. Department of the Air Force 1978).

3.2.2 Field Survey and Sampling

In order to assess the potential effect of HCl on the Kauai environment, a field survey was conducted of plants, soil, and water in and around the launch site and at a control point (about 22 miles) away from the KTF. The purpose of the survey was to evaluate through field observation and field and lab analysis the historical effects of HCl on plants, soil, and water in and around the KTF.

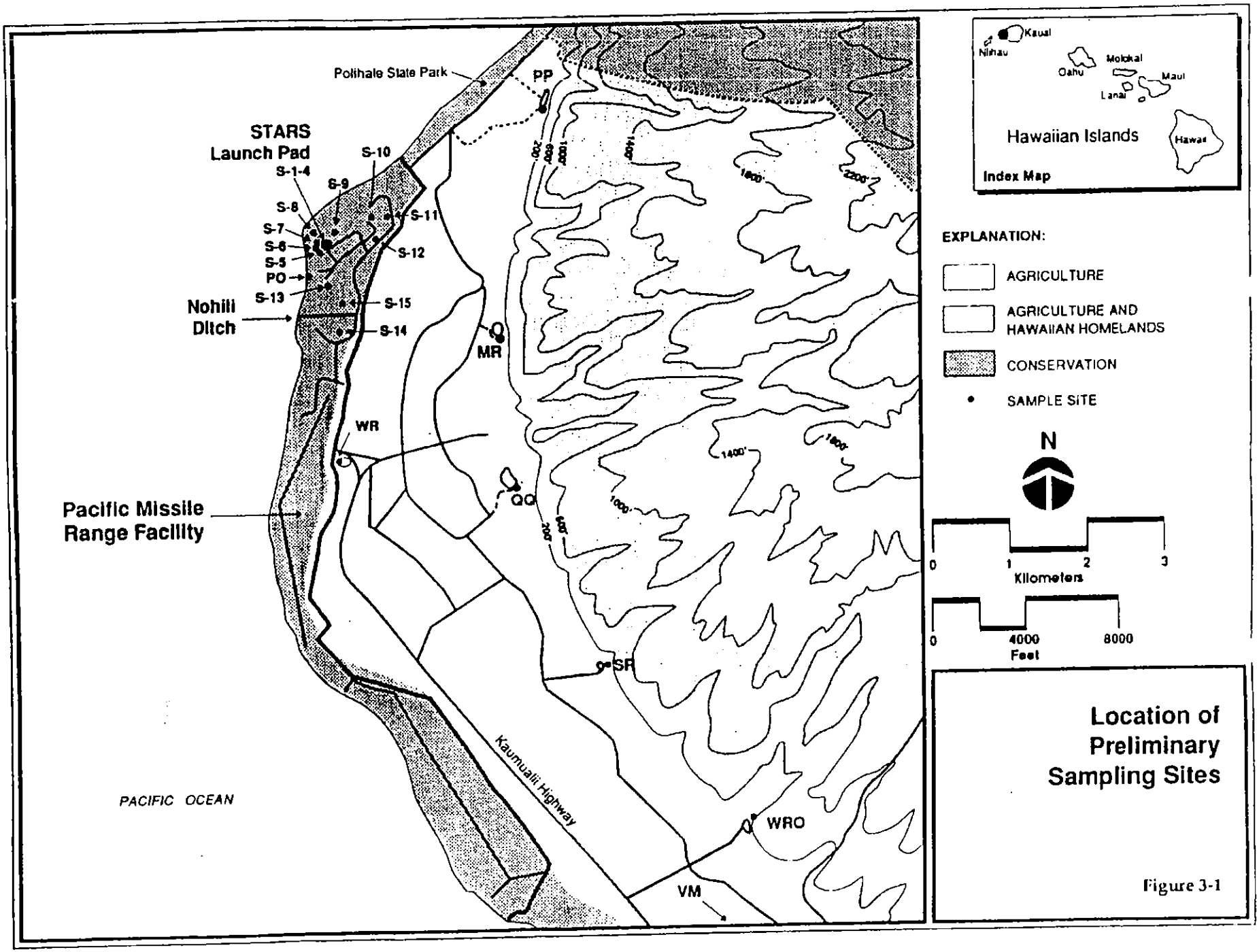
A control site was chosen near Waimea that would not have been exposed to HCl from prior KTF or Navy launches. Sampling points at various areas on and adjacent to the KTF were also established (Figures 3-1 and 3-2). These sample sites were in areas potentially exposed to HCl over the last two decades with the latest exposure in February 1991 from a launch of a STRYPI from the KTF.

