Wake Island Launch Center (WILC)

Supplemental Environmental Assessment

Final

October 1999

Executive Summary

EXECUTIVE SUMMARY

Introduction

Wake Island is a possession of the United States under the jurisdiction of the U.S. Department of the Air Force; however, it is now administered by the U.S. Army Space and Missile Defense Command (USASMDC) in Huntsville, Alabama. Wake Island has been claimed by the United States since 1899 and has remained under U.S. control since that time, with the exception of the period from late 1941 through late 1945 when it was controlled by Japan. Wake Island was under military control from the end of World War II until 1947. At that time, responsibility for the island was given to the Federal Aviation Administration, which retained control until 1972 when the U.S. Air Force was granted administrative control. The United States Army has operated the facility under a permit from the U.S. Air Force since 1994, and has renamed the facility the Wake Island Launch Center (WILC).

The current WILC mission is varied; however, target missile launch activities supporting the Ballistic Missile Defense Organization (BMDO) is WILC's main reason for remaining an active military installation. BMDO's mission includes research and testing of tactical and theater missile defense technologies necessary to protect U.S. forces, as well as U.S. friends and allies throughout the world, from future missile threats. In addition to BMDO target missile launch activities, Wake Island supports trans-Pacific military operations and Western Pacific military contingency operations. It also serves as an in-flight emergency airfield and provides transient military/civilian aircraft servicing and emergency sealift capability.

USASMDC has prepared this environmental analysis to supplement a previous Environmental Assessment (EA) for Theater Missile Defense (TMD) target and defensive missile systems at Wake Island. This Supplemental EA (SEA) analyzes an additional category of target missiles proposed for launch from WILC.

Purpose and Need

The proposed test activities include Liquid Propellant Target (LPT) missile launches in the existing test scenarios, to provide realistic test situations for ground-based missile defenses (acquiring, tracking, and intercepting notional target missiles) within a simulated theater of operations. Such missile flight tests support the development and operational effectiveness of TMD missile and sensor systems. Presently, the United States operates no functional overland ranges, and few over-water ranges, that provide realistic distances for testing within such a simulated theater of operations.

The *Wake Island EA* (1994) analyzed the launch of solid propellant target missiles and the construction of new launch and support facilities. Since the completion of that document, USASMDC has expanded its inventory of target missiles to include LPT missiles. The acquisition and testing of these missiles will greatly enhance the understanding of TMD threats to the United States and its allies. USASMDC would use these LPT missiles as targets for several anti-missile interceptors. This SEA analyzes the transportation, storage, fueling and launch of these LPT missiles at WILC.

Methodology

Twelve broad environmental components were evaluated to provide a context for understanding the potential effects of the proposed action and to provide a basis for assessing the significance of potential impacts. The areas of environmental consideration are air quality, airspace, biological resources, cultural resources, hazardous materials and waste, health and safety, infrastructure and transportation, land use, noise, physical resources, socioeconomics, and water resources. The evaluation indicated that proposed LPT test activities and related minor construction would not pose a potential for short- or long-term impacts to these components at WILC.

To assess the significance of any impact, a list of the activities necessary to accomplish the proposed action was developed. The affected environment at Wake Island was then described. Next, those activities with potential for causing environmental consequences were identified. If a proposed activity was determined to cause potential environmental impact, then it was evaluated by considering the intensity and context in which the impact would occur.

Results

Conclusions of the evaluations made for each area of environmental consideration for the proposed LPT test activities at WILC are summarized below.

Air Quality

Computer modeling was used to determine whether emissions from a HERA missile would exceed regulatory thresholds in the *U.S. Army Kwajalein Atoll Temporary Extended Test Range Environmental Assessment* (USASSDC, 1995). Of the combustion products present in the exhaust of a liquid propellant missile, carbon monoxide (CO) is the only constituent listed as a criteria pollutant and regulated by the National Ambient Air Quality Standards. Modeling results revealed that CO levels were within acceptable ranges for the HERA. The HERA missile contains at least 320 kg (705 lb) more CO in the exhaust than the LPT missile described in the proposed action. Therefore, the CO in the exhaust of the LPT missile proposed for launch from WILC would also be within acceptable regulatory limits. No adverse impacts to ambient air quality would be expected.

If the proposed action is implemented, more missile launches would occur at Wake Island. These launches are discrete events and the temporary effects of launch plume exhausts are not additive. Current emissions sources, such as portable generators, power plants, vehicles, and general fugitive emissions would be combined with occasional missile exhaust emissions, but the strong prevailing trade winds that sweep over the island prevent any localized emissions from accumulating. No cumulative impacts to air quality would be expected.

Airspace

Wake Island, located in international airspace, has no formal airspace restrictions surrounding it, and the only air traffic control facility is the WILC control tower. The airspace is managed by the Federal Aviation Administration (FAA) Air Route Traffic Control Center (ARTCC) at Oakland, California, and airspace procedures are governed by the International Civil Aviation Organization (ICAO). Only one jet route, A-450, passes over the island. Missiles launched with trajectories of 87° elevation remain clear of route A-450. Launch activities are coordinated with the Central Air Reservation Facility (CARF) in Washington, D.C. With proper scheduling and coordination of missile launches, impacts to airspace are considered not significant.

Biological Resources

The minor construction that would be necessary with implementation of the proposed action would have little potential to disturb any type of bird nesting habitat or activities. Previous studies have shown that noise from missile launch activities, while startling, generally causes no significant impacts to birds or other wildlife in the vicinity. The probability of an accidental taking of protected sea turtles or marine mammals due to falling missile debris is judged to be extremely remote. With proper inspection procedures in place, non-native species that could be accidentally introduced can be prevented from introduction to the somewhat sensitive flora and fauna endemic to Wake Island. Standard operating procedures (SOPs) for spill control would be implemented in the event of an accident. With appropriate control and mitigation measures implemented as part of the proposed action, potential impacts to biological resources would be expected to be not significant.

Cultural Resources

Wake Island has been designated a National Historic Landmark because of the events that occurred there during World War II. Since the proposed action involves no new major construction, no cable trenching, and only minimal ground disturbance, no impacts to subsurface resources or the historic viewshed would be expected. Incidental collection of cultural resources associated with increased human presence on the island would be prohibited. Falling missile debris from an aborted launch event or a launch mishap has at best only an extremely remote possibility of damaging any historic structures. For these reasons, significant impacts to cultural resources are not expected.

Hazardous Materials/Waste

Although the quantities of hazardous materials used and hazardous waste generated would be expected to increase slightly as a result of the proposed action, adherence to SOPs would readily accommodate LPT testing activities. Waste material generated would be handled in accordance with regulatory requirements, and the small amounts of waste generated would put no burden on the waste disposal process currently in place at WILC. No significant impacts from hazardous materials or waste would be expected as a result of the proposed action.

Health and Safety

Missile launch mishaps and anomalies have the potential to cause significant hazards from explosion, debris impact, and the possible release of toxic combustion products. Safety SOPs at WILC ensure that the likelihood of such actions occurring is minimal. Normal LPT launch operations would entail no more increased hazards than those that presently occur, as nominal missile launch system performance is considered a safe operation. No significant health or safety impacts would be expected.

Infrastructure and Transportation

Up to a maximum of 45 additional persons could be stationed at Wake Island during LPT testing activities. The island's infrastructure is capable of supporting at least 300 transients at any one time, so it would not be overburdened by the presence of LPT program personnel. If multiple testing programs should desire to use the WILC facilities during the same timeframe, proper scheduling and coordination will ensure that sufficient housing, utilities, and transportation would be available without burdening the infrastructure. No significant impacts to infrastructure or transportation are expected.

Land Use

Proposed action activities are consistent with the current land use practices and patterns at WILC. No cumulative impacts from LPT test activities would be expected.

Noise

Noise from minor construction activities necessary to implement the proposed action would be below background levels and would pose no significant impact to workers. During a missile launch, non-essential personnel are evacuated to a safe distance where noise impacts are negligible, and mission-essential personnel are supplied with adequate hearing protection. Auditory protection SOPs already in practice would also be implemented for LPT testing. Therefore, temporary noise impacts associated with LPT testing activities would be considered not significant.

Physical Resources

Because the minor construction activities necessary to implement the proposed action would occur on previously disturbed and improved sites, any impacts to physical resources would be not significant in nature.

Socioeconomics

Because of the current nature of WILC's mission, socioeconomic issues are essentially confined to the availability of housing, of which there is sufficient to accommodate LPT program test personnel as well as others. No impacts to socioeconomics are expected as a result of the proposed action.

Water Resources

Accidental petroleum or propellant spills could adversely impact water resources if allowed to contact the limited ground or surface water available at WILC. Containment measures would be employed with the proposed action to ensure that any leaks are captured before reaching the soil. Therefore, potential impacts to water resources as a result of the proposed action would be negligible and not significant.

Conclusions

Two additional alternative propellant storage and fueling sites were considered in the SEA. One alternative locates propellant storage and missile fueling sites on Wilkes Island at an existing petroleum tank farm. This alternative was not selected due to the inherent dangers of hauling heavy equipment across the aging causeway and the relative isolation of the area. The second alternative locates propellant storage and missile fueling sites near a World War II aircraft revetment, midway between the harbor area and the Peacock Point launch areas on Wake Island. This alternative was not selected because of potential danger posed by heavy equipment to the historic aircraft revetment and the adjoining parking apron.

The no action alternative is the continuation of existing program testing and evaluation activities. Under this alternative, USASMDC would not proceed with any LPT missile activity at WILC. Flight test information for LPT missiles, needed for development of TMD sensors, interceptors, and technology, would not be collected from test activities at WILC.

USASMDC and USEPA have developed and agreed upon corrective actions where compliance concerns exist at Wake Island. These actions are identified in the *Wake Island Federal Facility Compliance Agreement* (USASMDC, August 1999) reproduced in Appendix D, and are in the process of being implemented under the no action alternative. These actions will be sufficient to ensure no additional mitigation measures in these areas would be required under the proposed action.

Another alternative action was examined but was not carried forward due to operational considerations. Two LPT missiles were launched from Aur Atoll in 1997, and were analyzed in the *U.S. Army Kwajalein Atoll Temporary Extended Test Range Environmental Assessment*, prepared in 1995. Although this analysis has been completed, LPT launches from Aur were not considered for this SEA because such launches would not meet the flight distance requirements, engagement geometry, instrumentation coverage, and other mission needs of current test requirements.

Careful evaluation of the areas of environmental consideration for which a potential impact exists has determined that no significant short-term or cumulative impacts would occur from expanding the suite of target missiles launched and tested from WILC to include LPT missiles.

Acronyms and Abbreviations

ACRONYMS AND ABBREVIATIONS

ac	Acre
ADIZ	Air Defense Identification Zone
AMC	Air Mobility Command
AR	Army Regulation
ARTCC	Air Route Traffic Control Center
AST	Above Ground Storage Tank
BMDO	Ballistic Missile Defense Organization
BOE	Bureau of Explosives
BOS	Base Operating Support
°C	Degrees Celsius
CAA	Clean Air Act
CARF	Central Air Reservation Facility
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CITES	Convention for the International Trade of Endangered Species
cm	Centimeter
CO	Carbon Monoxide
CONUS	Continental United States
dB	Decibel
DOD	Department of Defense
DOT	Department of Transportation
EA	Environmental Assessment
°F	Degrees Fahrenheit
FAA	Federal Aviation Administration
FIR	Flight Information Region
FRP	Facility Response Plan
ft	Foot
FWPCA	Federal Water Pollution Control Act
g	Gram
gal	Gallon
GHLE	Ground Handling Launch Equipment
ha	Hectare
HAP	Hazardous Air Pollutant
ICAO	International Civil Aviation Organization
in	Inch

IRFNA	Inhibited Red Fuming Nitric Acid
kg	Kilogram
km	Kilometer
KMR	Kwajalein Missile Range
kW	Kilowatt
l	Liter
lb	Pound
LHA	Launch Hazard Area
LPT	Liquid Propellant Target
m	Meter
MAB	Missile Assembly Building
MBTA	Migratory Bird Treaty Act
mi	Mile
MLRS	Multiple Launch Rocket System
MSDS	Material Safety Data Sheet
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NO_2	Nitrogen Dioxide
NOTAM	Notice to Airmen
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
O_3	Ozone
OSHA	Occupational Safety and Health Administration
oz	Ounce
Pb	Lead
PM_{10}	Particulate Matter Less Than or Equal to 10 Micrometers in Diameter
SCBA	Self-Contained Breathing Apparatus
SEA	Supplemental Environmental Assessment
SO_2	Sulfur Dioxide
SOP	Standard Operating Procedure
SPCC	Spill Prevention, Control and Countermeasures
SWDA	Solid Waste Disposal Act
SWMP	Solid Waste Management Plan
TAFT	Transport and Fueling Trailer
TCMP	Theater Missile Defense Critical Measurements Program
TMD	Theater Missile Defense
US	United States

USAF	United States Air Force
USAKA	United States Army Kwajalein Atoll
USASMDC	United States Army Space and Missile Defense Command
USASSDC	United States Army Space and Strategic Defense Command
USC	United States Code
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
UST	Underground Storage Tank
WILC	Wake Island Launch Center
WWII	World War II

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APPENDICES

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1.0 PURPOSE AND NEED

The National Environmental Policy Act (NEPA), the Council on Environmental Quality (CEQ) regulations implementing NEPA (40 Code of Federal Regulations [CFR] 1500-1508), Army Regulation (AR) 210-20, *Master Planning for Army Installations*, and AR 200-2, *Environmental Effects of Army Actions*, direct that Department of the Army officials take into account environmental consequences when authorizing or approving major Federal actions. The U.S. Army Space and Missile Defense Command (USASMDC) has prepared this environmental analysis to supplement a previous Environmental Assessment (EA) for Theater Missile Defense (TMD) target and defensive missile systems at Wake Island. Wake Island is located approximately 3,950 kilometers (km), or 2,460 miles (mi), west of Hawaii and 2,560 km (1,590 mi) east of Guam. This Supplemental EA (SEA) analyzes an additional category of target missiles proposed for launch from the Wake Island Launch Center (WILC). This document, hereafter referred to as the WILC SEA, makes extensive reference to, and incorporates by reference, the previous EA (*Wake Island Environmental Assessment*, USASSDC, 1994).

Chapter 1.0 describes the purpose and need for the action. Chapter 2.0 presents the description of the proposed action and other alternatives. Chapter 3.0 briefly describes the environment to be affected by the proposed action. A detailed discussion was provided in the 1994 EA, and only the minor changes that have since occurred and new information that was unavailable for the previous EA are presented. Chapter 4.0 assesses the potential environmental consequences of the proposed action on the environmental resources identified in Chapter 3.0. If a particular activity has the potential to have a significant effect(s) on the environment, mitigation measures have been incorporated into the proposed action to reduce the potential significant effect(s) to insignificant levels. Chapter 5.0 lists the individuals and agencies contacted during research for this assessment. Chapter 6.0 lists references for this document. Chapter 7.0 lists preparers and others who contributed to the SEA development.

1.1 BACKGROUND

Wake Island is a possession of the United States under the jurisdiction of the U.S. Department of the Air Force; however, it is now administered by the USASMDC in Huntsville, Alabama. Wake Island has been claimed by the United States since 1899 and has remained under U.S. control since that time, with the exception of the period from late 1941 through late 1945 when it was controlled by Japan. Wake Island was under military control from the end of World War II (WWII) until 1947. At that time, responsibility for the island was given to the Federal Aviation Administration (FAA), which retained control until 1972 when the U.S. Air Force was granted administrative control. The United States Army has operated the facility under a permit from the U.S. Air Force since 1994, and has renamed the facility the Wake Island Launch Center.

Wake Atoll is a typical Pacific coral atoll consisting of three islands (Wake, Wilkes and Peale) that surround a lagoon. Wake and Peale are connected by a bridge, and Wake and Wilkes by a causeway (Figure 1-1). The "V-shaped" atoll is approximately 14.5 km (9 mi) long from one end of the "V" to the other, and is about 3.2 km (2 mi) wide (from approximately Heel Point to the southern portion of WILC), creating 40 km (25 mi) of shoreline. Total dry landmass is approximately 739 hectares (ha), or 1,826 acres (ac), created by coral growth on top of an underwater volcano. The lagoon formed by the V averages about 3 meters (m), or 10 feet (ft) in depth. A barrier reef, varying in width from approximately 27 to 1006 m (30 to 1,100 yards), encircles the atoll. WILC has been designated a National Historic Landmark because of events which occurred there during WWII.

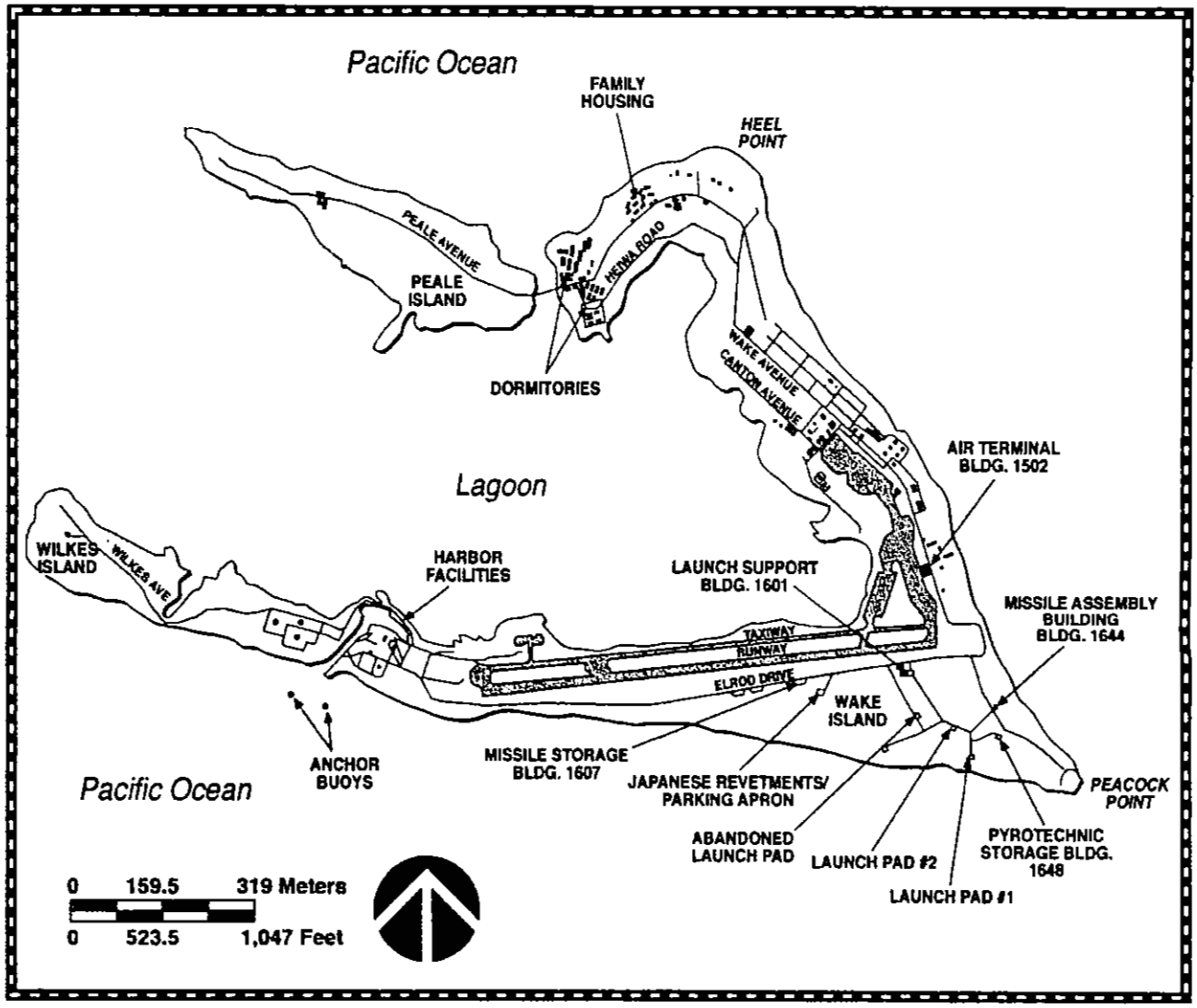

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Figure 1-1 WILC Existing Facilities Location Map

The current WILC mission is varied; however, target missile launch activities supporting the Ballistic Missile Defense Organization (BMDO) is WILC's main reason for remaining an active military installation. BMDO is a joint service Department of Defense (DOD) organization created to determine the feasibility of developing an effective ballistic missile defense system. BMDO's mission includes research and testing of tactical and theater missile defense technologies necessary to protect U.S. forces, as well as U.S. friends and allies throughout the world, from future missile threats. USASMDC conducts most of these test activities for BMDO. In addition to BMDO target missile launch activities, Wake Island supports trans-Pacific military operations and Western Pacific military contingency operations. It serves as an in-flight emergency airfield and provides transient military/civilian aircraft servicing and emergency sealift capability.

1.2 PURPOSE OF AND NEED FOR THE PROPOSED ACTION

The proposed test activities include Liquid Propellant Target (LPT) missile launches in the existing test scenarios, to provide realistic test situations for missile defenses (acquiring, tracking, and intercepting notional target missiles) within a simulated theater of operations. Such missile flight tests support the development and operational effectiveness of TMD missile and sensor systems. Presently, the United States operates no functional overland ranges, and few over-water ranges, that provide realistic distances for testing within such a simulated theater of operations.

The experience of the United States coalition forces and U.S. allies with ballistic missile attacks during the Gulf War of 1991 (Operation Desert Storm) highlighted the need for a TMD component of ballistic missile defense. A TMD system is intended to respond to post-Cold War era dangers by protecting deployed United States and allied military forces and civilian assets against tactical ballistic missile attacks.

The Wake Island EA analyzed the launch of solid propellant target missiles and the construction of new launch and support facilities. Since the completion of that document, USASMDC has expanded its inventory of target missiles to include LPT missiles. The acquisition and testing of these missiles will greatly enhance the understanding of TMD threats to the United States and its allies. USASMDC would use these LPT missiles as targets for several anti-missile interceptors. This SEA analyzes the transportation, storage, fueling and launch of these LPT missiles at WILC.

1.2.1 DECISIONS TO BE MADE

The decisions to be made by the Director, Ballistic Missile Defense Organization and supported by information contained in this SEA are:

- Whether to use LPTs at WILC
- The selection of fuel storage sites at WILC
- The selection of launch sites at WILC
- The selection of support facilities at WILC

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2.0 Description of Proposed Action and Alternatives

2.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

The USASMDC proposes to fuel and launch up to 20 LPTs at WILC over a ten-year period. These target missiles would be used in planned and notional testing of various sensors and interceptor systems. This SEA analyzes the potential environmental impacts of conducting LPT target launches and associated activities at WILC.

The proposed action would involve only minimal new site preparation activities to establish a liquid propellant missile launch capability at WILC. Radar illumination, flights, and intercepts were analyzed in the *Wake Island EA* (USASSDC, 1994) and the *Supplemental Environmental Impact Statement for Proposed Actions at the U.S. Army Kwajalein Atoll* (USASSDC, 1993). Flight trajectories and any associated intercepts which do not fall under the analysis presented in those documents would be analyzed in future supplemental documentation.

2.1 LPT MISSILE AND SUPPORT EQUIPMENT DESCRIPTION

The largest LPT under consideration for launching from WILC in this EA is a single stage, liquid-fueled missile (Figure 2-1). Consideration of this missile provides the basis for the environmental analysis performed in this document. Smaller LPTs (containing less propellant) could be used instead of the "larger" one described. Any smaller LPT missile would be very similar to the missile described in this document, and would emit the same exhaust constituents, but in lesser amounts than described herein. The LPT is transported on and launched from a self-propelled Ground Handling Launch Equipment (GHLE) vehicle. Missile launch procedures would be controlled from a separate command center, housed in a transportable trailer or Building 1601, depending on availability of the facility at that time and other mission requirements. Launch commands to the GHLE would be transmitted via fiber optic and analog cabling, placed in an existing cable tray or directly on the ground surface. No cable trenching would be required. The LPT and GHLE have the following characteristics:

<u>LPT</u>
Propulsion System: Single Stage, Liquid-Fueled
Propellants: Kerosene-based main fuel, inhibited red fuming nitric acid (IRFNA) oxidizer, and initiator fuel
Guidance System: Inertial
Range: 50-300 km
Altitude: 90 km (maximum trajectory range)
Length: 11 m
Diameter: 0.88 m
Finspan: 1.81 m
Weight (unfueled): 2,050 kg
Weight (fueled): 5,850 kg
Payload Weight: (Maximum): 1000 kg
Payload Type: Instrumentation Package

<u>GHLE</u>
Wheels: 8
Fuel: Diesel
Length: 11 m
Width: 3 m
Height: 3.2 m
Height (with missile erected): 13.2 m
Weight (w/o missile): 27,800 kg

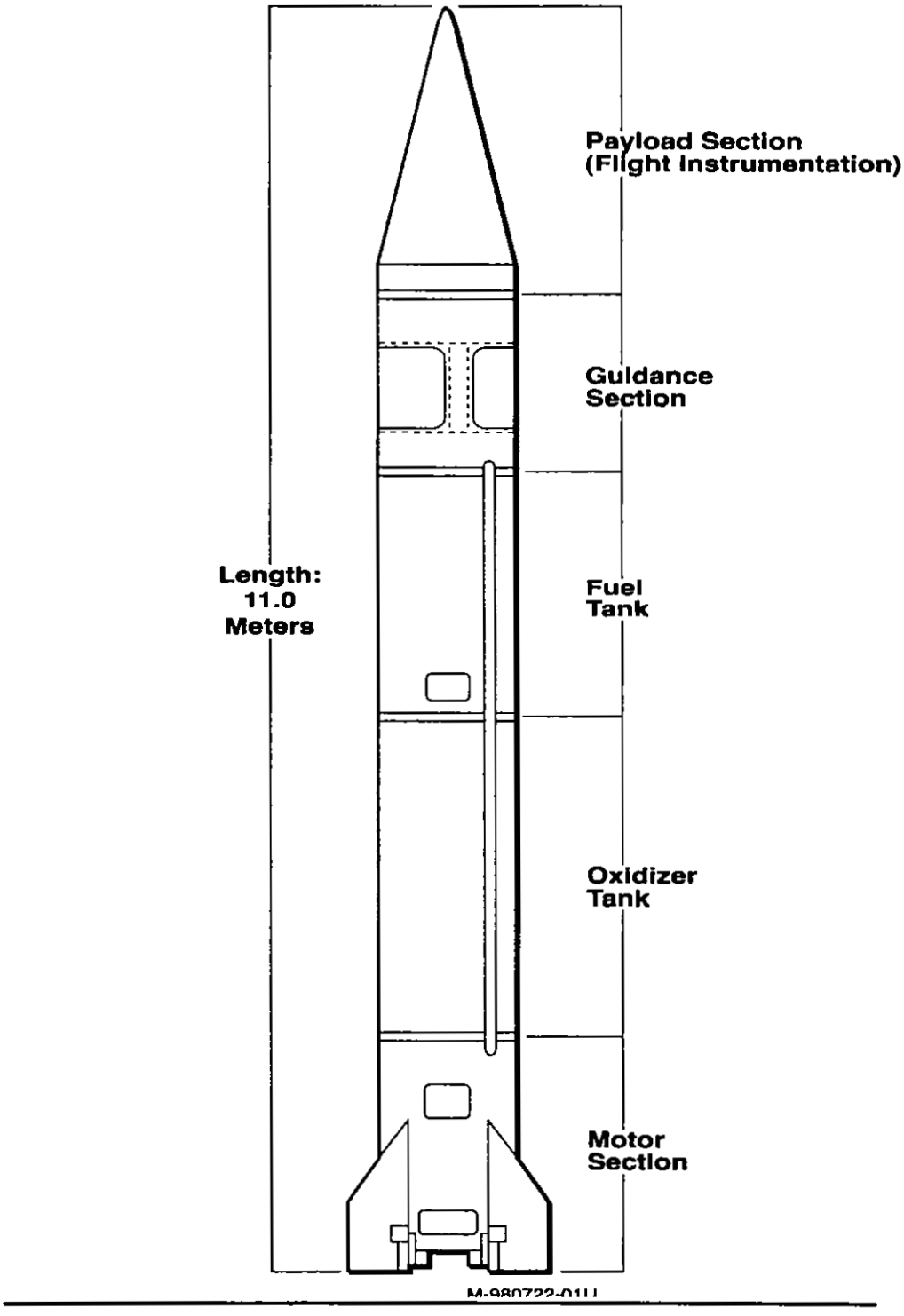


Figure 2-1 Liquid Propellant Target

2.2 FLIGHT TEST HARDWARE ASSEMBLY, MODIFICATION AND REFURBISHMENT

The LPT under consideration includes approximately 825 kg (1820 lb) of a kerosene-based fuel, 2,920 kg (6437 lb) of IRFNA, and 30 kg (66 lb) of initiator fuel. Modification and refurbishment of existing missile systems would be performed, if necessary, at contractor facilities (other than WILC), and would be considered routine activities. Approximately 25 personnel would be involved in the process. This process typically includes tests on components and subsystems, and administrative functions. The modification or refurbishment of the LPT would involve the use of various solvents, cleaning materials, and adhesives (such as acetone and isopropyl alcohol). These materials are routinely used for such purposes and would be handled in accordance with data provided on the appropriate material safety data sheet (MSDS). No modifications to existing facilities, unusual utility requirements, or additional personnel would be required to support this level of activity.

2.3 LPT MISSILE SYSTEM TRANSPORTATION TO WILC

Target missiles would be transported to a designated port for shipment to WILC via ship or barge, and be received at the WILC harbor facilities (Figure 1-1). Some equipment could be transported to a designated U.S. Air Force Base for transportation to WILC by U.S. Air Force Air Mobility Command (AMC) C-5, C-17, C-130, or C-141 cargo aircraft. Materials arriving via aircraft would be received at the WILC airfield. For aircraft transportation, FAA and/or applicable U.S. Air Force safety regulations would be followed.

All transportation within the continental United States (CONUS) would be performed in accordance with appropriate U.S. Department of Transportation (DOT) approved procedures and routing, as well as Occupational Safety and Health Administration (OSHA) requirements and U.S. Army safety regulations. Liquid propellants would be transported in DOT approved containers. Safety measures would be followed during transportation of the propellants as required by DOT and as described in the Bureau of Explosives (BOE) Tariff No. BOE 6000-I, *Hazardous Materials Regulations of the Department of Transportation* (Association of American Railroads, 1992). For ship or barge transportation, U.S. Coast Guard and/or U.S. Army transportation safety regulations would also be followed.

In addition to the missile, GHLE and propellants, several other support equipment items would also be transported to WILC. These include:

- Launch Control Van, (if pre-existing permanent launch facilities are not available)
- Pad Equipment Shelter (pick-up truck with electronics shelter on truck bed)
- Missile Transportation and Fueling Trailer
- 4 100-kilowatt (kW) Diesel or Gasoline Generators (only used if power is not otherwise available)
- Specialized Fueling Equipment (pumps, valves, fittings and hoses to transfer propellants from storage tanks to missiles)

2.4 FINAL ASSEMBLY AND PREFLIGHT ACTIVITIES AT WILC

Missile components and support equipment would arrive at WILC's harbor and/or airfield approximately 30 days prior to a scheduled launch. The components and equipment would be stored in Building 1644, the Missile Assembly Building (MAB), for final preflight assembly and integration and necessary preflight tests. The missiles (up to two at a time) would also be stored in the MAB, with any final assembly requirements taking place there. The LPT would use very small amounts of explosives (squibs), which would be temporarily stored in an existing pyrotechnic storage facility (Building 1648), until installed in the missiles. The GHLE would be co-located in the MAB for these preflight operations.

Approximately 40 WILC personnel, and up to 45 temporary duty personnel, would be required for preflight and testing operations, for up to 30 days prior to each launch. These activities are routine for WILC, and

no additional permanent WILC personnel would be required. No increases to infrastructure capacity demands would be necessary to support these operations.

2.5 FUEL STORAGE AND MISSILE FUELING ACTIVITIES

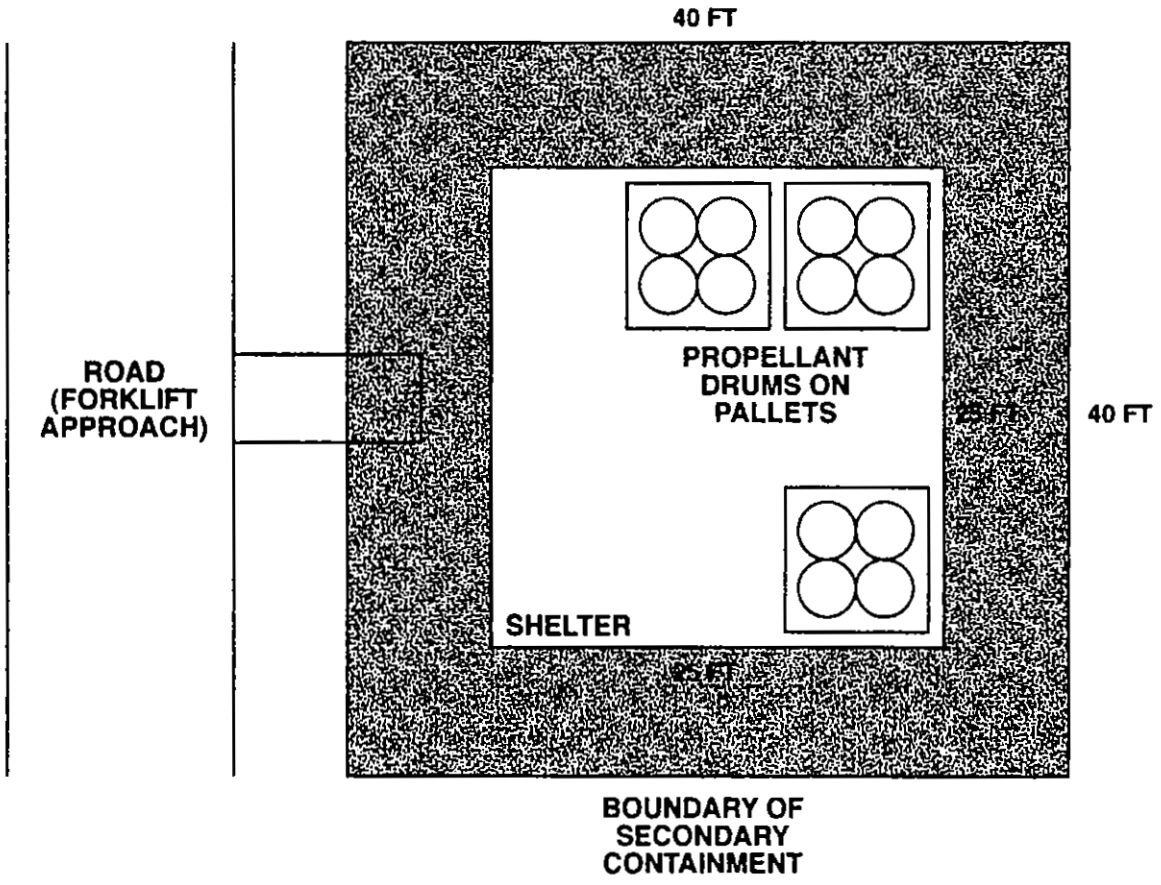
The LPT propellant is composed of the fuel (a kerosene-type petroleum product), the oxidizer (IRFNA), and the initiator fuel. Propellant ingredients for an LPT missile are listed in Table 2-1. The oxidizer must be stored at least 45.7 m (150 ft) from any petroleum-based fuels. The initiator fuel, required in only small amounts, can be co-located with the main fuel. As a result, two propellant storage areas must be established. Propellants would be stored in DOT approved containers in accordance with all accepted governing standards. Fuels would be stored in stainless steel containers, and the oxidizer in aluminum containers. The storage containers would vary between 114 to 1140 l (30 to 300 gal) in capacity. They would be placed in a single layer on a hardpack flat surface and would be protected from the sun and salt spray at both sites by a non-permanent awning approximately 7.6 by 7.6 m (25 by 25 ft) square. Although a leak of any of these components from constituent containers would be highly improbable, approved spill containment would be installed at each site to ensure any accidental leakage does not enter the soil. This containment would most likely consist of a low earthen perimeter berm 30.5 to 45.7 cm (12 to 18 in) high with a non-permeable lining material on the bottom and sides of the storage area (Figure 2-2).

Table 2-1 LPT Propellant Constituents

	Component	Approx. Weight kg	(lb)
Main Fuel	60% coal tar distillate, 40% kerosene	825	(1820)
Oxidizer	100% inhibited red fuming nitric acid (IRFNA)	2920	(6400)
Initiator Fuel	50% triethylamine, 50% dimethylanilines	30	(66)

Several factors were considered in selecting locations for alternative propellant storage. Foremost, storage areas should be on the south side of the atoll in case of an accidental release of IRFNA. In this area, the prevailing northeast to southwest winds would sweep any gases immediately out to sea and away from atoll inhabitants. As mentioned in the previous paragraph, IRFNA cannot be stored any nearer than 45.7 m (150 ft) from petroleum-based fuels, yet it must be in a location accessible to fueling areas. Flat, stable terrain and a paved road network facilitate the use of rough terrain forklifts to transport the propellant containers to the fueling site. A notional kerosene/IRFNA layout is presented in Figure 2-2. This layout would be essentially the same in each of the alternatives.

Fueling operations (delivering the propellant from the storage containers to the missile) would take approximately three days per missile. During fueling, the missile would be mounted on a transport and fueling trailer (TAFT) and moved from the MAB to the fueling site. Containers of propellant would be moved from the kerosene and IRFNA storage sites, by rough terrain forklift, to the fueling site. After fueling, the missile would be transported back to the launch area and mounted on the GHLE.



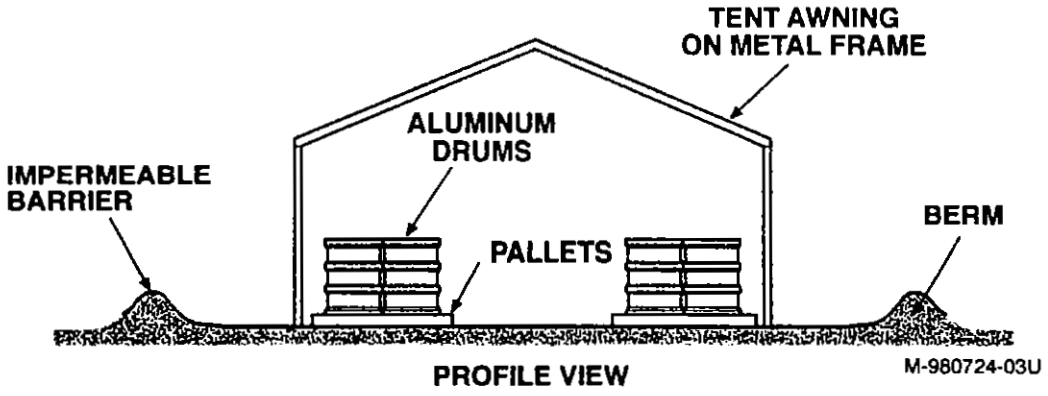


Figure 2-2 Notional Kerosene/IRFNA Storage Site
(identical for each constituent)

All personnel involved in these operations would wear appropriate protective clothing and would receive specialized training in liquid propellant safety, handling, spill containment, and cleanup procedures prior to handling the materials. It is anticipated that only very small amounts (approximately 10 g or 0.4 oz) of oxidizer vapors would be released to the atmosphere during the oxidizer transfer operation. A negligible amount of fuel vapors would also be released into the atmosphere during fuel transfers. After completion of the transfer operations, the oxidizer transfer system would be flushed with water. This operation is expected to yield approximately 5 g (0.2 oz) of nitric oxide gas that would be released into the atmosphere, and 208 l (55 gal) of a mild nitric acid solution (<0.05 percent) that would be collected and disposed of per applicable regulations. The main fuel and initiator fuel transfer systems would be flushed with 208 l (55 gal) of ethyl alcohol, and the waste alcohol (with approximately 40 g [1.4 oz] of fuel in solution) would be collected and disposed of per applicable regulations. Figure 2-3 shows the notional layout for the fueling area. It would be virtually the same for each alternative.

Specific, standardized procedures for fuel/oxidizer transfer would be developed in accordance with Army requirements for the handling of liquid rocket propellants. These procedures would incorporate measures to minimize both the amount of waste propellants generated during transfer operations and the potential for accidental spills.

PREFERRED FUEL STORAGE AND FUELING SITES

Figure 2-4 shows areas where kerosene and IRFNA storage sites could be located. Although these sites could be located almost anywhere in their respective area, the preferred locations are indicated. Proposed storage sites would be carefully surveyed for any nesting birds, and an appropriate wildlife or biological specialist would provide instruction on how to proceed if a nest is encountered. The preferred IRFNA storage site is located adjacent to a north-south road 274 m (900 ft) away from a jet fuel pump station and 245 m (800 ft) from the proposed kerosene storage site. This IRFNA storage location would offer easy access by trucks and forklifts and is located on an old 7.6 x 30.5 m (25 x 100 ft) concrete pad. It would be only a short distance to move the IRFNA containers from this storage site to the fueling site.

The preferred kerosene storage site is located southwest of the IRFNA site adjacent to an infrequently used road. This location would also allow convenient access by trucks and forklifts. The fueling site is relatively near and the kerosene containers would not have to be moved far for fueling activities.

Fueling could take place in any of the areas indicated in Figure 2-4; however, the preferred site is an abandoned 6.1 x 36.6 m (20 x 120 ft) concrete pad adjacent to an infrequently used road (the road would have to be closed for 2-3 days during the operation). The fueling could be performed on the pad or the road. This site would be easily accessible by forklifts moving from the IRFNA and kerosene storage sites.

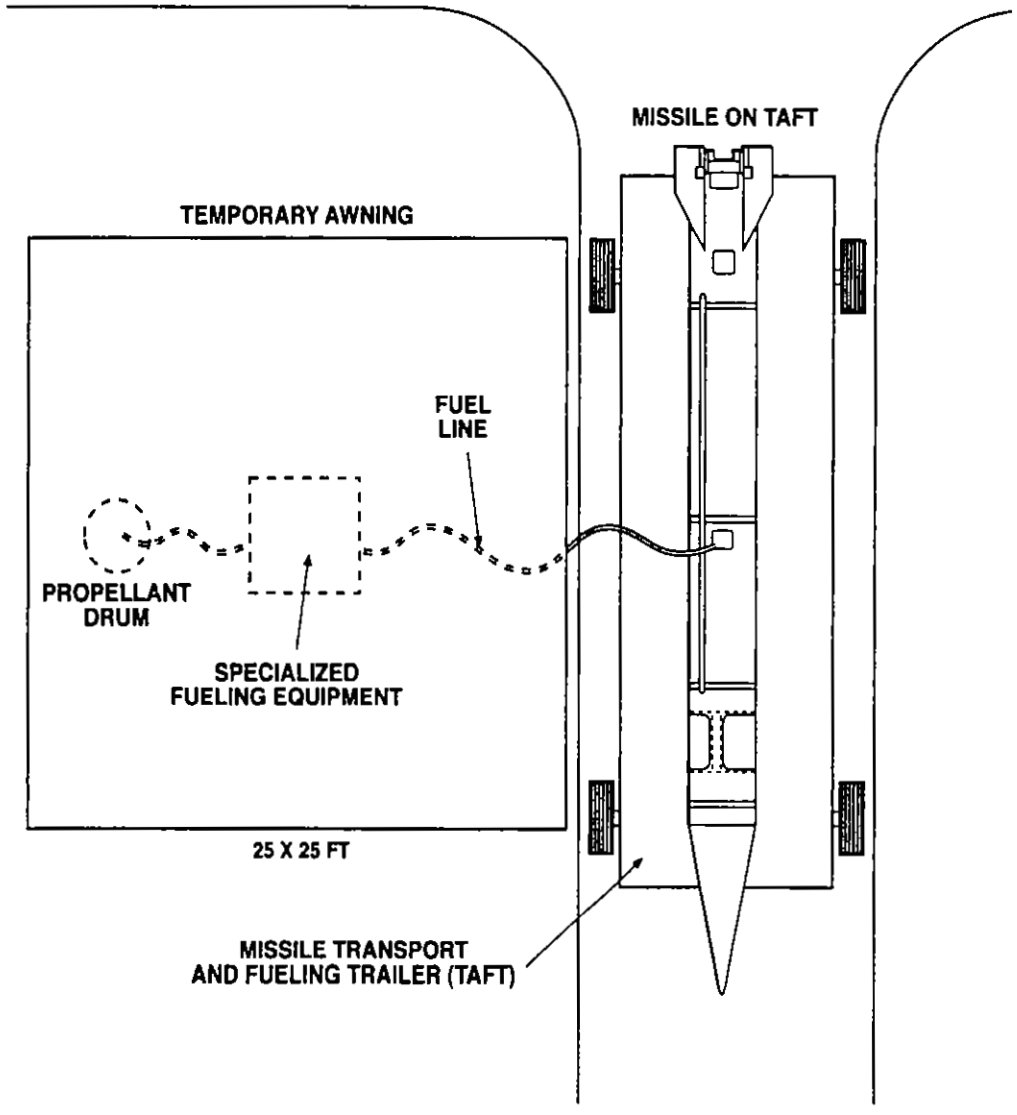


Figure 2-3 Notional Propellant Transfer Area

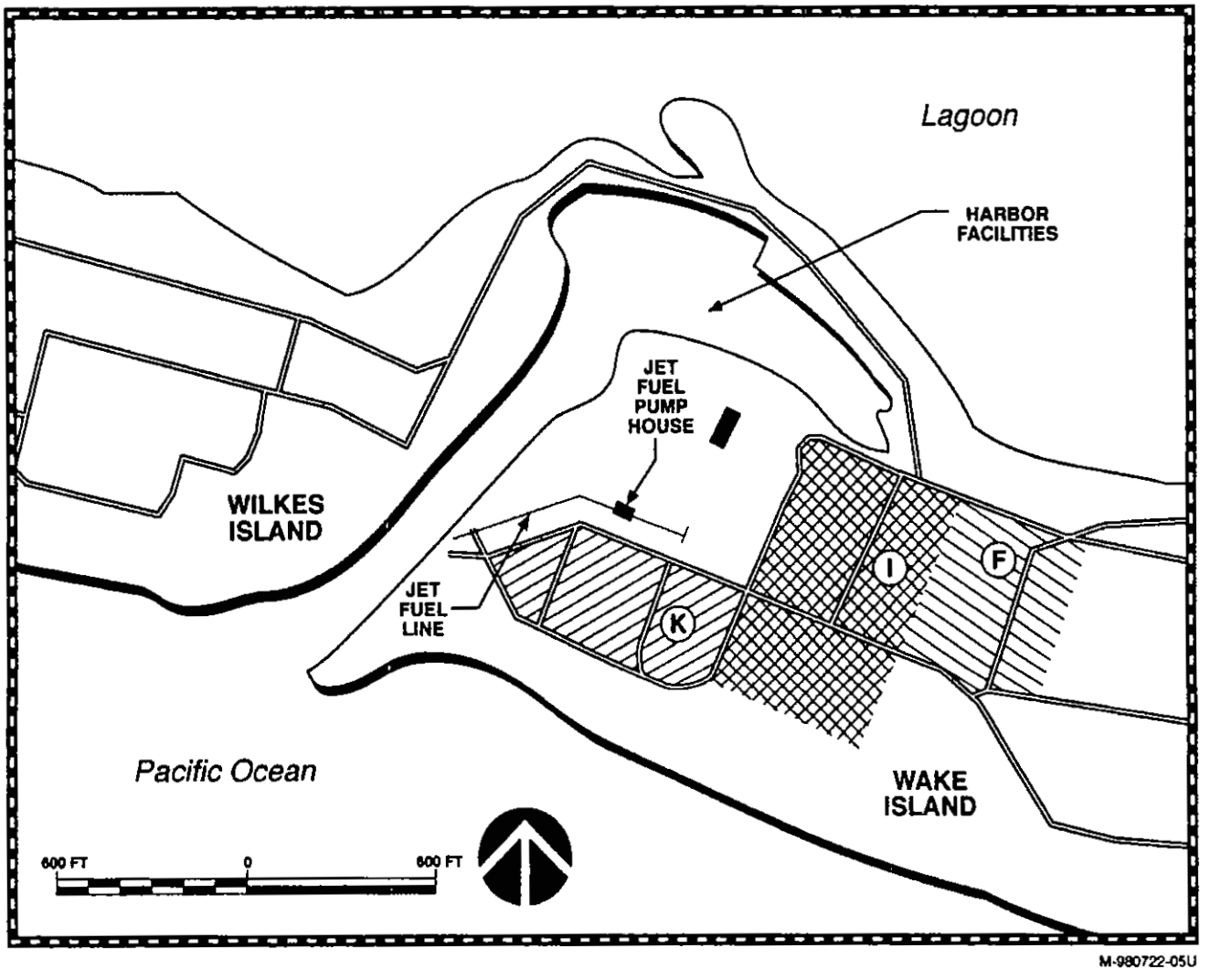


Figure 2-4 Harbor Area Propellant Storage and Fuel Transfer Sites

2.6 LAUNCH SITE PREPARATION AND ESTABLISHMENT

Launches would occur at the Peacock Point launch area on the southeast corner of the island (Figure 2-5). The preferred launch site is the existing Launch Pad #2. The alternate site is an abandoned pad southwest of Launch Pad #2. Both sites have existing level concrete pads and would require no new construction. Preparation of these sites would require only the trimming of some taller vegetation to allow a line of site with the Building 1601 control tower. All power and communication cables would be placed on the ground surface. No cable trenching would be required. The existing facilities would not require any grading, excavation or clearing. Another launch pad at Peacock Point, Launch Pad #1, was not considered because it has a large launch rail which is not compatible with a GHLE launch.