Visual observation was used to identify existing plant species and to determine their general condition in order to ascertain if characteristics attributable to HCl exposure were present. Soil, water, and vegetation samples were taken, and field measurements of pH (acidity) were conducted (Tables 3-3 and 3-4).

3.2.3 Vegetation

Vegetation types at all preliminary sampling sites can generally be described as being dominated by naturalized, exotic species. There are some differences in the species composition among the sites. The differences in vegetation between the KTF and other sampled locations are due to the level of disturbance, availability of water, and soil type. The KTF area was previously disturbed but appears to have been relatively undisturbed from some time, except for open mowed areas, allowing the kiawe and koa hoale to become dominant. There was no evidence of leaf damage (as characterized by spotting), and no pattern of pH and chloride values indicated any HCl effect (Tables 3-3 and 3-4). The rare adder's tongue fern occurs in this area near active launch pads, which have been used for HCl-emitting launches for over 20 years.

The time-weighted 20-minute average of HCl derived from TRPUF data for 300 to 3,000 m indicated a concentration range from 5 ppm at 300 to 1.5 ppm at 3,000 m at a nominal wind speed of 1.6 m/s (Table 3-5). When these data are compared to observed effects of various concentrations of HCl (Table 3-6) on some test plant species (Heck et al. 1980), the indication is that the predicted concentrations for a STARS launch are expected to cause little or no damage to vegetation.


Polihale State Park
PP
STARS
Launch Pad
S-1-4
S-10
S-9
S-8
S-11
S-7
S-6
S-12
S-5
PO
S-13
S-15
Nohili
Ditch
S-14
MR
WR
QQ
Pacific Missile
Range Facility
SR
Kaumualii Highway
PACIFIC OCEAN
WRO
VM
Kauai
Niihau
Oahu
Molokai
Maui
Lanai
Hawaii
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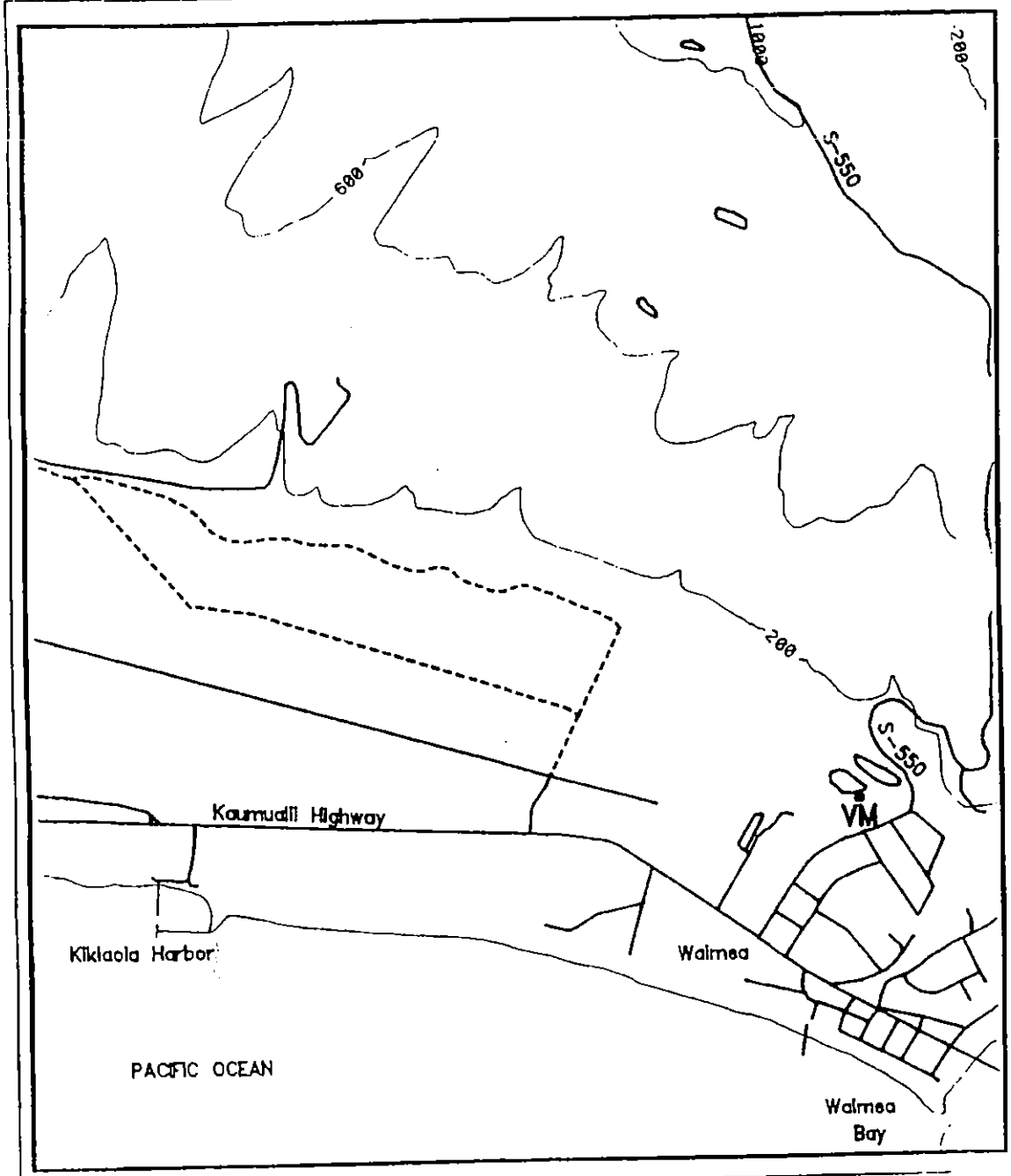
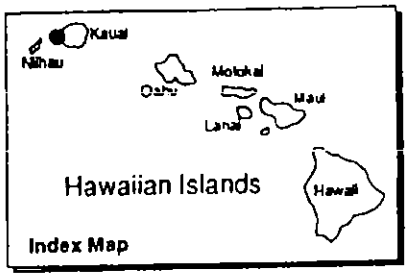
AGRICULTURE AND
HAWAIIAN HOMELANDS
CONSERVATION
SAMPLE SITE
N
0
1
2
3
Kilometers
0
4000
8000
Feet
Location of
Preliminary
Sampling Sites
Figure 3-1





• SAMPLE SITE

N

0 .25 .5 1.0
Kilometers

0 2000 4000
Feet

Location of Preliminary Sample Site VM

Figure 3-2

Table 3-3.

Summary of field pH and miscellaneous field measurements on water, saturated soil paste, and vegetation wash water samples taken 28 and 29 May 1991 in the vicinity of the PMRF.