The high amount of pedestrian traffic in these areas during launch preparation would require some precaution to protect biological and cultural resources. Personnel would be instructed to avoid areas designated as avian nesting or roosting habitat and to avoid all contact with any nest that may be encountered.

Wake Island is a National Historic Landmark because of the WWII battle that occurred there and the subsequent Japanese occupation. To ensure the protection of any historic resources already identified within the project area from unauthorized artifact collection or vandalism, personnel would be briefed before activities commence on the significance of these types of resources and the penalties associated with their disturbance or collection. All operations personnel would receive a brief orientation involving a definition of cultural resources and the associated protective Federal regulations.

If, during the course of program activities, historic materials (particularly human remains) are unexpectedly discovered, work in the immediate vicinity of the cultural materials would cease until a qualified historic preservation professional could evaluate the site to determine its significance. In the unlikely event of damages to historic properties occurring as a result of falling missile debris from a launch abort or mishap, an assessment would be conducted to determine the measures appropriate to mitigate the impacts.

2.7 FLIGHT TEST ACTIVITIES

Launch activities would begin with the arrival of the launch team approximately 30 days prior to the scheduled launch. Miscellaneous flight readiness testing would occur during this time period. Launch team equipment would consist of the target, GHLE, launch control van, pad equipment shelter truck, four 100-kW generators, a 9,000 kg (10 ton) crane, supporting light vehicles for equipment and supply transportation, and miscellaneous small equipment and supplies. For a maximum of 60 days, an average of approximately 25 transient personnel (possible maximum of 45), would be on the island to perform prelaunch operations.

Minor mechanical repairs could be performed on the island in existing repair shops. Diesel refueling operations for motorized vehicles and generators would also be performed. All ground vehicle refueling operations would take place at established refuel points.

Missile fueling operations are not expected to be performed at the launch sites. However, should the need arise for launch site fueling, existing spill response plans and liquid fuel transport and handling plans include adequate safety measures for the procedure. In the event of a technical problem with the liquid components of the LPT, bulk liquid storage containers would be available on the island for de-fueling of the liquid propellant launch vehicle. Water would be available at the launch site for fire suppression.

Launch activities would be controlled from the Launch Command Center. The Launch Command Center would either be self-contained in a trailer-mounted shelter, or located in Building 1601. Launch equipment would be located in the truck-mounted Pad Equipment Shelter. It is unmanned during launches and would be located approximately 45.7 m (150 ft) from the GHLE (Figure 2-6).

Shortly before launch, all mission-essential personnel would be evacuated from the launch area to the launch control area (at a minimum of 457 m [1,500 ft] from the launcher). Non-mission-essential personnel would be evacuated from the launch hazard area (LHA) at a minimum of 2,000 m (6,562 ft) from the launch pad. LHAs are configured to provide the maximum protection for personnel and take into account the ability to control access to the hazard areas. A sweep of the LHA for any personnel or water craft would be conducted. Sea and air corridors along the target flight path would also be verified as clear. After the LHA is verified clear, the launch signal would be given from the launch control area. Standard protective procedures would be followed during test activities to provide hearing protection of workers and minimize any noise impacts associated with launch activities. Missile impact zones would be confined to open areas at sea, or existing range areas which have been verified clear of personnel. Standard operating and safety procedures for missile launching and testing would be implemented to minimize the risk of any adverse health or safety impacts associated with the program. Figures 2-7 and 2-8 present the expected layouts at Launch Pad #2 and the Abandoned Launch Pad, respectively.

No explosives or biological or chemical simulants would be used in LPT warheads. Only instrumentation packages would be flown in the payload section of the vehicle. The content and expected amount of various emissions during each launch are shown in Table 2-2.

Table 2-2 LPT Emission Component Masses per Launch

Compound	Formula	Approx. Emission Mass	
		kg	(lb)
Carbon Monoxide	CO	982	(2170)
Carbon Dioxide	CO_2	922	(2030)
Hydrogen	H_2	38	(84)
Water vapor	H_2O	961	(2120)
Nitrogen	N_2	674	(1490)
Other	----	9	(20)

The issuance of International Notices to Airmen (NOTAMs), timely coordination with the FAA (Oakland Oceanic), and proper scheduling of the missile launches will minimize potential impacts to air traffic. The target launch vehicle would most likely follow a flight trajectory from WILC approximately south-southeast toward Kwajalein Atoll. The impact would occur between Wake and Kwajalein in the open ocean area. Flights and intercepts of this type are analyzed in the Wake Island EA (USASSDC, 1994), and the *Supplemental Environmental Impact Statement for Proposed Actions at the U.S. Army Kwajalein Atoll* (USASSDC, 1993). Flight trajectories and any associated intercepts which do not fall under the analysis presented in those documents would be analyzed in future supplemental documentation prepared by project offices associated with such testing activities.

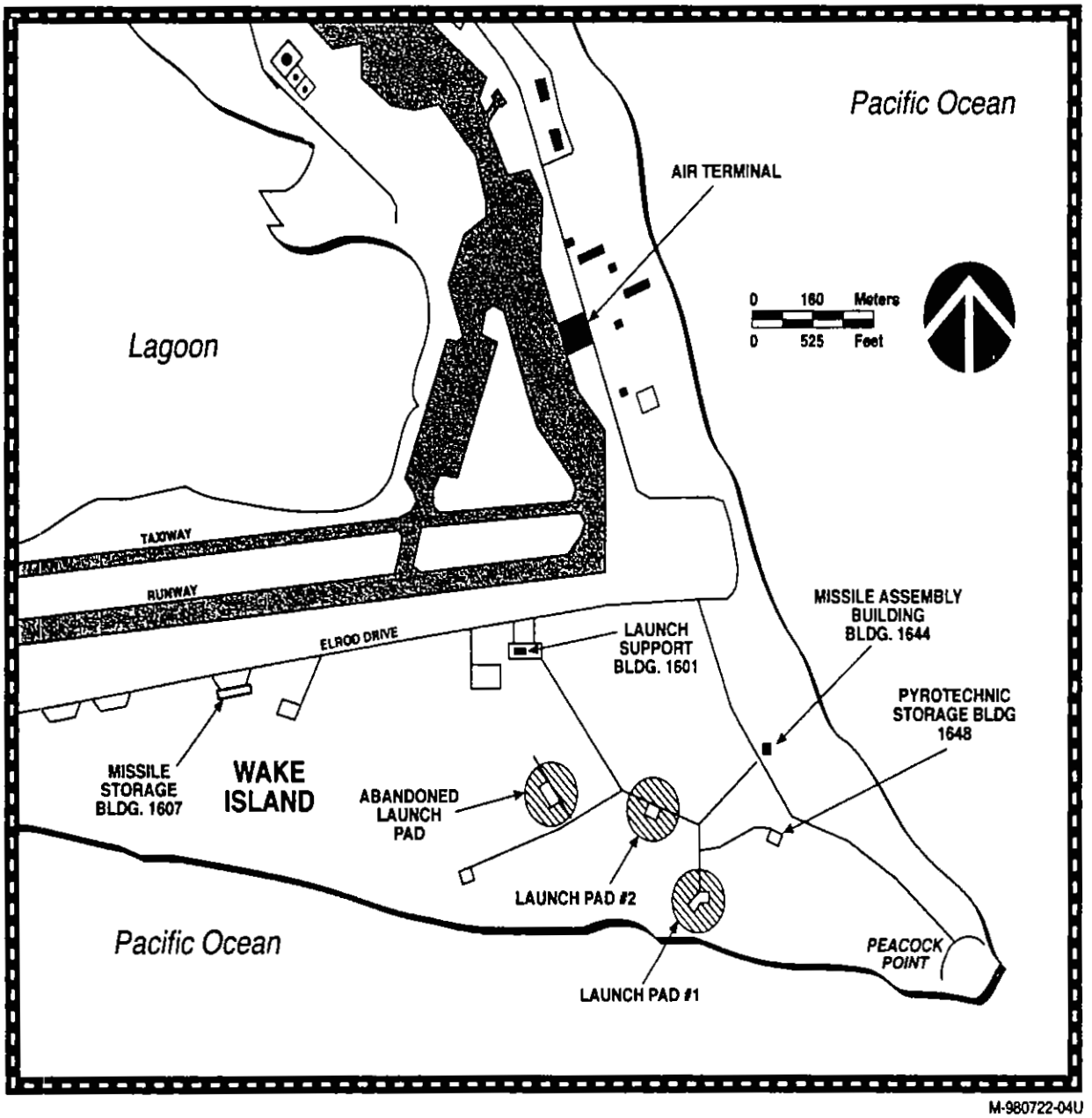


Figure 2-5 Peacock Point Launch and Support Areas

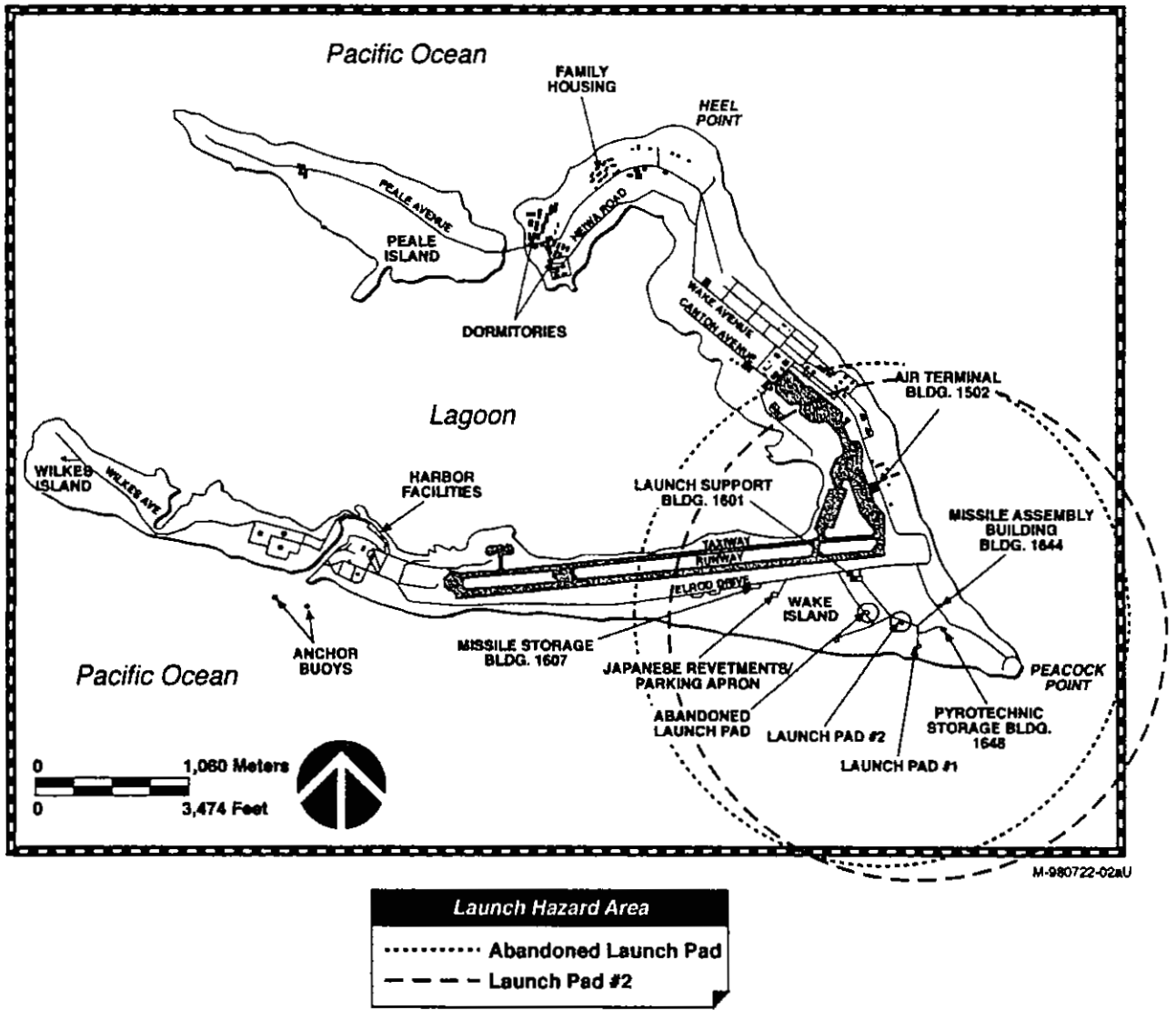


Figure 2-6 Proposed Launch Hazard Areas

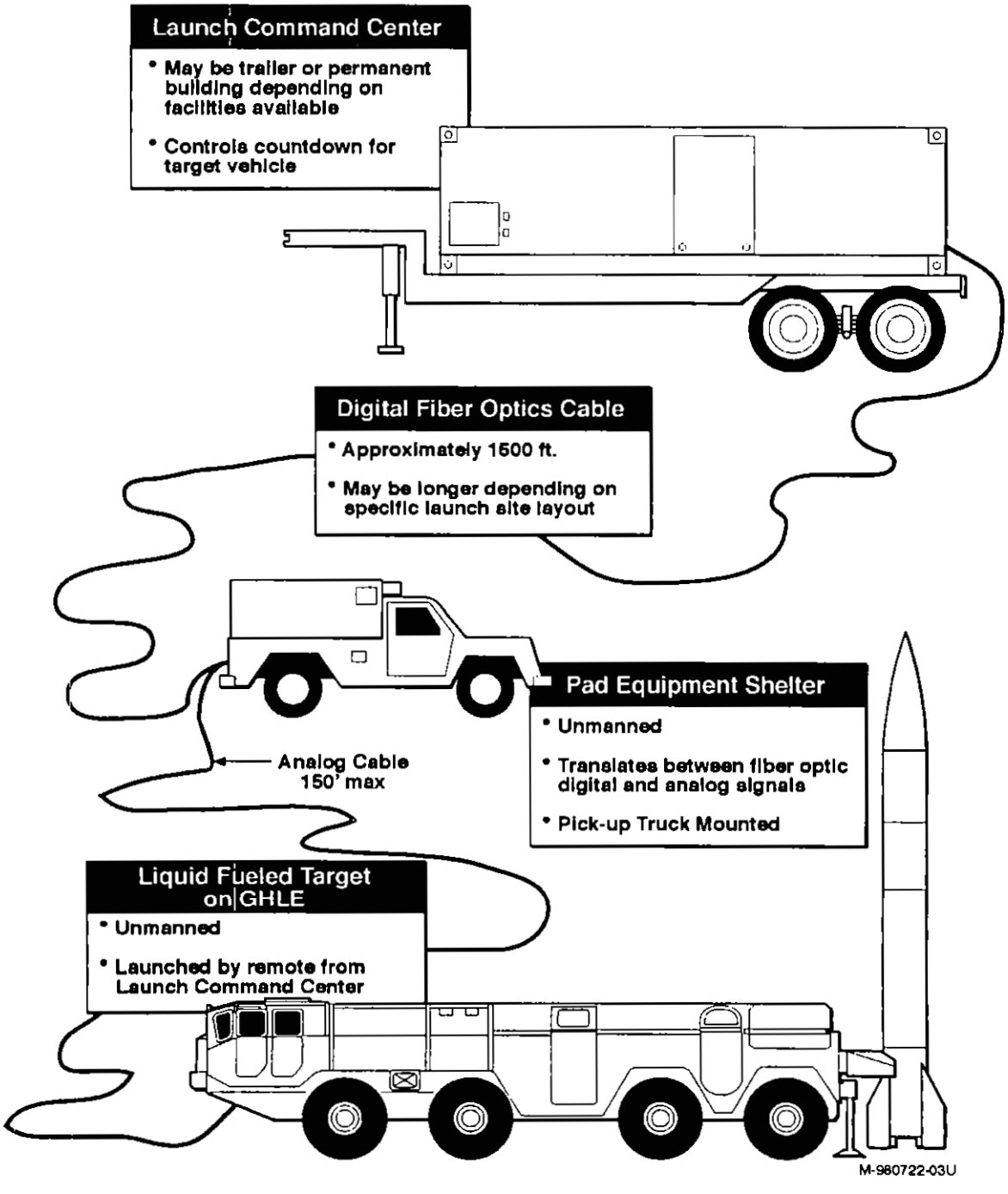


Figure 2-7 Launch Command Layout

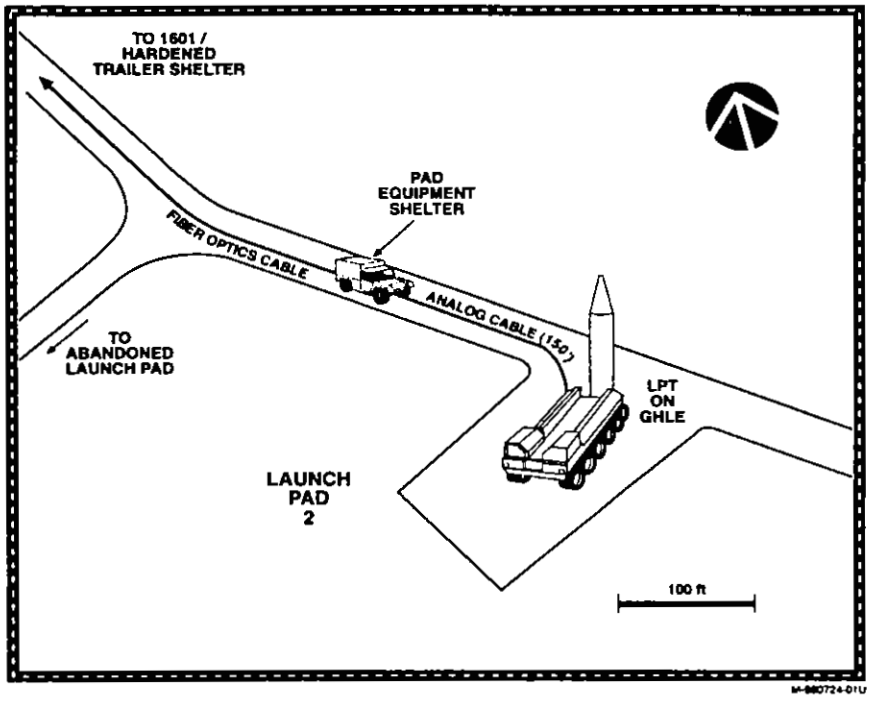


Figure 2-8 Launch Pad #2 Layout

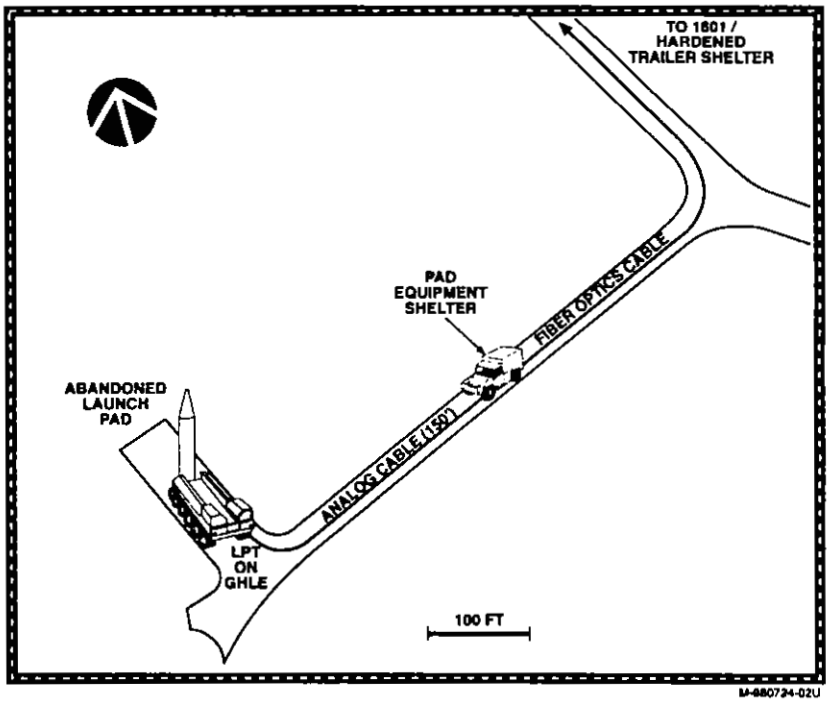


Figure 2-9 Abandoned Launch Pad Layout

2.8 POST LAUNCH ACTIVITIES

After a launch, in-place procedures would be used to decontaminate any equipment as necessary. Following the completion of the launch program at WILC, all associated vehicles and equipment would be returned to their respective CONUS locations. Leftover propellants and other chemicals, including any hazardous waste, would be brought back to the U.S. mainland. Clean propellants would be stored at Redstone Arsenal for future use, and waste would be sent to a certified disposal facility in the U.S. In the unlikely event that follow-on launch missions would be conducted within sixty or less days between events, equipment and fuels would be left on the island.