Sample Site[a]	Air Temp. (°C)	Water Temp. (°C)	pH (Std. units) Water	Soil	Vegetation
S-1	--	--[b]	--	7.3	7.9
S-2	--	--	--	7.9	7.5
S-3	--	--	--	7.3	5.2
S-4	--	--	--	7.7	7.3
S-5	--	--	--	7.8	5.
S-6	--	--	--	7.0	6.4
S-7	--	--	--	8.6	5.4
S-8	--	--	--	8.9	6.4
S-9	--	--	--	8.8	5.7
S-10	--	--	--	7.0	5.7
S-11	--	--	--	7.3	7.2
S-12	--	--	--	8.5	5.1
S-13	--	--	--	7.1	8.7
S-14	--	--	--	7.4	6.2
S-15	--	--	--	7.7	7.3
PO	22.8	25.6	8.1	8.2	5.5 (5.3)[c]
WR	30.6	28.9	7.8	8.2	6.4 (6.2)
PP	26.7	26.1	7.1	6.3	7.3 (6.6) (6.4)
MR	25.6	26.1	7.1	6.5	6.8
QQ	26.7	26.7	7.9	7.9	6.2
SR	26.1	25.6	7.4	6.1	6.7 (7.0) (6.3)
WRO	26.7	29.4	7.3	7.3	6.3 (6.8)
VM	24.4	25.6	7.2	6.4	6.0

[a]Locations shown on Figures 3-1 and 3-2
[b]No data available
[c]Numbers in parentheses are from duplicate samples

Table 3-4.

Chloride levels of water, saturated soil paste, and vegetation wash water samples taken 28 and 29 May 1991 in the vicinity of the PMRF.

Sample Site[a]	Water (mg/liter)	Soil (mg/kg)	Vegetation (mg/liter)
S-1	--[b]	130	3
S-2	--	50	< 0.5
S-3	--	60	0.5
S-4	--	30	1.5
S-5	--	80	< 0.5
S-6	--	360	4.5
S-7	--	30	2
S-8	--	70	9.5
S-9	--	70	7.5
S-10	--	320	< 0.5
S-11	--	50	1
S-12	--	< 10	3.5
S-13	--	320	4.5
S-14	--	60	< 0.5
S-15	--	60	< 0.5
PO	19,600 (19,900)[c]	120	< 0.5
WR	20,600 (19,400)	110 (20)	5 (0.5) (1) (0.5)
PP	305 (350)	160	1 (< 0.5) (< 0.5)
MR	388 (388)	130	< 0.5
QQ	263 (263)	90	1 (0.5) (1)
SR	150 (150)	180	2.5 (< 0.5) (1)
WRO	220 (223)	50	6.5 (< 0.5)
VM	50 (50)	190	1

[a]Locations on Figures 3-1 and 3-2
[b]No data available
[c]Numbers in parentheses are from duplicated samples

Table 3-5.

Predicted 20-minute average hydrogen chloride concentrations
at a nominal wind speed of 1.6 m/s.
(derived from TRPUF)

Downwind Distance (meters)	20-min Average (ppm)
300	5.0
500	4.5
1,000	3.9
2,000	2.4
3,000	1.5

Table 3-6.

Percent leaf injury from exposure to 10 ppm, 20 ppm, and
40 ppm HCL for 20 minutes.

Species	10 ppm	20 ppm	40 ppm
Radish	36	66	--
Soybean	1	70	--
Tomato	3	20	--
Corn	2	35	--
Pennywort	1	11	72
Citrus	--	--	0
Wax myrtle	< .5	3	21

The infrequency of exposure (four launches per year), field observations indicating no discernible physical or chemical effects as a result of 28 years of exposure to rocket launches of various types, and the occurrence of a rare species, such as the adder's tongue fern, near an active launch site indicate no adverse effects would be expected due to HCl emissions from STARS launches. In addition, due to the small exposure frequency and the historical lack of effect from previous launches, no adverse cumulative effects due to STARS launches are anticipated.