Schedule of Activities

LPT launch activities would occur, based on mission needs, over a ten-year period, beginning in Fiscal Year 2000. A notional schedule for each launch is presented in Table 2-3 below.

Table 2-3 Notional LPT Launch Schedule

Days	Activities
T-45	Missiles, propellants, and equipment arrive at WILC
T-45 to T-10	Prepare equipment for launch; fuel missiles, system checkout, etc.
T-10 to T-1	Countdown dry run, final checkout
T-0	Final countdown, launch
T+1 to T+15	Equipment pack-out (including leftover propellants and hazardous waste)

2.9 ALTERNATIVES TO THE PROPOSED ACTION

2.9.1 ALTERNATIVE 1 - WILKES ISLAND TANK FARM AREA FUEL STORAGE AND FUELING OPERATIONS

The eastern end of Wilkes Island has an existing petroleum tank farm which would provide adequate room and distance requirements for propellant storage sites and a fueling site. These potential sites are shown in Figure 2-9. Petroleum stored in the existing tanks would limit IRFNA storage to only one possible site (just east of Building 1806) which is approximately 76.2 m (250 ft) from the nearest fuel tank and approximately 152 m (500 ft) from the proposed kerosene storage site. The proposed kerosene site is in an open area on the western edge of the tank farm. Both of these sites offer level hardpack terrain adjacent to gravel roads.

The proposed fueling site is in an open area on the eastern edge of the tank farm, just south of an improved gravel road. The TAFT and LPT would have to travel across the causeway from Wake Island to Wilkes Island to reach the fueling area. This alternative was not selected due to the inherent dangers of hauling heavy equipment across the aging causeway and the relative isolation of the area.

2.9.2 ALTERNATIVE 2 - AIRCRAFT REVETMENT AREA FUEL STORAGE AND FUELING OPERATIONS

This area is located approximately midway between the harbor area and the Peacock Point launch areas, just south of the runway and Elrod Road (Figure 2-10). The use of this area would require the utilization of two WWII Japanese aircraft revetments and a parking apron. The IRFNA storage site would be located in the southernmost revetment (Building 1609), which is an open-front, open-top masonry structure that has four bays divided by approximately 3-m (10-ft) walls. The IRFNA would be placed in one bay and a temporary, metal-framed awning would be installed in such a way that no permanent alterations would be made to the structure. The floor of the bay would be covered by a non-permeable barrier as discussed in Paragraph 2.5. Kerosene would be stored in the same manner in another aircraft revetment (Building 1616) located approximately 396 m (1300 ft) northwest of the IRFNA storage site.

Fueling would take place on the eastern edge of the aircraft parking apron about 30.5 m (100 ft) south of Elrod Road. This parking apron is a segmented concrete pad that is trapezoidal in shape and is approximately 107 m (350 ft) long on its longest side. It is bounded on the north by Elrod Road and on the south by an aircraft revetment. This alternative was not selected because of potential danger posed by heavy equipment to the historic aircraft revetment and the adjoining parking apron.

2.9.3 NO ACTION ALTERNATIVE

Under the no action alternative, the USASMDC would not proceed with any LPT missile activity at Wake Island. Flight test information for LPT missiles, needed for development of TMD sensors, interceptors, and technology, would not be collected from test activities at WILC.

USASMDC and USEPA have developed and agreed upon corrective actions where compliance concerns exist at Wake Island. These actions are identified in the *Wake Island Federal Facility Compliance Agreement* (USASMDC, August 1999) reproduced in Appendix D, and are in the process of being implemented under the no action alternative. These actions will be sufficient to ensure no additional mitigation measures in these areas would be required under the proposed action. This compliance agreement describes the actions necessary for WILC to achieve and maintain compliance with the requirements of the U.S. environmental statutory and regulatory provisions identified in the plan regarding these issues.

2.9.4 ALTERNATIVES CONSIDERED BUT NOT CARRIED FORWARD

Two LPT missiles were launched from Aur Atoll in 1997 and were analyzed in the *U.S. Army Kwajalein Atoll Temporary Extended Test Range Environmental Assessment* (USASSDC, 1995). Although this analysis was already completed, this alternative was not carried forward because launches from Aur Atoll would not meet the flight distance requirements, engagement geometry, instrumentation coverage, and other mission needs of current test requirements.

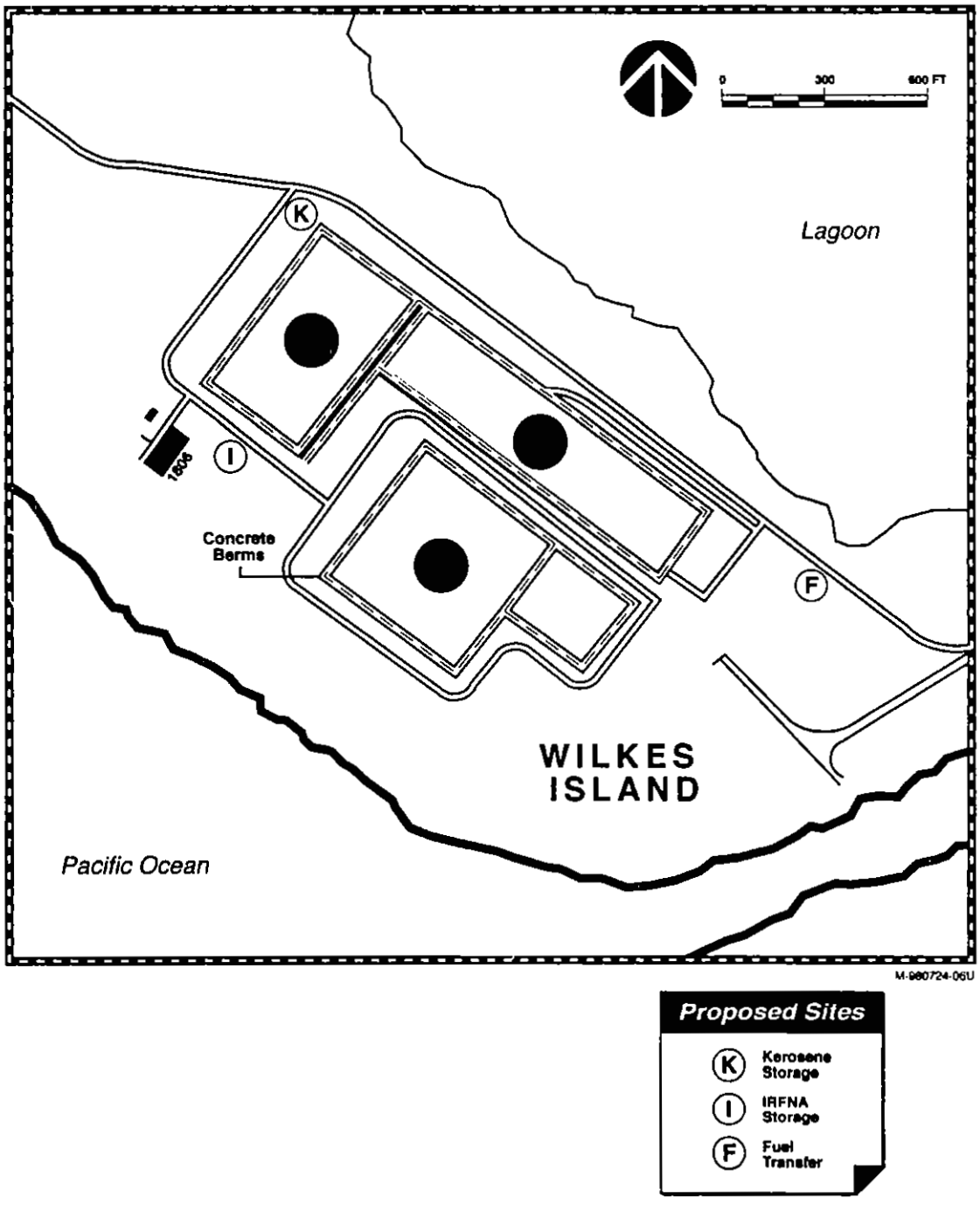


Figure 2-10 **Wilkes Island Propellant Storage and Fuel Transfer Sites**

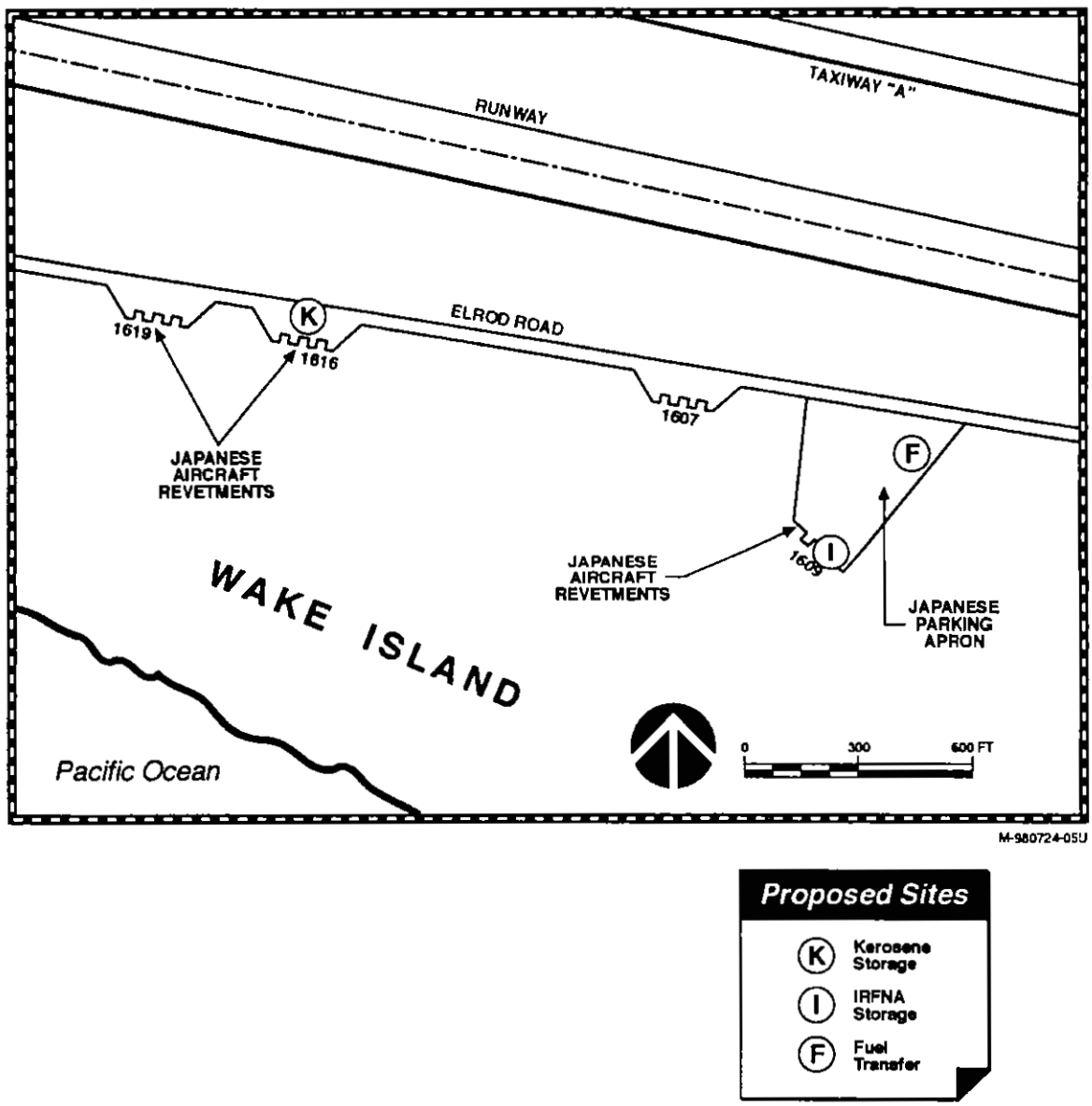


Figure 2-11 **Aircraft Revetment Area Propellant Storage and Fuel Transfer Sites**

3.0 Affected Environment

3.0 AFFECTED ENVIRONMENT

This section describes the affected environment (i.e., the environmental characteristics that have the potential to be changed by implementation of the proposed action) at Wake Island. Much of the information in this chapter is drawn from the Affected Environment chapter of the Wake Island EA (1994). Detailed background information presented in the 1994 assessment has been omitted. Pertinent new information has been added where the affected environment has changed. For more detailed information the reader is referred to the 1994 EA.

Twelve broad environmental components were evaluated to provide a context for understanding the potential effects of the proposed action and to provide a basis for assessing the significance of any potential impacts: air quality, airspace, biological resources, cultural resources, hazardous materials/waste, health and safety, infrastructure and transportation, land use, noise, physical resources, socioeconomics, and water resources.

The data presented are commensurate with the importance of the potential impacts, with attention focused on key issues. Federal environmental statutes, many of which set specific guidelines, regulations, and standards, provide a benchmark that assists in determining the significance of environmental impacts. The status of compliance of each proposed Wake Island action with respect to environmental requirements was included in the information collected on the affected environment. The areas of environmental consideration are described briefly below.

Air Quality - Air quality at Wake Island was reviewed, with particular attention paid to background ambient air quality compared to the primary National Ambient Air Quality Standards (NAAQS).

Airspace - The extent of effects of both air and ground operations on high and low-altitude jet routes and local air traffic, including aircraft arrivals and departures, was reviewed.

Biological Resources - Existing information on plant and animal species and habitat types on the island was reviewed, with particular attention paid to the presence of any species that are protected or on Federal lists of threatened or endangered species.

Cultural Resources - The specific location of resources on the National Register of Historic Places (NRHP) was reviewed from existing documentation.

Hazardous Materials/Waste - Existing hazardous materials/waste management practices and records of compliance were reviewed to determine the capability of the facility to handle any additional hazardous materials/waste associated with Wake Island actions and any potential problems with their use, handling, storage, treatment, or disposal.

Health and Safety - Safety precautions regarding the use, handling, storage, and disposal of hazardous materials/waste were reviewed.

Infrastructure and Transportation - The capacity and current demands of infrastructure elements (i.e., electricity, solid waste, sewage treatment, water supply, and transportation) were examined to determine if there were any infrastructure and transportation constraints to conducting the proposed activities.

Land Use - Facility master plans, environmental management plans, evaluations of known or suspected areas of hazardous material contamination and/or potential mitigation measures, and other documentation were reviewed to determine if there are any known conflicts between existing and future facilities and land uses and proposed activities.

Noise - Existing facility documents were reviewed to determine if noise concerns are an issue.

Physical Resources - Existing information on topographic, geologic, and soil resources was reviewed to determine if there are any physical resource concerns.

Socioeconomics - Existing island personnel numbers were compared to the personnel requirements for proposed activities on the island.

Water Resources - Existing information on groundwater and surface water resources was reviewed to determine if there are any water resource concerns on the island that could potentially be affected by proposed activities.

3.1 AIR QUALITY

Climatological Conditions

The climate at Wake Island affects the dispersion of air pollutants and the resulting air quality. The climate is maritime, and chiefly controlled by the easterly trade winds, which dominate the island throughout the year. The winds blow steadily every month of the year with very little variation. The yearly average wind speed is 22.2 km (13.8 mi) per hour.

Temperature varies little during the day or from month to month. In February, normally the coldest month of the year, the average daily high is 27.6 degrees Celsius (°C) (81.7 degrees Fahrenheit [°F]) and the average daily low is 21.9°C (71.5°F). In August, normally the hottest month of the year, the average daily high is 31.2°C (88.1°F) and the average daily low is 25°C (77°F) (National Oceanic and Atmospheric Administration, 1993). Occasionally, intrusions of polar air masses in the general vicinity of Wake Island occur during the late fall, winter, or early spring. The record low temperature of 17.8°C (64°F) occurred during a polar intrusion in December 1954.

Average annual precipitation is approximately 89 cm. Summer is the season with the greatest amount of rainfall. Rain showers occur most frequently between midnight and sunrise. Average annual humidity ranges from 69 to 80 percent, and the average amount of the daytime sky obscured by clouds is approximately 54 percent.

Air Quality Standards

In compliance with the Clean Air Act (CAA), the U.S. Environmental Protection Agency (USEPA) has established NAAQS for six criteria pollutants: carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3), particulate matter with a hydrodynamic diameter less than or equal to 10 microns (PM_{10}), and sulfur dioxide (SO_2). The primary NAAQS are designed to protect public health with an adequate margin of safety, and the secondary NAAQS are designed to address harm to environmental and economic interests. The CAA also seeks to "prevent significant deterioration" of air quality in areas where the air is cleaner than that required by the NAAQS.

Title III, "The Air Toxics Program," of the CAA addresses hazardous air pollutants (HAPs), which are air pollutants not covered by the NAAQS and that may reasonably be expected to cause or contribute to irreversible illness or death. Title III, from the 1990 Amendments to the CAA, replaces the National Emissions Standards for Hazardous Air Pollutants program. Determination of standards and compliance issues for Wake Island is within the jurisdiction of USEPA Region 9.

No ambient air quality monitoring data is known to be available for Wake Island; however, it is believed that there are no air pollution problems at Wake Island since the strong trade winds quickly disperse any local emissions. Furthermore, because there are no other islands within several hundred miles of Wake Island, there are no nearby sources from which Wake would receive air pollutants, and there are no nearby communities that could be affected by air pollutants from emissions generated at Wake Island.

Existing Sources of Air Pollution

The principle pollutant emission sources are the power plant, motor vehicles, aircraft operations, fuel storage tanks, open burning of trash at the base landfill, the incinerator, and infrequent rocket launches. No air emissions inventory is known to exist for Wake Island Airfield. None of the emission sources meet the threshold for Title V permitting under the CAA, and no ambient air quality standards have been exceeded.

Currently, the Theater Missile Defense Critical Measurements Program (TCMP) is the first scheduled active launch program on the island. Approximate TCMP rocket motor emission component masses per launch event are presented in Table 3-1. Launches are discrete, short-term events, and the missile emissions disperse quickly. TCMP tests involve the release of payloads at altitudes of about 150 km. Two types of tests are performed. One test includes the release of multiple payload objects, and the other involves the release of a small amount of kerosene. Neither payload test is expected to affect air quality. The launch and experimental payload testing of the TCMP was described and analyzed in the *Theater Missile Defense Countermeasures Mitigation Program Environmental Assessment* (September, 1992). This previous EA determined that there would be no significant impacts from those actions.

At present, two additional TCMP launches are scheduled, the first in May 1999 and the second in the 2nd quarter of 2000. This flight series is currently scheduled to use a SR-19FS motor with two Multiple Launch Rocket System (MLRS) assist motors.

The HERA target missile is scheduled to use the launch facilities at Wake beginning in October 1999. Fifteen launches of the SR-19 HERA target are scheduled through the 4th quarter of 2006.

Open Ocean Area

There is no data on air quality baseline characteristics for the open ocean area surrounding Wake Island and the area between Wake Island and the U.S. Army Kwajalein Atoll (USAKA). It is assumed for the purposes of this document that the salient characteristics are the same as for the atmosphere above Wake Island itself.

Table 3-1 TCMP Emission Component Masses (kg) per Launch

CHEMICAL	SR-19 FS	MLRS
Al_2O_3	1,767.00	10.45
CO	1,327.00	7.09
CO_2	288.00	0.72
H_2	117.00	0.64
HCl	1,402.00	5.92
H_2O	776.00	2.92
N_2	545.00	2.66
Other	74.00	1.61
Total	6,296.00	32.01

3.2 AIRSPACE

Wake Island is located beneath international airspace managed by the Oakland Air Route Traffic Control Center (ARTCC) Oceanic Control-5 Sector. One jet route, A-450, passes over the island. A summary of the number of flights using this route is not maintained. During the first half of 1998 there was an average of 50 flights per month to Wake Island (WILC Flight Operations, 1998).

Consideration of operations in international airspace involves International Civil Aviation Organization (ICAO) procedures to be followed in international airspace. ICAO Document 4444 is the equivalent air traffic control manual to the FAA Handbook 7110.65. The FAA acts as the U.S. agent for aeronautical information to the ICAO. The ICAO does not establish international boundaries for air traffic control purposes, and each country has its own Flight Information Region (FIR) and Air Defense Identification Zone (ADIZ). The ICAO is not an active air traffic control function and has no authority to allow aircraft into a particular country's FIR or ADIZ. Oakland ARTCC, which manages the airspace over Wake Island, has previous experience in handling missions similar to the proposed action.

3.3 BIOLOGICAL RESOURCES

A discussion of the biological resources at Wake Island is presented in four sections. The first section highlights wildlife native to Wake Island, and the second section describes botanical resources. A third section presents a brief discussion on marine biological resources typically encountered at Wake. The last section characterizes any Federally protected terrestrial biota that has been sighted or suspected to occur at Wake Atoll.

The majority of the information contained in section 3.3 has been extracted from two surveys (terrestrial and marine) performed in 1998, and from two previous surveys (ornithological and botanical) performed in 1993 for the Wake Island EA (USASSDC, 1994). The 1998 Terrestrial Resources Survey (Appendix B) conducted by the U.S. Department of the Interior, provides identification and characterization of terrestrial biota at Wake Atoll, including flora, fauna, and avifauna. The 1998 Baseline Marine Biological Survey (Appendix C) was conducted jointly by the U.S. Fish and Wildlife Service and the National Marine Fisheries Service. It documents the primary species of reef fishes, corals and other macroinvertebrates, and algae encountered at several marine discharge sites. The 1993 survey reports are located at Appendices E and F of the 1994 Wake Island EA.

3.3.1 Wildlife Resources

Approximately 32 species of birds encountered at Wake Atoll have been described in recent reports. Taken together, these accounts include resident species, migrants, visitors, vagrants, accidentals, and exotics. Included among these 32 bird species are 15 species of seabirds, 9 species of shorebirds, 4 species of land birds and 3 species of waterbirds. Of these 32 species, 30 species are considered indigenous and 2 species (the domestic chicken and the domestic pigeon) are exotic. All seabirds present on the island, except for tropicbirds, are conspicuous nesters, i.e., they lay their eggs in the open, either on bare ground or exposed in shrubs or small trees. Figure 3-1 depicts general areas of known bird sitings and nesting areas. The reader is referred to Appendix B for a more detailed description of Wake Atoll avifauna and other terrestrial biota

A population of albatrosses, either nascent or remnant, returns to Wake Island each year in November for the courtship and nesting season. Over the 1997-98 winter season, five individual black-footed albatross and three individual Laysan albatross over-wintered at Wake Island, nesting and displaying courtship behavior. Recent sightings are shown in Figure 3-1. Atoll residents reported observing one black-footed albatross nest with one egg and one Laysan albatross nest with one egg, both on Wake Island. However, neither of these nests produced a chick. Predation by feral cats and possibly rats has been suspected in the repeated albatross nesting failure on Wake Island.

Other than birds, the native terrestrial fauna at Wake Atoll is relatively limited and includes insects and several species of land crabs. The following orders of insects have been recently reported at Wake Atoll: Lepidoptera (butterflies and moths), Hymenoptera (wasps, bees and ants), Diptera (houseflies, gnats and mosquitos), Odonata (dragonflies and damselflies), Isoptera (termites), and Coleoptera (beetles).

Skinks and geckos (introduced species) can be found on all three islands. The brown tree snake (*Boiga irregularis*), a species known to clandestinely immigrate throughout the Pacific in military and civilian cargo, has been reported at Wake Atoll. In March of 1949, a specimen was collected in a tree on Wake

Island. No recent accounts of brown tree snakes have been reported on Wake Atoll; however, the potential for such an introduction at the atoll has been recognized.

Exotic terrestrial mammalian species have been introduced, either deliberately or accidentally, to Wake Atoll. Three domestic dogs (*Canis familiaris*) were observed on Wake Island associated with the human population. Domestic cats, under human care, were observed on Wake Island in the resident housing area and at the boat harbor. Feral cats (*Felis catus*) were observed on all three islands and evidence of predation by these cats on seabird nests was evident at Kuku Point on Peale Island. These feral cats are successfully reproducing, and a litter of four unweaned kittens was observed during the 1998 terrestrial survey in the old VORTAC building on Wilkes Island, immediately adjacent to the sooty tern bird colony.

Atoll residents claim that although considerably more sooty terns have bred at Wake Island in past years, their overall decline is due to feral cats, which, according to some, can destroy hundreds of nestlings in a single night and cause others to disperse into dense vegetation where they are abandoned. The former VORTAC area on Wilkes Island is graded each year prior to commencement of the sooty tern nesting season in part to destroy rats, their young, and any subsurface burrows, but also to make feral cats more visible to the nesting birds. Flipper Point on Peale Island may not have any resident cats because of its nearly complete isolation from the rest of Peale Island, and this may be the reason for the success of its relatively small tern colony. Approximately 83 feral cats were eradicated in 1998 in an ongoing effort to control the feral cat population (Mark Henz, pers. comm., 1998).

Rats (*Rattus* spp.) were also observed nesting under construction debris during the recent terrestrial survey of Wake Island. The common house rat (*Rattus rattus*) and the Norway rat (*Rattus norvegicus*) are suspected to occur among the atoll's rodent population.

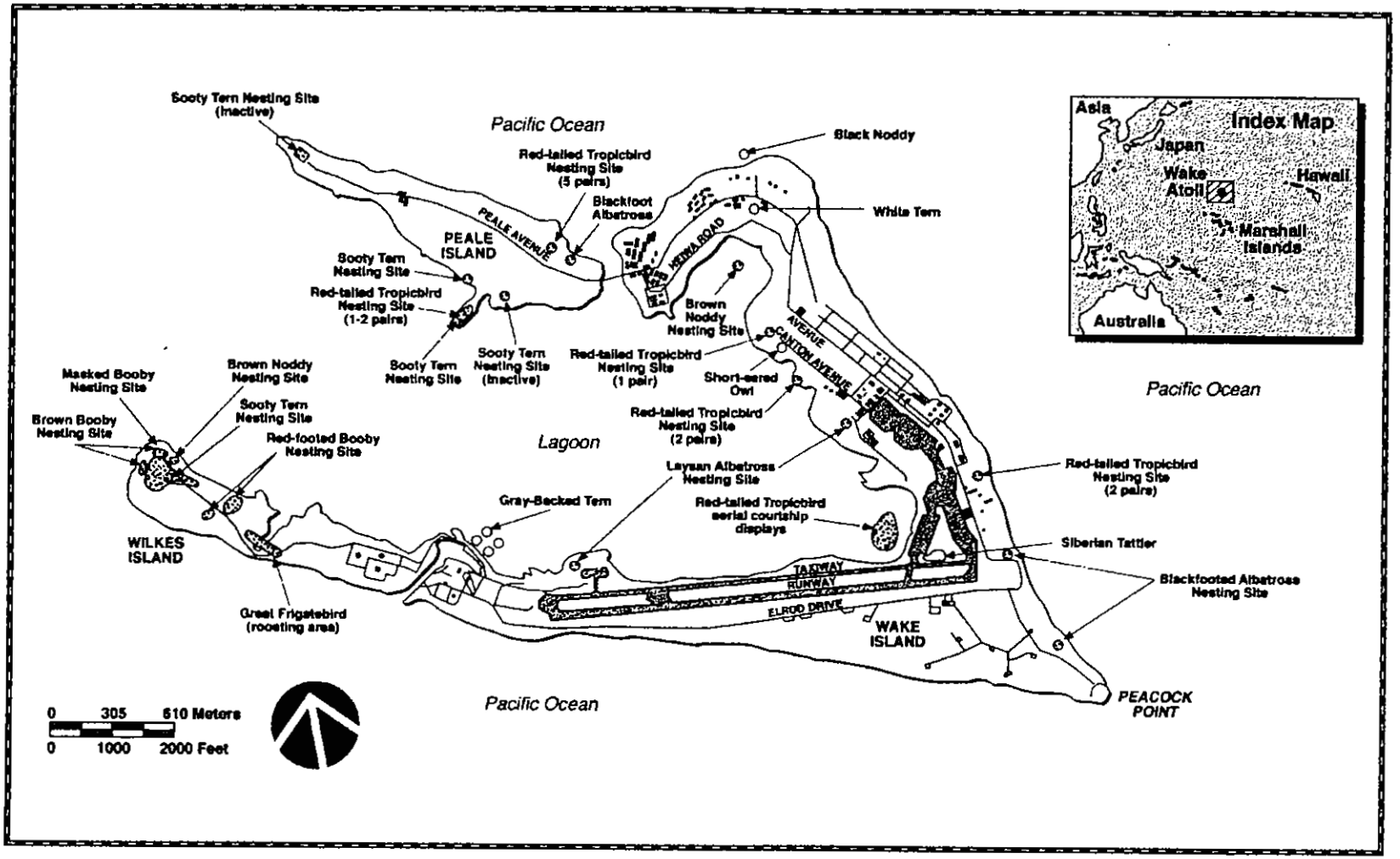


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Figure 3-1 Location Map Bird Sitings

Explanation	
Sightings of Nesting or Courtship Activity:	**Other Sightings:**
Sooty Tern nesting sites	Black Noddy
Red-tailed Tropicbird nesting sites (no. of pairs)	Gray-backed Tern
Red-tailed Tropicbird, aerial courtship display	White Tern
Brown Noddy nest site	Siberian Tattler
Blackfooted Albatross	Short-eared Owl
Laysan Albatross	
Masked Booby	

3.3.2 Botanical Resources

Recent compilations of terrestrial flora at Wake Atoll describe 204 species of terrestrial plants at the atoll, of which 20 are considered indigenous (i.e., a species which is native or probably native to the atoll), 55 are considered naturalized (i.e., a species which has been accidentally or deliberately introduced and has since become naturalized), and 129 are considered propagated (i.e., a species which is found only as a cultivated plant in a garden, a pot, or as a landscape plant). The distribution and composition of terrestrial plant communities at Wake Atoll varies among the three islands and reflects such primary community influences as elevation, climatic conditions, and the degree of human disturbance and intervention. Generally, the terrestrial plant communities on Wilkes and Peale Islands have been relatively less disturbed by contemporary human activities and exhibit more indigenous and mature vegetation than the cultivated and operational areas of Wake Island.

3.3.2.1 Wake Island

The Peacock Point area was the subject of a 100 percent coverage botanical survey in preparation of the *Wake Island EA* (1994). The site extends from the control tower eastward along Elrod Road to the ocean and from the tower south to the ocean. The vegetation of this area is a changing mosaic of scrub tree heliotrope, ironwood, and kou trees (*Cordia subcordata* L.) interspersed with dense stands of naupaka and cotton (*Abutilon albescens* Miq.). Eastward from Peacock Point Road the tree heliotrope is mostly scattered, shrubby individuals growing in coral rubble. West of Peacock Point Road, the tree heliotrope is interspersed with dense stands of naupaka and ironwood trees which become dominant at the west end of the site and in the near vicinity of the control tower. Just seaward of the tower and to the east as far as Peacock Point Road, dense stands of kou trees, 6 to 8 m (20 to 26 ft) in height, can be found.

The area around Launch Pad #2 has been cleared, and tree heliotrope is re-invading the area. Most of the plant cover is composed of weedy plants like Tridex, Jamaica vervain (*Stachytarpheta jamaicensis* (L.) Vahl), 'Uhaloa (*Waltheria indica* L.), and Nohu (*Tribulus cistoides* L.). The vegetation of the launch pad sites is principally weeds, except for the few plants noted. Both Launch Pad #2 and the abandoned pad southwest of Launch Pad #2 have low plant cover around the concrete pads. They were cleared of trees and bushes several years ago. Taller trees and bushes grow to within approximately 20-30 m of the launch pads.

3.3.2.2 Wilkes Island

The western third of Wilkes Island has been set aside as a large seabird colony. The area has been cleared and is regularly mowed to protect the seabirds from the feral cats that inhabit the island. The most conspicuous vegetation at the western end of the island is a scant fringe of heliotrope trees, 4 to 6 m (13 to 20 ft) in height, and the broad mats formed by the nohu vines (*Tribulus cistoides* L.) which dominate the clipped, flattened landscape.

From the eastern edge of the bird sanctuary clearing to the Wilkes Island channel and continuing on the south side of the road to as far as the fuel storage tanks, the vegetation cover is composed of scattered heliotrope trees from 1 to 8 m (3.2 to 26 ft) in height. The ground layer is mixed grasses, predominantly two species of bunch grass with intermittent patches of scurvy grass (*Lepidium bidentatum Montino*) and arena (*Boerhavia repens* L.).

On the south side of the dirt road, between the channel and the bird clearing, there is a long, deep anti-tank ditch that was dug during the WWII era. A dense colony of kou trees has grown up in this low area.

Along the lagoon shore of Wilkes Island the coastal vegetation is Pemphis with mats of sea purslane and a dense planting of ironwood trees near the point just north of the storage tanks. A scant scrub of tree heliotrope, naupaka, sour bush, cotton, and various weeds and grasses cover about 50 percent of the ground surface. The remainder is coral rubble and metal and wood scrap.

3.3.2.3 Peale Island

Essentially, the dominant vegetation of Peale Island is tree heliotrope, 2 to 8 m (6.6 to 26 ft) in height. The ground cover is mixed bunch grass and open coral rubble. Along the shore near the Peale Island Bridge, around to and including Flipper Point, and lining the inlets is a thriving Pemphis community with intermittent mats of red-stemmed sea pruslane. Upland from and intermingled with the Pemphis is a burgeoning community of ironwood trees. About 150 m (492 ft) from the Peale Island Bridge on the ocean side of Peale Island Road can be found a scattering of *Pisonia grandis* and kou trees, almost all that is left of what Fosberg referred to as a *Pisonia/Cordia* forest.

About halfway between the Peale Island Bridge and the northwestern tip of Peale Island is a dirt road which leads to the old Pan American Seaplane Ramp. Just at the turn, there is a dense planting of *Opuntia littoralis* (Tour.) Mill., and a little further along the road is a reproducing stand of sisal. On either side of the dirt road are open areas where there are no heliotrope trees. In these open places, huge enclaves of the shrubby, wild cotton that is native to this atoll can be found.

No threatened or endangered plant species as set forth by the U.S. Department of the Interior Fish and Wildlife Service (Endangered Species Act of 1973, [16 U.S. Code 1531-15431 as amended) have been encountered at Wake Atoll.

3.3.3 Marine Resources

During the 1998 marine biological survey, a total of 122 species of reef fishes, 41 species of corals, 39 species of other macroinvertebrates, and 19 species of macroalgae were recorded at Wake Atoll. Undoubtedly, many more species among all groups are present at the atoll but as yet remain uncataloged. The lagoon supports a large population of fish and the surrounding reefs host a diverse assemblage of reef fish. Nearshore fishes important for food and recreational purposes include groupers (*Cephalapholis argus*), porgy (*Monotaxis grandoculis*), and jacks (*Carangidae*). Sharks are abundant. The giant clam (*Tridacna maxima*) is commonly found in the nearshore waters surrounding Wake Atoll. *T. maxima* is currently afforded Federal protection under the Convention for the International Trade of Endangered Species (CITES).

Marine mammals that may occur in the open ocean area surrounding Wake Atoll and between Wake and Kwajalein Atolls include several species of cetaceans: the blue whale (*Balaenoptera musculus*), the finback whale (*Balaenoptera physalus)*, the humpback whale (*Megaptera novaeangliae*), Cuvier's beaked whale (*Ziphius cavirostris*), and the sperm whale (*Physeter catodon*). Bottlenose (*Tursiops truncatus*) and spinner dolphins (*Stenella longirostris*) may also be present around Wake Atoll. Hawaiian monk seals (*Monachus schauinslandi*) have also previously been sighted at Wake Island on occasion.

3.3.4 Federally Protected and Threatened/Endangered Species

Federally protected terrestrial biota at Wake Atoll are limited to the migratory seabirds, shorebirds and occasional vagrant waterbirds. These birds are identified as "migratory" and are protected under the Migratory Bird Treaty Act (MBTA) of 1916 (16 U.S.C. 703-712). Birds known to occur at Wake Atoll and protected under the MBTA include the black-footed albatross, Laysan albatross, brown booby, masked booby, red-footed booby, bristle-thighed curlew, great frigatebird, lesser golden-plover, black noddy, brown noddy, sharp-tailed sandpiper, christmas shearwater, wedge-tailed shearwater, northern shoveler, wandering tattler, gray-tailed tattler, sooty tern, gray backed tern, white tern, red-tailed tropicbird, white-tailed tropicbird, and the ruddy turnstone. There are no exclusively terrestrial biota, including plants and animals, Federally listed as threatened or endangered under the Endangered Species Act, currently known or reported from Wake Atoll (USFWS 1998).

The Federally threatened green sea turtle (*Chelonia mydas*) was observed multiple times in the nearshore ocean and lagoon waters at Wake Atoll during the 1998 terrestrial survey. Shoreline basking and nesting activity, the only terrestrially-based behaviors of this otherwise marine species, were neither observed during the investigation nor reported in the literature as having been observed at Wake Atoll. It is

conceivable, however, that green sea turtles might haul out along the southern shoreline of the atoll since the slope of the shoreline is not steep and offers limited basking opportunities.

The Federally endangered hawksbill sea turtle (*Eretmochelys imbricata*) has been suspected to occur at Wake Atoll (USAF 1994a); however, no records or accounts of confirmed sightings could be found in the literature reviewed. No observations of hawksbill sea turtles were recorded at Wake Atoll during the 1998 survey.

The Wake rail (*Rallus wakensis*), a flightless species endemic to Wake Atoll, has not been observed since WWII and is now considered extinct. Japanese soldiers occupying the atoll during WWII are reported to have hunted and eaten these small birds to avoid starvation during a sustained American blockade of Japanese supply shipments to the atoll. Predation by feral cats has also been suggested as a possible factor in the extinction of this species.

3.4 CULTURAL RESOURCES

Cultural resources are prehistoric and historic sites, structures, districts, artifacts, or any other physical evidence of human activity considered important to a culture, subculture, or community for scientific, traditional, religious, or other reasons. For ease of discussion, cultural resources have been divided into three main categories: prehistoric resources, historic structures and resources, and traditional resources.

Prehistoric archaeological resources are defined as physical remnants of human activity that predate the advent of written records in a particular culture and geographic region. They include archaeological sites, structures, artifacts, and other evidence of prehistoric human behavior. No evidence of prehistoric cultural resources has been discovered on Wake Island.

Historic resources consist of physical properties or locations postdating the advent of written records in a particular culture and geographic region. They include archaeological sites, structures, artifacts, documents, and other evidence of human behavior. Historic resources also include locations associated with events that have made a significant contribution to history or that are associated with the lives of historically significant persons.

Wake Island was designated a National Historic Landmark in 1985 in order to preserve both the battlefield where important WWII events occurred and Japanese and American structures from that period. The Pan American facilities and the U.S. Naval submarine and aircraft base are included in the historic property. Many of the Japanese structures were actually constructed with American labor. A group of 98 American Prisoners of War were forced to build these defenses until mid-1943, when they were executed by the Japanese (Urwin, 1983). These structures include several pillboxes, bunkers and aircraft revetments. Figure 3-2 presents the known WWII-era permanent structures on all three islands of the Atoll. A comprehensive survey of Japanese earthen structures and field fortifications has not been conducted.

The remoteness of the island, and the lack of fresh water sources other than rainfall, are characteristics of the island that discouraged settlement by native Pacific populations, so there is little potential for prehistoric or traditional resources to be present. No unique paleontological or traditional use resources are known to exist on the island.

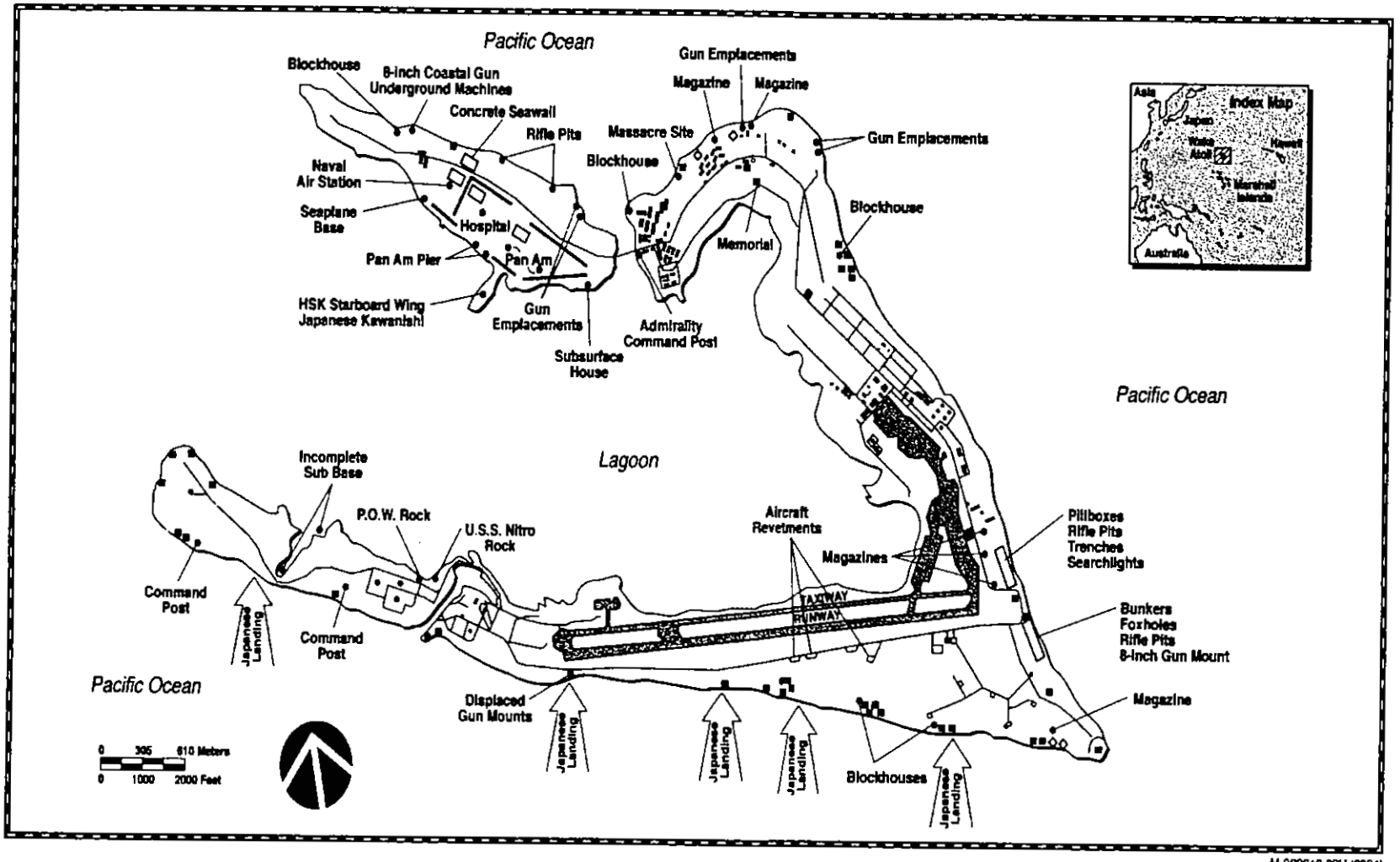


Figure 3-2 Locations of Recorded Surface Cultural Resources

3.5 HAZARDOUS MATERIALS/WASTE

Operations utilizing hazardous materials at Wake Island are limited to aircraft flight and maintenance activities, base operations and infrastructure support activities, and infrequent missile launches. Figure 3-3 presents the known sites of potential environmental contamination from past activities on the island.

JP-5 jet fuel is the hazardous material used in the greatest quantity at Wake Island. Storage of up to 37.8 million L (10 million gal) of JP-5 can be accommodated in fuel storage areas. JP-5 is transported to Wake Island via cargo ship and is transferred to the on-island storage system. It is distributed through two fuel systems (the first built during the FAA's administration and the second by the Air Force) to both aircraft refueling areas and to the power plant. No waste JP-5 is produced under normal conditions. The balance is consumed by aircraft flight operations and power production. In the event of a JP-5 spill, existing spill control contingency plans would be implemented to minimize the area of potential contamination and to expedite cleanup efforts.

In addition to JP-5, small quantities of lubricants and motor fuel (gasoline) are stored in bulk for base operations and infrastructure support. Like JP-5, these materials are delivered to Wake Island via ship and are transferred to storage facilities. Distribution of these materials is accomplished for individual users as needed. Most of these materials are consumed in ongoing activities, and any spills are addressed as with JP-5.

Small quantities of other hazardous materials, including some solvents, paints, cleaning fluids, pesticides, chlorine and other materials, are also used for infrastructure support and aircraft maintenance activities. These materials arrive via ship or cargo aircraft. Remaining quantities of these materials, which are not consumed in operations, are collected as hazardous waste.

Small quantities of explosive materials, contained within ordnance and other equipment, are handled at Wake Island. Explosives are stored in buildings 1648 and 1642.

Waste is initially collected at the point of generation, where it is temporarily stored. Waste is retrieved from the temporary storage areas and collected at a central accumulation area located at Building 1405. Types of waste generated include small quantities of used solvents and paints, cleaning fluids, asbestos-containing materials (generated during building maintenance activities), and some pesticides. At Building 1405, hazardous waste is placed in overpack containers (DOT-E-9618 polyethylene overpacks, approved by the DOT for waste shipment) for added security where it is held for shipment to the U.S. for disposal.

Currently, an Air Force funded clean-up program is removing all underground storage tanks (USTs) and abandoned fuel transfer lines on the atoll. This effort, begun in June 1998, will take approximately 10 months to complete. Above ground fuel tank 41126, formerly used for aircraft service, is no longer used and has been removed. The Base Operating Support (BOS) contractor has replaced the formerly used USTs with double-walled or bermed above ground storage tanks (ASTs).