3.2.4 Wildlife

Studies of the effects of HCl gas on domestic pigeons (USAF 1978) indicated that there was irritation of the eyes and nasal passages and slightly reduced hemoglobin concentrations when pigeons were exposed to 100 ppm HCl for 6 hours per day for 50 days. Additional studies of laboratory mice (USAF 1978) indicated a 50-percent mortality when mice were subjected to HCl gas at 14,000 ppm for 5 minutes and to 2,600 ppm for 30 minutes. Deluge systems are used for some large missiles to quiet noise and vibrations. The deluge water interacts with the exhaust and combines with HCl gas to form aqueous HCl (Dreschel and Hall 1990; Potter 1978). The aqueous HCl may then run off into surface waters and has resulted in fish kills (Hawkins et al. 1984; Milligan and Hubbard 1983).

Wildlife species present in the KTF and adjacent areas would be exposed to no more than 5.1 ppm (for a 10-minute average) even at 250 m from the launch pad. Since no deluge systems will be used and launches will not occur during rainfall, no adverse effects to wildlife should occur due to emissions from STARS launches. Due to the small exposure frequency (four times per year), no cumulative effects are anticipated.

3.2.5 Soil

There is no chemical or physical indication that past missile launch activities at the KTF have affected the soils of the KTF and surrounding areas of Kauai (Table 3-4). The relatively small amounts of HCl released in the STARS ground cloud, the rapid dispersion of the emissions, and the facts that launches will not occur during rainfall and no deluge system will be used should minimize any deposition of HCl on the soil during the launches. No significant direct, indirect, short- or long-term impacts to soil due to HCl releases are expected. Due to the small frequency of events (four times per year) and the absence of any effect from 21 years of similar launches, no cumulative impacts are anticipated.

3.2.6 Water

There is no indication that past missile launches at the KTF have affected the urface water resources in the adjacent areas. The dispersion of the relatively small amount of HCl in the ground cloud and the near-launch plume, the absence of a deluge system, and the fact that launches will not be conducted during rainfall should minimize any deposition of HCl on surface waters. No significant direct, indirect, short- or long-term, or cumulative impacts to surface water resources due to STARS HCl releases are expected.

4. CONFLICTS WITH FEDERAL, REGIONAL, STATE, LOCAL, OR INDIAN TRIBE LAND USE PLANS, POLICIES, AND CONTROLS

This section supplements Section 3.10 of the STARS EA (July 1990) with information concerning the Hawaii Ozone Protection Statute applicability to STARS activities on Kauai. The statute applies neither to the type of material nor the activities being pursued by the STARS program (Section 3.1.3 of this supplement), and STARS activities would not threaten a violation of the State statute.

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FINDING OF NO SIGNIFICANT IMPACT

UNITED STATES ARMY STRATEGIC DEFENSE COMMAND

AGENCY: U. S. Army Strategic Defense Command (USASDC)

COOPERATING AGENCY: Strategic Defense Initiative Organization

ACTION: Conduct the Strategic Target System (STARS) Program

BACKGROUND: An Environmental Assessment (EA) was prepared for the STARS program in July 1990 which resulted in a finding of no significant impact (FNSI) in August 1990. In October and November 1990, lawsuits were filed against the United States Army Strategic Defense Command and the Department of Defense by the Sierra Club and the State of Hawaii challenging the adequacy of the STARS EA and the decision not to prepare an environmental impact statement (EIS). On May 9, 1991, the Federal District Court in Hawaii determined no EIS need be prepared but that the STARS EA must be supplemented on the issues of hydrogen chloride (HCl) and freon releases. Moreover, the judge indicated the STARS EA may not have adequately described the use of various computer models used to predict the dispersion or movement of air pollutants from the rocket ignition. An environmental impact statement is not planned unless information received during the 30-day public comment period reveals significant impacts on the biophysical environment.

SUMMARY: The supplement to the STARS EA discusses three areas: 1) the two predictive dispersion models; 2) the potential effects of hydrogen chloride from the rocket launches on the Kauai environment; and 3) whether the release of freon from the second stage booster of the STARS violates the Hawaii Ozone Protection Statute.