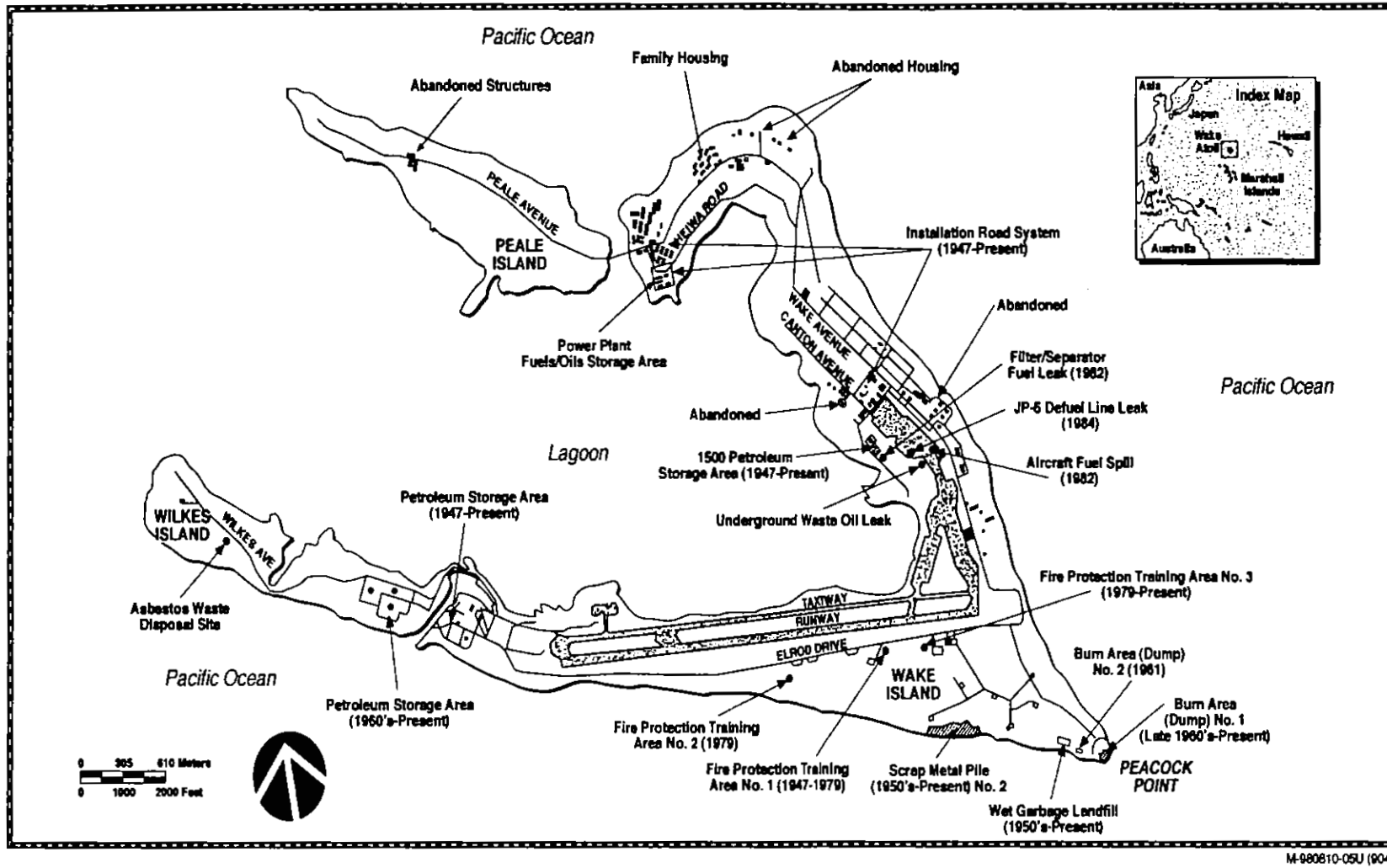


Figure 3-3 Sites of Potential Contamination

3.6 HEALTH AND SAFETY

Functioning as an Army installation, all operational activities at WILC are subject to Army health and safety regulations. These governing regulations include AR 385-10, *U.S. Army Safety and Occupational Health Program*; AR 385-64, *U.S. Army Explosives Safety Program*; and AR 420-90, *Fire and Emergency Services*. The current safety program at WILC is administered through two BOS departments: safety (which includes operational safety on the island), and medical (which is responsible for occupational health issues such as chemical exposure and other hazards). The missile safety program is provided by Kwajalein Missile Range (KMR).

At Wake Island, the primary existing hazards are associated with aircraft refueling activities and base infrastructure support. Hazards include handling and use of hazardous materials (e.g., solvents, paints, fuels, chlorine), noise exposure from aircraft operations, and physical safety associated with the use of heavy equipment and support operations. These hazards are well-controlled through ongoing evaluation and assessment of potential hazards, safety procedures, and use of safety equipment.

Handling of explosives is accomplished in accordance with DOD and Army regulations. Wake Island still contains a substantial amount of buried ordnance from WWII. In the event that unexploded ordnance is accidentally discovered during operations on the island, work is ceased and explosive ordnance demolition crews from Army units stationed in Hawaii or KMR dispose of the munitions.

The missile range extending from Wake Island to USAKA is under KMR jurisdiction. Range safety activities are managed at USAKA. KMR Range Safety Manual procedures are applied to missile flight operations at Wake Island. Requirements include presentation of a complete flight performance analysis, identification of all potential hazards to range personnel and assets, and approval by the KMR Range Safety Office of all proposed operations.

In the case of a disaster event (e.g., major typhoon, aircraft or missile mishap, oil or hazardous substance spill, enemy action, etc.), Operations Plan 355-1, *U.S. Army Launch Center, Wake Island, Emergency Action Plan*, is implemented. This plan specifies the responsibilities and initial response actions to be taken to minimize both disaster recovery time and potential hazards.

3.7 INFRASTRUCTURE AND TRANSPORTATION

3.7.1 INFRASTRUCTURE

Wake Island infrastructure was designed for a much larger population than is currently present. Wake Island's current permanent staff, consisting of approximately 82 Thai workers, 22 American contractor personnel, and one USASMDC employee with dependent, is much less than in the 1970s, when up to 1,600 personnel might be on the island at a given time. The transient population ranges from about 5 to 20 persons daily, depending on mission scope and requirements.

Fire protection is provided by fire suppression systems in most operations buildings and by a continuously staffed fire station. Wake Island has a medical clinic staffed by a medical technician and one full-time physician. Security is provided as an alternate duty by BOS contractor personnel.

Electrical power for the entire island is provided by a central generating station that contains five operable 1957 vintage Worthington diesel generators, of 800 kW each. To sustain normal operations, only three units are necessary, with the remaining two as backup. For logistic purposes and cost effectiveness, the generators use JP-5 jet fuel. There are several supplemental generators located on the island for emergency backup.

Solid waste generated on the island is disposed in the island's landfill/burning pit located on Peacock Point, or it is burned in the incinerator. No trash sorting is performed, with aluminum cans and glass burned with waste paper, foliage, leaves, and cardboard packing materials. The incinerator, an Advanced

Combustion Systems Model CA-150 with a design capacity of 68 kg (150 lb) per hour, actually burns approximately 27 kg (60 lb) per hour and is operated 2 to 4 hours per day, disposing of about 109 kg (240 lb) per day of primarily wet garbage from mess operations. Residue from the incinerator goes into the landfill.

Along with lagoon water, brackish wells provide water for the sanitary sewer system. A series of wet-well lift stations is used to collect and move sewage to a treatment plant where solids are collected and disposed, and wastewater is discharged to the ocean off Peacock Point at the far southeast end of Wake Island. Although their full design capacity is not known, the sewer system and treatment plant served the 1960s' peak base population.

Potable water is supplied by the capture of rainwater in two 7-ha (17-ac) catchment basins and is augmented by a desalinization plant with a design capacity of 454,248 l per day (120,000 gal per day). Catchment basin water is treated by filtration and disinfection through chlorine gas injection (U.S. Army Strategic Defense Command, 1992a). The desalination plant, using brackish well water, has three evaporators/boilers, only two of which are currently usable. Usually only one evaporator at a time is used, producing 136,274 to 140,060 L (36,000 to 37,000 gal) of water per day. On average, 3.8 million L (1 million gal) of potable water are kept in storage.

3.7.2 TRANSPORTATION

3.7.2.1 Air Transportation

Wake Island's runway is approximately 3,000 m (9,850 ft) long and 46 m (150 ft) wide, and is central to the missile launch support missions. In addition, the airfield supports trans-Pacific military operations and western Pacific military contingency operations, in-flight emergency airfield service, and emergency sealift capability. All aircraft operations and servicing activities are directed from base operations, which is manned 24 hours per day. Aircraft ramps are available for processing passengers and cargo, and for refueling up to 36 aircraft types, including DC-8, C-5, C-130, and C-141 aircraft. Although there is only one flight scheduled every other week to transport passengers and cargo to Wake, approximately 800 aircraft per year use the Wake Island Airfield. The overall condition of the runway is fair, with subsidence, raveling, and minor cracking over the entire length. Deterioration is worst on the east end of the runway; therefore, the Air Force uses that portion of the runway only as required, taking most traffic off at Taxiway B. The parallel taxiway (A) is in slightly better condition than the primary runway. The parking apron is also in fair condition.

3.7.2.2 Ground Transportation

Transportation on Wake Island is provided by bus or contractor or government-owned vehicles. Bus transportation between the Base Operations Building and the Dining Hall/Billeting Office for aircrews and passengers is provided on an as-needed basis. A limited number of Mitsubishi scooters are available for mission support and transient personnel.

The primary road is a two-lane paved road extending from the bridge connecting Peale and Wake Islands to the causeway between Wake and Wilkes Islands. Wake and Peale Islands are connected by a bridge restricted to automobiles and light trucks.

A combination of paved and coral roads serves the marina area. Paved access to Wilkes Island ends at the petroleum, oil, and lubricants tank farm, where a coral road provides access to the western point of Wilkes Island. A portion of the road, near the unfinished WWII submarine channel, is flooded nearly every year by high seas. The launch sites are accessed from the main paved road on Wake Island by paved and coral roads. Generally, the road network is suitable for low-speed, light-duty use only.

Wake Island's paved roadway network has been adequately maintained to move materials, services, and personnel from the airfield on the southern end to the personnel support area on the northern end. Modes

of transportation include pedestrian traffic, bicycles, light utility carts, standard automobiles, vans, trucks, and larger trucks and equipment.

3.7.2.3 Marine Transportation

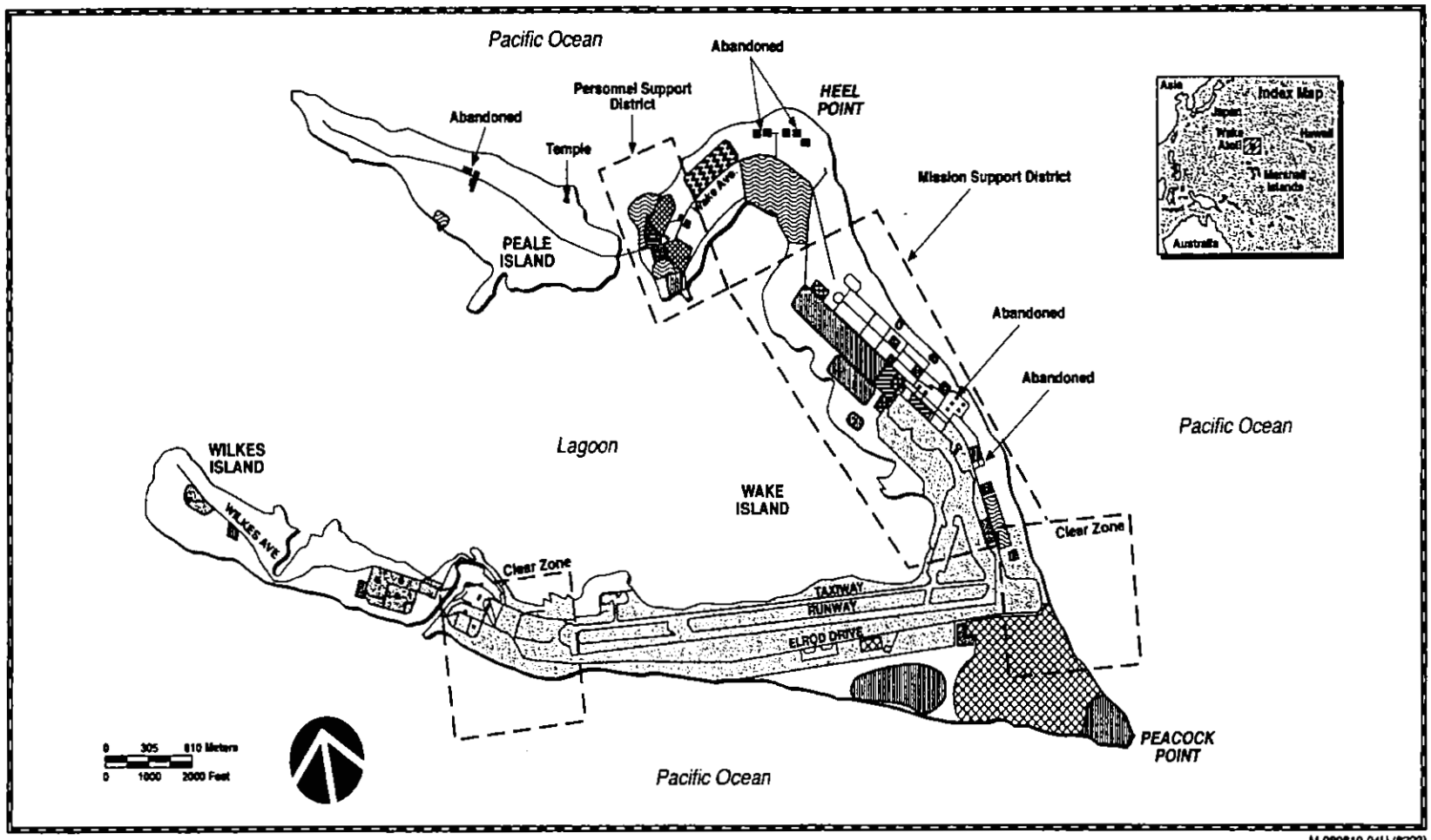
Wake Island is supplied by sea-going barges and ships. The BOS contractor maintains three small landing barges used to transfer material from ships to the dockyard. The barges are required because the harbor is too small for sea-going vessels to enter. Off and on-load fueling facilities built in the mid-1970s by the Navy have never been operated due to a reported electrical fault. The older off-load hydrants for gasoline and JP-5 fuels are operational and are currently used.

3.8 LAND USE

Wake Island is the main island and contains the majority of the operations and facilities associated with the military (Figure 3-4). Housing and community facilities are located toward the north end of the island. The central portion of the island contains support facilities (e.g., water catchment basins, water storage tanks, power plant). The airfield and missile launch facilities are situated on the southern part of the island.

Peale Island is used largely by migratory birds as a nesting area. There are remnants of Pan American Airways facilities and extensive WWII Japanese earthen defenses. Several recreational beach houses and a Thai Buddist temple are in use on Peale Island.

Wilkes Island is mainly an open area. The west end of the island is used as a nesting area for migratory birds. A petroleum storage area and an inactive asbestos disposal area are located on the east portion of the island. The central portion of the island contains an unfinished submarine channel that was partially developed by the U.S. Navy prior to the outbreak of WWII.



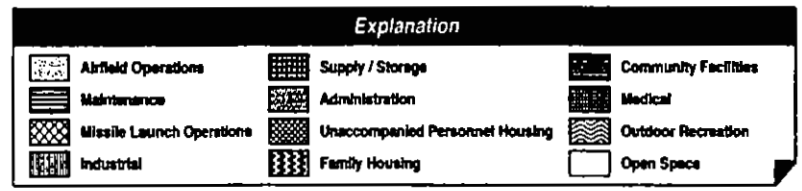


Figure 3-4 Existing Land Use Plan

3.9 NOISE

Natural background sound levels on Wake Island are relatively high because of wind and surf. Background levels can mask the approach of trucks on base roads, and personnel are not always aware of aircraft landings. No measurements of ambient sound levels are known to be available.

Anthropogenic sources of noise at Wake Island are from airfield operations and base maintenance activities. The majority of non-military aircraft are unscheduled. The majority of military aircraft are C-141s and C-130s. During flight operations, the noisiest aircraft that typically operates at Wake Island, an Air Force C-5, is estimated to generate A-weighted sound pressure levels of approximately 84 decibels (dB) at the base dispensary, 69 dB at base family housing, 74 dB at the base dormitories, 69 dB at the midpoint of Peale Island, and 95 dB at the midpoint of Wilkes Island. Hearing protection is required for personnel engaged in aircraft apron operations. Estimates of aircraft noise were developed using DOD Noise Exposure Model Version 6.1.

Missile launches are another noise source on Wake Island. Maximum A-weighted sound pressure level contours during flight vehicle launches for the TCMP vary from approximately 115 dB near Launch Pad #2, to less than 95 dB on the western ends of Peale and Wilkes Islands. The 95-dB contour covers almost all of the WILC (U.S. Army Space and Strategic Defense Command, 1994). Launch vehicles generate impulse-type noise for a brief period during the launch and only a few launches occur per year. Personnel engaged in missile launch operations are inside reinforced concrete shelters and do not require hearing protection. Other island personnel are evacuated beyond the LHA, where they do not require hearing protection. With the exception of diesel generators, other environmental noise sources do not exist on the island.

3.10 PHYSICAL RESOURCES

Wake Island is typical of mid-Pacific Ocean atolls formed when a volcano rises above the ocean surface and then subsides back below the surface due to deflation of the underlying magma chamber. When the volcanic island subsidence rate is relatively slow, coral reefs form around the island and continue to grow at a rate equal to that of the subsidence, forming a ring-shaped reef with a shallow central lagoon.

The reef rock is formed entirely from the remains of marine organisms (reef corals, coralline algae, mollusks, echinoderms, foraminiferans, and green sand-producing algae) that secrete external skeletons of calcium and magnesium carbonates. As these organisms grow and die, their remains are either cemented in place to form hard reef rock or erode and wash down slopes to accumulate as sediment deposits, particularly in the lagoon or on deep terraces downslope on the ocean side of reefs. The reefs are growing actively as a result of vigorous development and populations of corals, coralline algae, and large mollusks. Only the upper thin veneer of the reef structure is alive and growing, accreting over the remains of prior generations of reef organisms. Although coral reefs are unique because they build and advance wave-resistant structures in the face of persistent and severe wave and storm attack, the organisms that form the reefs are vulnerable to sedimentation, burial, and changes in circulation caused by human development activities.

Major reef-building organisms are marine fauna that cannot survive prolonged periods of exposure out of the water. The land masses at Wake Island have formed by one or both of two processes: accumulation of reef debris deposited on the lagoon side of the reef by large waves and the lowering of sea levels during periods of global cooling. The island's building process by large storm-generated waves is evidenced on the south side of Wake Island by the burial of pill boxes constructed during WWII under sand, gravel, and cobble-sized pieces of reef debris.

As a result of these building processes, atoll island soils are predominantly coarse-grained and almost exclusively composed of calcium carbonate. Therefore, they are of low fertility, lacking many of the nutrients required to support many plant species.

Island building by wave-deposited reef debris also limits land elevation. The maximum elevation on Wake Island is 6.4 m (21 ft) above mean sea level, and the average elevation is only about 3 m (10 ft). This makes the island very susceptible to damage from high winds and waves generated by tropical storms. In 1992, two typhoons caused extensive damage to the base infrastructure. Heavy damage occurred with high wave action from a typhoon in July 1994, and high water from a tsunami in February 1998.

The only natural resources on the island are sand and gravel. This material is of low quality for construction because of its calcium carbonate composition and vesicular nature. The one known borrow area on the island for sand and gravel is located on the north shore of Wilkes Island. However, this area is no longer in use. The current procedure is to obtain all construction aggregate materials from off-island sources.

3.11 SOCIOECONOMICS

The region of influence for Wake Island is limited to the island itself. Since the island is an isolated military installation, actions taken there have little effect on outside employment, population immigration, or local area expenditures. Therefore, key socioeconomic indicators concerned with effects on regional employment and income data were not examined.

The military or contractor personnel who work at Wake Island, including the Thai nationals brought to the island, live in billets previously constructed on the island. These billets are military controlled. There are some family housing units on Wake Island, also controlled by the military. There are no private homes, motel/hotels, or private retail businesses on the island. The economy on the island is dominated by the military installation. Government and contractor employment is the only contributor to the island economy.

The permanent island population is small, consisting of approximately 106 people. This number includes one USASMDC employee (with dependent), and the BOS contractor personnel. The BOS contractor figures include approximately 82 Thai nationals and about 22 U.S. citizens. The number of non-permanent personnel fluctuates from about 5 to 20 persons daily in relation to the scope and duration of each mission.

Two billets equipped with window-unit air conditioners are kept ready for transient personnel. These billets are usually used by transient aircrews. Building 1115 has 34 bedrooms and Building 1116 has 29 bedrooms. Open bays in Buildings 1173 and 1174 are available but require major renovations if needed for additional sleeping room on a long-term basis. Buildings 1172, 1175, and 1176 have 87 bedrooms with first priority to missile launch personnel. The bedrooms are primarily designed to house two persons per room, but there are several rooms that can accommodate more than two if necessary. Buildings 1117, 1118, and 1120 currently house BOS contractor personnel. Building 1177 is not habitable.

3.12 WATER RESOURCES

The average annual precipitation on Wake Island is 89 cm (35 in). Due to the relatively small area of the island and the high permeability of the soil, all precipitation rapidly runs from the land into the ocean and lagoon or filters into the soil. Other than the water collected in the catchment basins, there is virtually no fresh surface water on the island.

The island does contain some fresh groundwater. Rainwater that filters into the soil is less dense than the underlying saline or brackish groundwater and generally remains segregated. However, this resource is limited by the subdued topography and limited areal extent of the island. The amount of fresh groundwater that may be available for potable water consumption has not been investigated. Several deep wells are used to provide brackish groundwater to the desalination plant.

4.0 Environmental Consequences

4.0 ENVIRONMENTAL CONSEQUENCES

Chapter 4 assesses the significance of potential environmental impacts of the proposed LPT activities at Wake Island. To assess the potential for and significance of environmental impacts from the proposed action, a list of activities necessary to accomplish the proposed action was first developed (Chapter 2). Second, the environmental setting was described, with emphasis on any special environmental sensitivities (Chapter 3). Next, the program activities were compared with the potentially affected environmental components to determine which of the identified program activities have no potential for significant environmental consequences and which, if any, present a potential for significant impact (Chapter 4).

Federal environmental laws and regulations were reviewed to assist in determining the significance of environmental impacts (if any) in fulfillment of NEPA requirements. Appendix A provides a description of the Federal laws and regulations for each relevant environmental component. Proposed activities were evaluated to determine their potential to cause significant environmental consequences using an approach based on the interpretation of significance outlined in the CEQ regulations for implementing the procedural provisions of the NEPA (40 CFR 1500-1508) and AR 200-2, *Environmental Effects of Army Actions* (U.S. Department of the Army, 1988).

The following sections address issues of concern for each resource potentially affected. Guidelines established by the CEQ (40 CFR 1508.27) specify that significance should be determined in relationship to both context and intensity (severity). The assessment of potential impacts and the determination of their significance are based on the requirements in 40 CFR 1508.27.

"Significantly," as used in the NEPA, requires consideration of both context and intensity:

- **Context** – This means that the significance of an action must be analyzed in several contexts such as society as a whole (human, national), the affected region, the affected interests, and the locality. Significance varies with the setting of the proposed action. For instance, in the case of a site-specific action, significance would usually depend upon the effects in the locale rather than in the world as a whole. Both short and long-term effects are relevant.

- **Intensity** – This refers to the severity of impact. Responsible officials must bear in mind that more than one agency may make decisions about partial aspects of a major action. The following should be considered in evaluating intensity:

  - Impacts that may be both beneficial and adverse (A significant effect may exist even if the Federal agency believes that on balance the effect will be beneficial.)

  - The degree to which the proposed action affects public health and safety

  - Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas

  - The degree to which the effects on the quality of the human environment are likely to be highly controversial

  - The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks

  - The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration

- Whether the action is related to other actions with individually insignificant, but cumulatively significant impacts (Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.)

- The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the NRHP or may cause loss or destruction of significant scientific, cultural, or historical resources

- The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973

- Whether the action threatens a violation of Federal, state, or local law or requirements imposed for the protection of the environment

Based on the previous criteria, three levels of impact can be defined:

- No Impact – No impact is predicted.

- Not a Significant Impact – An impact is predicted, but the impact does not meet the intensity/context significance criteria for the specific resource.

- Significant Impact – An impact is predicted that meets the intensity/context significance criteria for the specific resource.

Significant impacts may be reduced to a not-significant level through implementation of appropriate mitigation measures.