Two predictive dispersion modeling techniques (REEDM and TRPUF) were used for estimating pollutant emissions from the proposed STARS missile launches. The TRPUF model results were presented in the STARS EA because TRPUF provided a highly conservative estimate of emissions. This supplement to the STARS EA describes in more detail the assumptions and variables used in the REEDM and TRPUF models and gives a more detailed description of the findings of the two models.

A search of existing literature on environmental effects of HCl was conducted to determine if there were specific studies on HCl effects on the Hawaiian environment. No study specific to Kauai was found, but the literature did indicate experimental HCl levels and the corresponding effect on selected species of plants and animals. The studies indicate injury from HCl occurs primarily when the HCl is released in a moist or wet environment, such as when a deluge water system is used or the HCl gas comes in contact with precipitation. In moist conditions, the HCl mixes with water to form hydrochloric acid and may damage plants on contact. HCl from the STARS launches will not be released in such moist or wet environments since no deluge water is used and the missile will not be launched when it is raining.

In addition, the Launch Hazard Area (LHA) extends 10,000 feet from the launch site and the safety procedures associated with the launch require nonessential personnel to be evacuated from the LHA. The two modeling techniques produced different pollutant dispersion results. TRPUF indicated that HCl concentrations would exceed the State of Hawaii public guideline. REEDM indicated that the guideline would not be exceeded. Based on REEDM, which is believed to predict more realistic and valid field concentrations than TRPUF, it is highly unlikely that HCl releases from STARS will cause adverse human health or environmental effects on Kauai. Thus, HCl releases from STARS will not present a problem for health or the environment.

Since no site specific literature was available, field data collection was conducted on the island of Kauai. Control areas (areas not exposed to rocket exhaust but which were otherwise environmentally similar to the Kauai Test Facility (KTF) were

identified and compared to areas of the KTF which have been routinely exposed to missile exhaust over a period of 28 years. No physical or chemical differences in the soil, vegetation or water were identified which could be correlated to exposure to HCl. The *Ophioglossum concinnum*, a candidate endangered species, occurs near existing launch areas and does not appear to be affected.

On January 1, 1991, the Hawaii Ozone Layer Protection statute went into effect. This law is designed to regulate the release of chlorofluorocarbon (CFC) chemicals from such sources as air conditioners or mobile air conditioners. Specifically, it regulates CFCs consisting of certain chlorine, fluorine, carbon, and hydrogen compounds. The listed compounds which are regulated are: CFC-11, CFC-12, CFC-13, CFC-112, CFC-113, CFC-114, and CFC-115. The type of freon used in the STARS second stage motor is Freon 114B2, a brominated fluorocarbon; it is not a chlorofluorocarbon. Since the Hawaii statute only regulates CFCs, bromine compounds, such as Freon 114B2, do not fall within its purview. Therefore, the STARS activities do not threaten a violation of the Hawaii statute.

FINDINGS: This supplement to the STARS EA describes in more detail the assumptions and variables used in the atmospheric dispersion models and gives a more detailed description of the findings of the models. No study specific to Kauai was found, but the literature did reveal levels of HCl, the corresponding effect on representative species of plants and animals and that the environmental injury from HCl occurs primarily when the HCl is released in a moist or wet environment, such as when a deluge water system is used or the gas comes in contact with precipitation. HCl from the STARS launches will not come in contact with such a moist or wet environment since no deluge water is used and the missile will not be launched when it is raining. Modeling methods developed from missile launch situations indicated that HCl concentrations at the boundary of the LHA would not exceed the State of Hawaii public exposure guideline. Thus, HCl releases from STARS will not present a problem for health or the environment. Since the Hawaii statute only regulates CFCs, bromine compounds, such as Freon 114B2, do not fall within its purview. Therefore, the STARS activities do not threaten a violation of the Hawaii statute.

DEADLINE FOR RECEIPT OF PUBLIC COMMENTS: AUG 16 1991

POINT OF CONTACT: A copy of the Supplement to the Strategic Target System Environmental Assessment July 1991 is available from:

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Dated JUL 10 1991

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