4.1 ENVIRONMENTAL CONSEQUENCES

4.1.1 AIR QUALITY

4.1.1.1 Proposed Action

The proposed action describes the addition of LPT missiles to the list of those currently launched from Wake Island. The LPT missiles would use ground hazard areas comparable to those already established for current launch programs. No adverse impact is anticipated due to launches of current missiles. No missile proposed for launch would emit greater exhaust components than those currently launched at WILC.

The proposed action includes provisions for storage and launch of liquid propellant missiles. These missiles use a kerosene-based fuel, IRFNA, and a 50/50 mixture of triethylamine and dimethylaniline, which will spontaneously combust in the presence of a strong oxidizer (such as nitric acid or nitrogen tetroxide). The exhaust components of this type of missile generally have less impact on air quality than those of equivalent sized solid-fueled missiles. However, both the fuel and the oxidizer may present potential health hazards if inhaled. The combustion products from a liquid propellant rocket motor were presented in Table 2, page 2-11. Of the combustion products present in the exhaust of an LPT missile, CO is the only constituent listed as a criteria pollutant and regulated by the NAAQS.

Computerized air quality modeling was performed on both solid and liquid propellant target missiles during preparation of the *U.S. Army Kwajalein Atoll Temporary Extended Test Range Environmental Assessment* (U.S. Army Space and Strategic Defense Command, 1995). This analysis used the TSCREEN PUFF computer model developed by the Environmental Protection Agency. The reader is referred to Appendix E of this earlier document for a more detailed description of the methodology employed and the systems analyzed.

One of the missiles analyzed in the 1995 EA was the HERA missile, having SR19-AJ-1 (single-stage) and M57A1 (two-stage) rocket motors. The launch exhaust of a single-stage HERA contains approximately 1,300 kg (2,900 lb) of CO. This amount was used as the source strength in a PUFF analysis for a normal HERA launch. The modeling results for this scenario predicted a maximum of 1.594 mg/m^3 CO at a distance of 3 km (1.9 mi) from the point of release. This amount is well below the NAAQS regulatory limits of 10 mg/m^3 (over an 8-hour averaging period) and 40 mg/m^3 (over a 1-hour averaging period).

A two-stage accident scenario was also modeled for the HERA. This scenario includes vehicle destruction on the launch pad, in-flight failure, and command vehicle destruction. The mass of the puff (source strength of the model) equals all the emissions from both the first and second stage rocket motors in this situation, which contained approximately 1,750 kg (3,850 lb) of CO. The modeling results for this scenario predicted a maximum of 2.099 mg/m^3 CO at a distance of 3 km (1.9 mi) from the release. This amount is also well below the NAAQS standards for CO described in the preceding paragraph.

The results from the modeling described above show that for both a normal launch and an early flight termination scenario of a HERA missile, neither the 1-hour nor the 8-hour NAAQS would be exceeded for distances equal to or greater than 3 km from the launch site. Since the exhaust of the HERA contains at least 320 kg (705 lb) more CO than the LPT missile described in the proposed action for this document, air quality modeling for the LPT is not necessary. The NAAQS for CO would not be exceeded from the launch of LPT missiles described in this document; therefore, no adverse impacts to ambient air quality are expected.

In addition to the increased variety of missiles and launch vehicles proposed for use at Wake Island, selection of the proposed action would result in an increase in the number of launches per year. However, each launch is a discrete event. The logistics of the launch procedures would allow sufficient time between launches so that no exhaust from one launch would affect the ambient air quality during the next. In the event of dual launches of target missiles, the exhaust products would nominally be double those for

a single launch, assuming the two target missiles are the same. However, because the launch pads would be apart from each other, the amount of exhaust product deposition on any given spot on the ground would be less than the combined exhaust product. As such, the overall effect to air quality is anticipated to be equivalent to that of any one launch. Activities associated with the proposed action would not cause a significant increase in air emissions. No ambient air quality standards would be exceeded. Therefore, no adverse impacts to air quality are anticipated.

4.1.1.2 Alternative 1

Alternative 1 would produce identical air emissions as the proposed action, as it only involves a change in the location of the fuel storage and fueling operations. The actual air emissions would be the same as those for the proposed action, as the same missiles would be used.

4.1.1.3 Alternative 2

Alternative 2 would also have the same air emissions as the proposed action for the same reasons presented above.

4.1.1.4 No Action Alternative

Under the no action alternative, no LPT missiles would be launched from Wake Island. Air emissions associated with the discrete solid propellant target missile launches would continue with the ongoing launches. These impacts were found not significant in previous analysis.

4.1.1.5 Cumulative Impacts

Cumulative impacts to air quality from the proposed action would be anticipated to be similar to those described for the no action alternative. Specifically, portable generator exhaust, power plant emissions, vehicle emissions, and general fugitive emissions along with occasional missile exhaust emissions would still be generated. As mentioned above, missile launches are discrete events, and the emissions from single launches are not additive. Most of the emissions sources on the island are not continuous in nature; they do not produce continuous emissions of pollutants. The strong prevailing trade winds that sweep over the island prevent any localized emissions from accumulating, regardless of the emission source. Therefore, no cumulative impacts to air quality as a result of the proposed action are expected.

4.1.2 AIRSPACE

4.1.2.1 Proposed Action

Wake Island is located in international airspace; therefore, no formal airspace restrictions surround it. The only air traffic control facility available is the control tower. Missiles launched with trajectories of 87° elevation remain clear of air route A-450 and should pose no serious impacts. Launch activities will be coordinated with the Central Air Reservation Facility (CARF) in Washington, D.C., and are governed by procedures of the ICAO. Consequently, impacts to airspace use are considered not significant with such coordination.

4.1.2.2 Alternative 1

This alternative would have the same potential impacts as the proposed action.

4.1.2.3 Alternative 2

This alternative would have the same potential impacts as the proposed action.

4.1.2.4 No Action Alternative

Under the no action alternative, LPT missile launches would not occur at WILC. However, missile testing and launching activities would continue with other programs. Those associated impacts were analyzed in previous documents and found not significant.

4.1.2.5 Cumulative Impacts

All missile launches, missile intercepts, and lethal debris impact would take place in international airspace. There is no airspace segregation method such as a warning or restricted area to ensure that the area would be cleared of nonparticipating aircraft. Missile launches are short-term, discrete events, however, and using the required scheduling process for international airspace would alleviate the potential for cumulative impacts.

4.1.3 BIOLOGICAL RESOURCES

Native or naturalized vegetation, wildlife, and the habitats in which they occur are collectively referred to as biological resources. Existing information on flora (plant) and fauna (animal) species and habitat types in the vicinity of proposed sites was reviewed with particular attention paid to the presence of any species Federally listed as rare, threatened, or endangered to assess their sensitivity to the effects of the proposed action.

The analytical approach for biological resources involved evaluating the degree to which the proposed activities could impact the vegetation, wildlife, threatened or endangered species, and sensitive habitat within the affected area. Criteria for assessing potential impacts to biological resources are based on the following: the number or amount of the resource that would be impacted relative to its occurrence at the project sites, the sensitivity of the resource to proposed activities, and the duration of the impact. Impacts are considered significant if they have the potential to result in: reduction of the population size of Federally listed threatened or endangered species; degradation of biologically important unique habitats; substantial long-term loss of vegetation; or reduction in the capacity of a habitat to support wildlife.

4.1.3.1 Proposed Action

There is little potential to disturb any type of nesting habitat during the minor construction activities that would occur to accommodate LPT missile testing at Wake Island, because the proposed sites for the storage facilities have been previously disturbed and are situated on improved property. The impacts of launching liquid propellant missiles would be the same or less harmful to the environment than launching solid propellant missiles (which was analyzed in the 1994 Wake Island EA), because the liquid propellant missiles do not release hydrogen chloride as an exhaust product. However, potential impacts could result from launch-related activities such as launch noise, launch emissions, and sonic booms. The effects of noise on birds and wildlife have been extensively reviewed. Several studies have shown that intermittent noises (other than those at or near the threshold of pain) have little if any apparent effect on most animals, including birds. Birds acclimate quickly to most non-constant noises in their environment, and after an initial flushing generally return to the nest. Other wildlife typically exhibits a momentary startle effect. Previous environmental analysis has determined that the noise from missile launches generally causes no significant impacts to birds or other wildlife.

The potential for indirect impacts on birds may result from increased human presence on the island. Human intrusion into seabird colonies can result in abandonment of the colony from repeated or prolonged disturbance. Also, nests exposed when birds are flushed may be susceptible to predation by frigatebirds. Without restrictions, an increased population of humans (and accompanying increases of air and sea-based traffic to the island), could result in an increase of non-native pests that may be inadvertently transported to the island. For example, the inadvertent introduction of the brown tree snake (*Boiga irregularis*) from Guam to Wake Island is a very real threat, the risk of which is likely to increase in direct proportion to the number of cargo shipments to the island, especially if unregulated or unmonitored. Similarly, plant seeds inadvertently carried on incoming aircraft or cargo have already altered the botanical

composition of the atoll. Without proper safeguards, an increased frequency of arriving aircraft associated with increased launch activities could exacerbate this condition. This potential can be mitigated by requiring cargo-handling personnel to inspect arriving aircraft for pest species of plants and animals. Program personnel will be briefed on methods for pest detection, and the briefing will include viewing of the video produced by the Hawaii Chapter of the Wildlife Society entitled *Oahu Snake Menace*. No cargo or equipment associated with the proposed action would be shipped to WILC from Guam. With proper standard operating procedures (SOPs) in place, no adverse impacts to atoll flora, fauna, or avifauna are expected from the proposed action.

An additional possible impact could arise as a result of contamination in the case of an accidental spill. Generally, hazardous materials contamination would be restricted to small areas near the source of pollution. Local spills of petroleum products such as gasoline, jet fuel, and oil could be harmful if they are allowed to come into contact with or are ingested by birds. Spills into the lagoon may spread over the surface of the waters and result in impacts including death of a small number of seabirds that may drink from or land on the water. However, with SOPs already in place, any potential for adverse impacts is judged to be not significant.

Another possible impact could occur as a result of an on-pad catastrophic failure or explosion. The launch hazard areas depicted in Figure 2-6 contain some avian nesting sites, as shown in Figure 3-1. Avian species protected under the MBTA that are known to nest within the proposed LHAs include the red-tailed tropicbird, the blackfooted albatross, and potentially the Laysan albatross. The LHAs also extend into the ocean area several hundred meters, where the Federally protected green sea turtle might be found. Due to implementation of launch safety SOPs, the potential for an on-pad failure or explosion would be very remote and therefore, the potential for impact to the above biological resources is considered to be not significant.

The open ocean area around Wake Island is an extremely large area, and very little is known of the numbers and distribution of marine biological resources, including marine mammals and sea turtles. Of the internationally protected species, sea turtles and marine mammals would have the greatest risk, although extremely remote, of incidental impact from falling missile debris in the booster drop area or in the event of an aborted flight. The taking of a protected species would be a significant impact, but the probability of such an occurrence is judged to be extremely remote. Thus, no significant impacts to marine biota are anticipated from implementing the proposed action.

Although Federally protected, threatened or endangered species or habitats are known to exist at Wake Atoll, no significant impacts to such resources would occur due to the implementation of the proposed action.

4.1.3.2 Alternative 1

This alternative would have the same potential impacts as the proposed action.

4.1.3.3 Alternative 2

This alternative would have the same potential impacts as the proposed action.

4.1.3.4 No Action Alternative

There would be no impacts to biological resources if the no action alternative is selected. However, missile testing and launching activities would continue with other programs. Those associated impacts were analyzed in previous documents and found not significant.

4.1.3.5 Cumulative Impacts

The increased numbers of personnel represent potential impacts due to the continuing introduction of invasive plant species that can crowd out native vegetation. Bird populations may be subjected to

predation by non-native predator species introduced to the atoll. The increased number of personnel present during program launch activities would not represent a significant increase in personnel as compared to other launch activities. With proper SOPs in place, no cumulative impacts are expected from implementing the proposed action.

4.1.4 CULTURAL RESOURCES

4.1.4.1 Proposed Action

At the end of WWII there were extensive earthworks and many Japanese and American structures remaining on Wake Atoll. Many of these features are no longer visible as a result of construction on the island and the destructive forces of nature. However, there is potential for evidence of these cultural resources to be present below the current ground surface.

The proposed action, which involves no new major construction, no cable trenching and minimal ground disturbance, would not impact the subsurface resources or the historic viewshed and thus would not alter the historic character of the site.

Operation of the additional equipment in the proposed fuel storage and launch areas is expected to have no significant impact to the island's cultural resources. While incidental collection of cultural resources could affect cultural resources on the island, personnel will be briefed on the requirements to not disturb these resources; therefore, there is not expected to be a significant impact from proposed activities.

There is the potential for damage to an existing historical structure from falling debris or from a missile due to a launch abort or launch mishap. This is considered an extremely remote possibility, given (1) the unlikely possibility of a launch abort or mishap and (2) the small profile of most existing historic structures on the island and very small probability of any one area being impacted by large debris capable of sustaining structural damage. For these reasons, significant impacts to cultural resources are not expected.

4.1.4.2 Alternative 1

This alternative would have the same potential impacts as the proposed action.

4.1.4.3 Alternative 2

This alternative would involve the use of historic structures for fuel storage and fueling operations. These structures are two Japanese aircraft revetments and a Japanese aircraft concrete parking apron. The revetments are corral cobble masonry and concrete. The parking apron is segmented concrete approximately 4 to 6 in thick that was designed originally for relatively light single engine aircraft. These resources are currently in good condition, although the parking apron shows some signs of spalling and cracking. This alternative has the potential to adversely affect these resources by: (1) chipping and breaking masonry by inadvertent collisions with the missile trailer and forklift, (2) cracking and crumbling the concrete apron by moving the heavy missile trailer, forklifts and other vehicles on it, and (3) detrimentally changing the historic character of the site. Implementation of this alternative could potentially cause significant adverse impacts to the historic structures that would be involved.

4.1.4.4 No Action Alternative

If the no action alternative is implemented there would be no impacts to cultural resources. However, missile testing and launching activities would continue with other programs. Those associated impacts were analyzed in previous documents and found not significant.

4.1.4.5 Cumulative Impacts

No significant cumulative impacts from test activities are expected.

4.1.5 HAZARDOUS MATERIALS/WASTE

4.1.5.1 Proposed Action

Preparation and launch of the LPT missiles from WILC have the potential to increase the quantities and types of hazardous materials used, and the quantities and types of hazardous waste generated.

Small quantities of solvents and cleaning materials may be required during launch preparation activities. Such materials would be similar to hazardous materials already in use at Wake Island and would be transported to the facility and distributed through normal supply channels. The small quantities that would be associated with launch activities would not represent a significant increase over quantities already in use.

All storage areas for toxic/hazardous materials and/or waste would maintain spill containment structures. Existing spill prevention procedures would be implemented to further decrease the risk of accidental release of toxic or hazardous substances to the environment. The disposal of hazardous waste materials would be in accordance with the island's hazardous waste management practices, which mandate handling in compliance with U.S. hazardous waste management laws and regulations.

Minimal quantities of hazardous waste would be produced by launch activities and would consist of items such as used or excess solvents and cleaners. These materials are similar to waste already generated and handled at Wake Island. Management of this hazardous waste is the responsibility of the program and would be accomplished in accordance with applicable regulatory requirements. The small quantities of waste that are expected to be generated would not represent a significant increase in the amount of hazardous waste currently produced, and no significant impacts from hazardous materials or wastes would be expected.

4.1.5.2 Alternative 1

This alternative would have the same potential impacts as the proposed action.

4.1.5.3 Alternative 2

This alternative would have the same potential impacts as the proposed action.

4.1.5.4 No Action Alternative

No significant impacts from hazardous materials and/or wastes would occur as a result of implementing the no action alternative.

4.1.5.5 Cumulative Impacts

Hazardous materials used during launch activities and any hazardous waste generated would be very similar to materials and waste presently generated. All materials would be stored and handled according to appropriate health and safety procedures, and all hazardous waste generated during program activities would be shipped off the island to an approved facility in the U.S. These activities can be accomplished within the existing waste management system or through establishment of an LPT program waste management system. In either case, all waste would be handled and disposed of in accordance with applicable Federal regulatory requirements, and no significant cumulative impacts are expected.

4.1.6 HEALTH AND SAFETY

4.1.6.1 Proposed Action

Missile launch operations within the military have been conducted for many years. Safety requirements have been developed based upon the lessons learned during this time. While risks associated with launch activities will always be present, standard safety procedures minimize the risks to an acceptable level.

Normal LPT testing operations would not entail any increased hazards at WILC, since normal system performance is considered to be a safe operation. IRFNA is a highly toxic, corrosive, and potentially fatal compound, and must be handled with caution. During missile fueling activities, personnel would be required to wear appropriate protective clothing, such as impervious gloves, safety goggles, full body covering suit with hood, gloves, and boots, and approved self-contained breathing apparatus (SCBA), or must be supplied with external supplied air.

In the event of a launch accident, there is the potential for significant hazards associated with debris impact, explosion, and release of toxic combustion products. In accordance with the KMR Range Safety Manual, a launch hazard area would be established around the launch facility. This area represents the footprint of maximum hazard associated with debris impact and explosive overpressure. Any personnel inside this footprint area would remain within facilities rated to provide adequate blast and debris protection, and protection from exposure to any fuels or chemicals that might be spread as a result of a catastrophic missile failure. Therefore, the risk of a significant health and safety impact resulting from such a failure is considered not significant. No significant health and safety impacts are expected to occur due to launch activities.

4.1.6.2 Alternative 1

This alternative would have the same potential impacts as the proposed action.

4.1.6.3 Alternative 2

This alternative would have the same potential impacts as the proposed action.

4.1.6.4 No Action Alternative

If the no action alternative is implemented, there would be no impacts to health and safety issues associated with conducting LPT testing at the WILC. However, missile testing and launching activities would continue with other programs. Those associated impacts were analyzed in previous documents and found not significant.

4.1.6.5 Cumulative Impacts

Program activities would follow standard safety practices. All employees would be trained in the proper use of the materials which they would be handling and would use required safety equipment and follow established OSHA and Army safety procedures. No significant impacts from LPT or other planned launch program activities are expected to occur. The minor construction activities needed for propellant storage facilities would be considered routine, and safety hazards associated with these operations are not considered significant. Health and safety impacts would be minimized by using safety procedures established for similar testing activities. While risks associated with missile launch activities will always be present, the safety procedures are designed to minimize the risks to an acceptable level. Therefore, no cumulative impacts from implementing the proposed action would be expected.

4.1.7 INFRASTRUCTURE AND TRANSPORTATION

4.1.7.1 Proposed Action

Transient personnel involved in LPT test activities would not be allowed on the island unless sufficient accommodations were available. A maximum of 45 persons could be stationed at WILC during LPT testing activities. The island's infrastructure, which is capable of supporting at least 300 transients at any one time, would not be overburdened. Thus, the impacts to infrastructure from the LPT program would not be significant.

4.1.7.2 Alternative 1

This alternative would have the same potential impacts as the proposed action.

4.1.7.3 Alternative 2

This alternative would have the same potential impacts as the proposed action.

4.1.7.4 No Action Alternative

If the no action alternative is implemented, there would be no impacts to infrastructure and transportation associated with LPT testing activities. However, the same potential impacts described in the 1994 EA would still be applicable as other testing operations at Wake Island would continue.

4.1.7.5 Cumulative Impacts

If the proposed action is implemented, the number of personnel on the island would increase during LPT test activities, but proper scheduling and coordination of activities would prevent the island's accommodations and infrastructure from being overtaxed. The number of flights to and from the island may need to be increased due to mission requirements, but no adverse impacts would be expected. Different missile test programs (anticipate no more than two programs at a given time) may have ongoing activities at WILC at the same time. The scheduling coordinator in the Ballistic Missile Targets Joint Project Office at USASMDC will ensure that adequate facilities are available for all personnel. Even with two different test programs present at WILC simultaneously, sufficient housing, utilities, and transportation would be available without stressing the infrastructure. Therefore, no cumulative impacts to infrastructure and transportation resources would be expected from implementing the proposed action.

4.1.8 LAND USE

4.1.8.1 Proposed Action

There are no activities associated with the proposed action that are inconsistent with current land use practices, policies or controls for Wake Island. No impacts to current land use patterns would result from the proposed action.

4.1.8.2 Alternative 1

There would be no impacts to land use practices for this alternative for the same reasons as the proposed action.

4.1.8.3 Alternative 2

There would be no impacts to land use practices for this alternative for the same reasons as the proposed action.

4.1.8.4 No Action Alternative

There would be no impacts to land use under this alternative; land use patterns would continue in the same manner with the current ongoing mission of WILC.

4.1.8.5 Cumulative Impacts

Minor construction, missile preparation, launch, and related post-launch LPT program activities are consistent with current land use patterns on Wake Island. Implementation of the proposed action will not necessitate any additional land uses that are incompatible with the current mission of WILC; therefore, no cumulative impacts from LPT test activities would be expected.

4.1.9 NOISE

4.1.9.1 Proposed Action

Launch vehicle noise predictions for TMD target and defensive missile launches were previously performed with a far-field predictor program, based on empirical data from both solid and liquid-fueled rocket motors. The reader is referred to the 1994 Wake Island EA for a detailed discussion on this subject. The noise level at the missile launch site is approximately 120 dB for a few seconds as the missile lifts from the pad. This amount of noise is approximately 11 percent of the daily noise exposure permitted by OSHA. However, all personnel would be excluded from the launch area and would be protected from adverse noise effects. Therefore, the impact from missile launch noise would not be significant. Noise impacts from minor construction activities would also be not significant.

4.1.9.2 Alternative 1

This alternative would have the same potential noise impacts as the proposed action.

4.1.9.3 Alternative 2

This alternative would have the same potential noise impacts as the proposed action.

4.1.9.4 No Action Alternative

If the no action alternative is selected, there would be no noise impacts from LPT missile launch activities or the associated minor construction needed to build the liquid propellant storage facilities. However, missile testing and launching activities would continue with other programs. Those associated impacts were analyzed in previous documents and found not significant.

4.1.9.5 Cumulative Impacts

Noise from minor construction activities would be of short duration and is not expected to be substantially above background levels. Noise generated during LPT flight vehicle launches is of short duration (about 1 minute), and would be about the same intensity as the launches that typically occur at Wake Island. Since missile launches are discrete events (the noise generated from a launch is temporary and does not present a continual auditory hazard) and in-place regulations used during test activities provide hearing protection of workers, no cumulative noise impacts would be expected from the proposed action.

4.1.10 PHYSICAL RESOURCES

4.1.10.1 Proposed Action

Only minirnal construction would be necessary to erect the LPT fuel and oxidizer storage facilities on Wake Island. The two harbor sites described in the proposed action that were chosen for these non-

permanent propellant storage structures are both located in previously disturbed areas. The preferred IRFNA storage site is situated on an existing concrete pad, and both proposed storage sites are located adjacent to service roads. Construction activities could slightly increase the potential for surface soil erosion at these sites should any vegetation need to be cleared. However, due to the disturbed nature of the preferred sites and the surrounding improvements, any potential impacts to physical (soil) resources would be temporary and not significant in nature.

4.1.10.2 Alternative 1

If this alternative is selected, the IRFNA and kerosene storage sites and the missile fueling site would be located at the Wilkes Island tank farm area. Similar to the sites selected in the proposed action, this land has also been previously disturbed. Impacts to physical resources at this location would also be minimal and not significant.

4.1.10.3 Alternative 2

For this alternative the aircraft revetments and parking apron would be used as the propellant storage and missile fueling sites, respectively, and no impacts to physical resources would be expected.

4.1.10.4 No Action Alternative

No minor construction activities would be performed if this alternative is selected; therefore no impacts to physical resources would occur.

4.1.10.5 Cumulative Impacts

Construction of the temporary propellant storage facilities would not add to any current physical resource impacts; therefore, no cumulative impacts to physical resources would be expected.

4.1.11 SOCIOECONOMICS

4.1.11.1 Proposed Action

Because of Wake Island's location, socioeconomic issues are essentially confined to the availability of housing. Demographic, employment, income, and fiscal impacts are not factors. All of the operations, flight preparation, and testing activities detailed in Chapter 2 would require approximately 25 (maximum of 45) temporary duty personnel per missile launch event. These transient personnel would be housed in existing USASMDC controlled billets, in which at least 150 rooms (which sleep two persons per room) are available. Consequently, no impact to housing and, thus, socioeconomic resources is anticipated.

4.1.11.2 Alternative 1

Similar to the proposed action, this alternative would create no impacts to socioeconomic resources.

4.1.11.3 Alternative 2

This alternative would also cause no impacts to socioeconomic resources.

4.1.11.4 No Action Alternative

If this alternative is implemented, no impacts to socioeconomic resources would occur as a result of LPT testing. Additionally, since proper scheduling allows for accommodations of all necessary test personnel, no additional impacts would be expected from the ongoing test activities at Wake Island.

4.1.11.5 Cumulative Impacts

More than one test program may be conducting activities at WILC at a given time. This could create the potential for transient housing conflicts. Temporary duty personnel would be housed in existing USASMDC controlled billets. Proper scheduling by the USASMDC coordinator would prevent the island's housing and other accommodations from being overtaxed; therefore, no cumulative impacts to socioeconomic resources from the proposed action would be expected.

4.1.12 WATER RESOURCES

4.1.12.1 Proposed Action

Normal LPT program activities would have no adverse impact on surface or groundwater resources. However, an accidental fuel release could adversely impact water resources, if enough fuel flowed to the lagoon or to water catchment basins. Containment berms would be placed around the storage facilities before any fuel is brought to the site. These berms will be in place as long as the propellant storage facilities are in use, so any adverse impacts from a leak or accidental spill would be considered not significant.

4.1.12.2 Alternative 1

Under this alternative propellant storage facilities would have containment berms around them in the same manner as the proposed action, so impacts to water resources would also be not significant.

4.1.12.3 Alternative 2

Potential impacts under this alternative would also be not significant for the above listed reasons.

4.1.12.4 No Action Alternative

If the no action alternative is selected, LPT missiles would not be launched from WILC, so no liquid propellant storage facilities would be constructed, and there would be no impacts associated with this alternative.

4.1.12.5 Cumulative Impacts

No cumulative impacts to water resources are expected as a result of implementing the proposed action.

4.2 CONFLICTS WITH FEDERAL LAND USE PLANS, POLICIES, AND CONTROLS

The proposed activities would occur in areas of the island already being used for similar purposes and would be limited to the DOD-operated installation. These activities are compatible with the mission and land uses for Wake Island. All activities would comply with Federal laws and regulations. No conflicts with Federal land use plans, policies, or controls are expected.

4.3 ENERGY REQUIREMENTS AND CONSERVATION POTENTIAL

Anticipated energy requirements of each program activity would be within the energy supply capacity of each island. Although the additional activities associated with launching LPT missiles from Wake Island would have energy demands, these needs would be met by using portable generators. Energy use requirements would be subject to any established energy conservation practices.

4.4 NATURAL OR DEPLETABLE RESOURCE REQUIREMENTS AND CONSERVATION POTENTIAL

Other than various structural materials, components required for testing (e.g., electronics), small quantities of various materials needed for testing, and fuels, no significant natural or depletable resources would be required.

4.5 ADVERSE ENVIRONMENTAL EFFECTS THAT CANNOT BE AVOIDED

The launching and testing of missiles, regardless of fuel source, creates minor adverse environmental effects (or potential effects). These include such effects as the temporary startling of wildlife and flushing of birds from their nests from firing noise, and the possibility, though extremely remote, that a marine mammal could be hit by missile debris over the open ocean area. The impacts from these sources would be short-term and are not expected to jeopardize the existence of any threatened, endangered, or marine species.

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

The WILC has been dedicated to military use since 1972. The proposed action does not eliminate any options for future use of the environment for the locations under consideration.

4.7 ENVIRONMENTAL JUSTICE (EXECUTIVE ORDER 12898)

The proposed LPT testing at the WILC would be conducted in a manner that would not substantially affect human health or the environment. The test program has identified no disproportionate or adverse human health or environmental effects on minority or low-income populations in the area. The program activities would also be conducted in a manner that would not exclude persons from participation in, deny persons the benefits of, or subject persons to discrimination under the LPT test program because of their race, color, or national origin.

4.8 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Irreversible and irretrievable commitments are related to the use of nonrenewable resources and the effects that the use of these resources would have on future generations. Irreversible effects primarily result from the use or destruction of a specific resource (e.g., energy, minerals, or extinction of threatened or endangered species) that cannot be replaced, except perhaps in the extreme long term. Irretrievable resource commitment involves the loss in value of an affected resource as a result of the action (e.g., disturbance of an important cultural site). Under both the no action alternative and proposed action there would be a limited use of irretrievable resources (e.g., fuel, construction materials, labor), and no significant impacts to natural or cultural resources would be expected. Proposed activities would not result in the change of any existing land uses and would not irreversibly curtail the range of potential uses of the environment.

4.9 SUMMARY OF UNRESOLVED ISSUES

Unresolved issues presented in this SEA include items described in the August 1999 *Wake Island Federal Facility Compliance Agreement*, reproduced in Appendix D. These activities and identified corrective measures are summarized in Table 4.1.

Table 4-1 Summary of Non-Compliance Activities and Corrective Measures

NON-COMPLIANT ACTIVITIES	CORRECTIVE MEASURES
• The wastewater treatment facility discharges partially treated domestic sewage to an off-shore ocean outfall. At present the facility provides little, if any, treatment.	• Under the FWPCA, the facility is required to have a NPDES permit and is also required to have secondary treatment if discharging pollutants to waters of the U.S.
• Heated cooling water is discharged into the lagoon from the power plant.	• Heat is a pollutant under the FWPCA, so this discharge requires a NPDES permit with effluent limitations. Alternate effluent limits must also be established for the power plant.
• Accumulated rainwater is periodically drained from the petroleum bulk storage secondary containment areas into the lagoon.	• These discharges require NPDES permits under the FWPCA.
• WILC reports two industrial storm water collection systems which drain into the ocean.	• All industrial storm water discharges must have NPDES permits to be compliant with the FWPCA.
• Filter backwash from the Drinking Water Treatment Facility is periodically discharged into the lagoon.	• This discharge must have a NPDES permit to be in compliance with the FWPCA.
• WILC has several petroleum storage tank sites and does not have a Facility Response Plan or Spill Prevention, Control, and Countermeasures Plan in place.	• An FRP has been prepared and submitted to the U.S. Coast Guard, but has not been submitted to the USEPA for approval. The petroleum storage sites must have an FRP and a SPCC to be in compliance.
• WILC has no integrated Solid Waste Management Plan and is generally in non-compliance with 40 CFR Part 258 regarding design and operating criteria for municipal solid waste landfills.	• WILC must submit an integrated SWMP with an implementation schedule to be in compliance with the Solid Waste Disposal Act.

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6.0 References

6.0 REFERENCES

United States. Departments of Commerce and the Interior. March 1999. *Final Baseline Marine Biological Survey, Peacock Point Outfall and Other Point-Source Discharges, Wake Atoll, Pacific Ocean.* Honolulu, HI: n.p.

United States. Department of Defense. Department of the Air Force. August 1994. *Transfer and Reuse of Wake Island Airfield Environmental Assessment.* Hickam AFB, HI: n.p.

United States. Department of Defense. U.S. Army Space and Missile Defense Command. June 1999. *Draft Wake Island Federal Facility Compliance Agreement between U.S. Environmental Protection Agency, Region 9, and Department of the Army, U.S. Army Space and Missile Defense Command.* Huntsville, AL: n.p.

United States. Department of Defense. U.S. Army Space and Strategic Defense Command. November 1994. *Final Environmental Impact Statement for Theater Missile Defense Extended Test Range.* Vol. I. Huntsville, AL: n.p.

United States. Department of Defense. U.S. Army Space and Strategic Defense Command. December 1993. *Final Supplemental Environmental Impact Statement (EIS) for Proposed Actions at U.S. Army Kwajalein Atoll (USAKA),* Vol. I. Huntsville, AL: n.p.

United States. Department of Defense. U.S. Army Space and Strategic Defense Command. October 1995. *U.S. Army Kwajalein Atoll (USAKA) Temporary Extended Test Range Environmental Assessment.* Huntsville, AL: n.p.

United States. Department of Defense. U.S. Army Space and Strategic Defense Command. August 1996. *U.S. Army Launch Center, Wake Island, Emergency Action Plan (EAP).* Huntsville, AL: n.p.

United States. Department of Defense. U.S. Army Space and Strategic Defense Command. January 1994. *Wake Island Environmental Assessment.* Huntsville, AL: n.p.

United States. Department of Defense. U.S. Army Strategic Defense Command. September 1992. *Theater Missile Defense Countermeasures Mitigation Program Environmental Assessment.* Huntsville, AL: n.p.

United States. Department of the Interior. April 1999 (rev.). *Draft Terrestrial Resources Survey, Wake Atoll, Mid-Pacific Ocean, June 18-29, 1998.* San Francisco, CA: n.p.

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Appendix A

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Appendix B

Terrestrial Resources Survey
Wake Atoll, Mid-Pacific Ocean
June 18 - 29, 1998

Report prepared for:
Department of the Army
U.S. Space and Missile Defense Command
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P.O. Box 1500
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MIPR No. W31RPD-8-B4515

Report date:
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Terrestrial Resources Survey
Wake Atoll, Mid-Pacific Ocean
June 18 - 29, 1998

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Terrestrial Resources Survey
Wake Atoll, Mid-Pacific Ocean
June 18 - 29, 1998

Purpose

This survey was performed at the request of the Department of the Army's U.S. Space and Missile Defense Command. The information contained herein is intended for use in the Army's application for a National Pollutant Discharge Elimination System (NPDES) permit under the Clean Water Act from the U.S. Environmental Protection Agency.

The purpose of this survey is to provide identification, characterization and analysis of terrestrial resources potentially affected by: 1) the sewage discharges from the Peacock Point outfall into the ocean; 2) the cooling water discharges from the Power Plant outfall into the lagoon; and, 3) the brine discharges from the Desalination Plant outfall into the lagoon on Wake Island at Wake Atoll. Consideration of potential receptor communities and potentially affected terrestrial resources is pertinent because these three point source outfalls are either immediately near to or directly on the Wake Island shoreline. A briefer analysis of terrestrial resources potentially affected by the following two point source discharges at Wake Atoll is also provided: 1) the Runway Stormwater Runoff Outfall into the ocean on Wake Island; and, 2) the 1800 Area Tank Farm Stormwater Runoff Outfalls into the lagoon on Wilkes Island.

Background

The U.S. Army's Center for Health Promotion and Preventive Medicine identified and analyzed the sewage and Power Plant cooling water discharges to surface waters at Wake Island on Wake Atoll (USCHPPM 1998). This report stated:

> *A biological assessment will be performed near the sewage outfall to examine the indigenous population of fish, shellfish and wildlife within the mixing zone of discharged pollutants.*

This report also recommended:

> *Use the mixing zone delineation results in this report in the development of a biological assessment of marine life at the sewage outfall area.*

This "Terrestrial Resources Survey" report is in partial fulfillment of the USCHPPM (1998) recommendation for such a biological assessment.

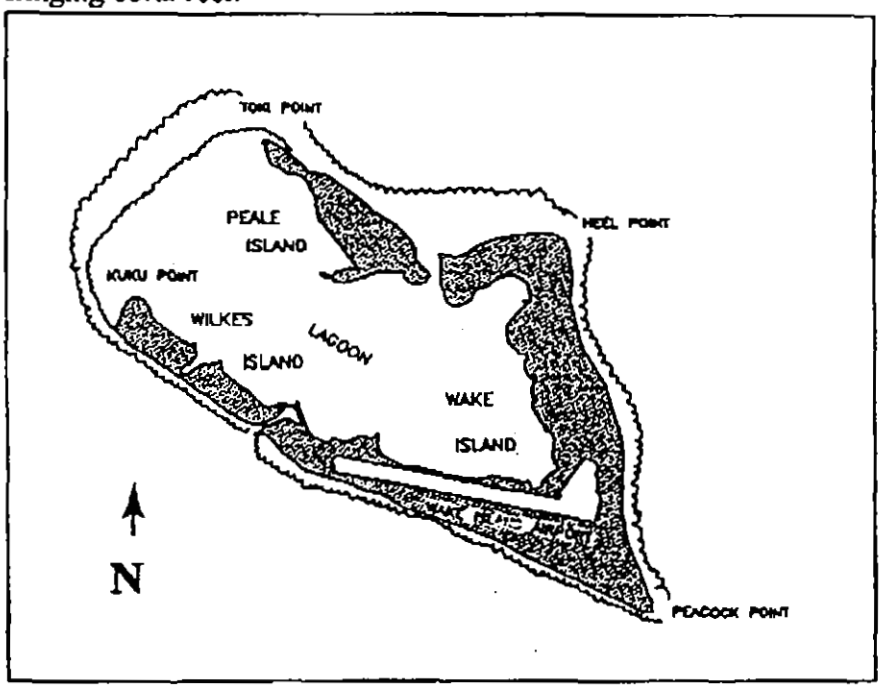
Additionally, at the request of the Department of the Army's U.S. Space and Missile Defense Command (SMDC), a similar biological assessment of terrestrial resources was concurrently performed for the three brine discharges from the Desalination Plant on Wake Island into the atoll lagoon. Also, at the request of SMDC, a briefer biological assessment of associated terrestrial resources was undertaken for the Runway Stormwater Runoff Outfall into the ocean on the eastern side of Wake Island and the 1800 Area Tank Farm Stormwater Runoff Outfalls into the lagoon on the eastern end of Wilkes Island.

Environmental Setting

Wake Atoll is located in the mid-Pacific Ocean at 19°17' North latitude and 166°38' East longitude, approximately 2,300 miles (3,700 km) west of Honolulu, Hawaii. The Atoll has a total land area of 2,600 acres (1,050 ha) comprising three islands: Wake Island, Wilkes Island and Peale Island. These three islands form a "V"-shaped atoll measuring approximately 4 miles (6 km) long on each side (Figure 1). The Atoll is 2 miles (3 km) wide at its widest point (USAF 1994a).

Altogether, the three islands have over 25 miles (40 km) of shoreline including the sheltered lagoon shoreline and the exposed ocean shoreline (Johnson 1996). The islands have an average elevation of 10 feet (3.1 m) and a maximum elevation of 21 feet (6.4 m) above mean sea level, resulting in essentially a flat terrain (USAF 1994a).

Figure 1. Prominent geographic features of Wake Atoll, Mid-Pacific Ocean, including Peale Island, Wake Island, Wilkes Island, lagoon and fringing coral reef.



The interior of the "V" is a shallow lagoon which is open to the ocean at the broad mouth between Wilkes Island and Peale Island and through a 400-foot (122-meter) wide cut between Wake Island and Peale Island. A narrow, historic, wooden bridge, constructed across this cut in 1941, still provides the only connection between Peale Island and Wake Island today. Wilkes Island, once physically separate from Wake Island, is now connected to Wake Island by a narrow, 300-foot (91-meter) long, landfilled causeway. This causeway blocks the exchange

of ocean and lagoon waters in the former cut between these two islands and provides a solid landbridge between the two islands.

A narrow, fringing coral reef encircles the atoll. This reef provides a continuous, shallow, nearshore barrier around the entire atoll except for an excavated gap in the area between the two anchor buoys offshore of the harbor entrance between Wake Island and Wilkes Island.

The preponderance of infrastructure, population and current operational activity is concentrated on Wake Island, the largest of the three islands. That portion of Wilkes Island which is north of the Submarine Cut (an uncompleted excavation laterally cutting through the middle of the island) is locally designated and managed as a "Bird Sanctuary." Human access to the western end of Wilkes Island is administratively restricted and a broad, open field area at Kuku Point is deliberately managed and maintained as nesting habitat for several species of ground-nesting seabirds. Human access to Peale Island is also administratively restricted for the transient human population at the Atoll, but not for residents. Residents currently use Peale Island for recreational activities such as jogging, walking, beach combing, picnicking, swimming and boating and for religious activities at a Buddhist temple used by the Atoll's Thai population.

At the time of this survey, the resident human population at Wake Atoll totaled 126 people. Demographically, this resident human population is comprised of: 3 women and 123 men; and 23 U.S. citizens and 103 Thai citizens. The transient human population at Wake Atoll varies according to mission requirements (Timmons pers. comm.). During mission launch activities, the Atoll's population may more than double to 300 people (USCHPPM 1998).

The climate of Wake Atoll is characterized as a maritime climate dominated by the northeast trade winds. These trade winds blow steadily all year with little variation creating certain windward-leeward effects at the Atoll. The average annual wind speed is 13.8 miles per hour (22.2 km per hour) (USAF 1994a).

Temperatures at Wake Atoll vary little during the day from month to month. February is normally the coldest month with an average daily high of 81.7°F (27.6°C) and an average daily low of 71.5°F (21.9°C). August is normally the hottest month of the year with an average daily high of 88.1°F (31.2°C) and an average daily low of 77.0°F (25.0°C). Polar outbreak weather systems may reach Wake Atoll during the late fall, winter or early spring. The record low temperature of 64°F (17.8°C) recorded at Wake Atoll occurred during a polar outbreak in December 1954 (USAF 1994a).

Average annual rainfall is 35 inches (89 cm). The greatest amount of rainfall occurs in the summer when typhoons are common occurrences. An estimated 10 to 20 percent of the precipitation evaporates or is evapotranspired through the vegetation. The remainder of the precipitation either runs off into the ocean or lagoon or percolates through the highly permeable limestone formation into the ground. With the exception of rainwater collected

from two catchment basins on Wake Island and stored for use as a potable water supply, there is no fresh surface water on the Atoll (USAF 1994a).

The subdued topography and the relatively small land surface area at Wake Atoll limit the Atoll's groundwater. Rainwater that infiltrates into the permeable limestone ground is less dense than the underlying saline water and generally remains segregated. Some brackish groundwater exists on Wake Island and ten operating shallow wells pump this brackish water for the following operations: four wells for the Power Plant; three wells for the Desalination Plant; and, three wells provide carrier water for the sanitary sewer system (USCHPPM 1998).

Average annual humidity ranges from 69 to 80 percent. The average amount of the daytime sky obscured by clouds is 54 percent. Humidity and cloud cover vary little from month to month (USAF 1994a).

Jurisdiction

The terms "Wake Island," "Wake Island Airfield" and "Wake Atoll" are sometimes colloquially used interchangeably. For the purposes of this report, however, "Wake Atoll" refers to the entire geologic formation including the three distinct islands, the lagoon and the fringing reef. "Wake Island" refers exclusively to the 1,350-acre (546-ha) island known as Wake Island and separately distinguished from Wilkes Island and Peale Island.

Wake Atoll is an unincorporated U.S. possession, not a part of any State, Territory or Commonwealth. Under an agreement effective June 14, 1972, which transferred civil administration authority from the U.S. Department of the Interior to the U.S. Air Force, the Atoll is operated as "Wake Island Airfield" (USAF 1994a). Up until September 30, 1994, Wake Island Airfield was civilly administered by Detachment 1 of the 15th Logistics Group, 15th Air Base Wing, Hickam Air Force Base, Hawaii. Currently, Wake Atoll remains under the jurisdiction of the Department of Defense and is under the control of the U.S. Army as defined by a Memorandum of Understanding between the U.S. Air Force and the U.S. Army (USAF 1994b).

Because of its unique jurisdictional setting, only federal natural resource and wildlife protection laws apply at Wake Atoll. No State, Territorial or Commonwealth natural resource or wildlife protection laws apply at Wake Atoll.

Survey Methodology

This "Terrestrial Resources Survey" was undertaken at Wake Atoll from June 18, 1998 through June 29, 1998, completed by Chip Demarest (Environmental Scientist, U.S. Department of the Interior, Office of Environmental Policy and Compliance, San Francisco, CA) and is the subject of this report. Information contained in this report is based on direct field observations and, where cited, reviewed literature and personal communications.

Because of the exclusive applicability of federal natural resource and wildlife protection laws at

Wake Atoll, this survey was conducted with a focus on federally protected terrestrial resources. Consequently, highlighted attention has been made in this report to those federally protected terrestrial resources observed at Wake Atoll during this survey including migratory birds and threatened and endangered species.

This "Terrestrial Resources Survey" is a companion to and was conducted concurrently with an associated marine resources survey. The companion marine survey was undertaken from June 18, 1998 through July 2, 1998, completed by Kevin Foster (Fish and Wildlife Biologist, U.S. Fish and Wildlife Service, Honolulu, HI), John Naughton (Pacific Islands Environmental Coordinator, National Marine Fisheries Service, Honolulu, HI) and Michael Molina (Supervisory Fish and Wildlife Biologist, U.S. Fish and Wildlife Service, Honolulu, HI) and is the subject of a separate report.

The U.S. Army's Center for Health Promotion and Preventive Medicine (USCHPPM) conducted a survey in the fall of 1998 to identify and analyze those additional point source discharges at Wake Atoll, including the stormwater and industrial runoff, which were not covered in the initial USCHPPM (1998) effort to characterize the sanitary sewer outfall mixing zone (Gunter pers. comm.). The findings of this USCHPPM survey were still in press and unavailable at the time this report was being prepared.

The nomenclature for the plants and animals referenced in this report has been standardized. Common names, if any, and scientific names are used. The common names and scientific names for plants in this report conform to the nomenclature used in Herbst (1994) with the exception of one plant. The currently preferred scientific name for naupaka is *Scaevola taccada* rather than *Scaevola sericea* (Herbst pers. comm.). Colloquial Hawaiian names are used as common names for some plants. The common names and scientific names for birds in this report conform to the nomenclature in Pratt *et al.* (1987). The common names and scientific names for animals other than birds have been adopted from cited references.

Federally protected terrestrial biota

Federally protected terrestrial biota at Wake Atoll are limited to the migratory seabirds, shorebirds and occasional vagrant waterbirds. These birds are identified as "migratory" and protected under the Migratory Bird Treaty Act. There are no exclusively terrestrial biota, including plants and animals, federally listed as threatened or endangered under the Endangered Species Act, currently known or reported from Wake Atoll (USFWS 1998).

The green sea turtle (*Chelonia mydas*), listed as a threatened species under the federal Endangered Species Act, was observed multiple times swimming in the nearshore ocean and lagoon waters at Wake Atoll during this survey. Shoreline basking and nesting activity, the only terrestrially-based behaviors of this otherwise marine species, were neither observed during this investigation nor reported in the literature as having been previously observed at Wake Atoll. Therefore, further discussion of the green sea turtle is not included in this "Terrestrial Resources Survey."

The hawksbill sea turtle (*Eretmochelys imbricata*), listed as an endangered species under the federal Endangered Species Act has been suspected to occur at Wake Atoll (USAF 1994a), however, no records or accounts of confirmed sightings could be found in the literature reviewed. No observations of hawksbill sea turtles were recorded at Wake Atoll during this survey.

The Wake rail (*Rallus wakensis*), a flightless species endemic to Wake Atoll, has not been observed since World War II and is now considered extinct (Pratt *et al.* 1987, Jones 1993). Japanese soldiers occupying the Atoll during World War II are reported to have hunted and eaten these small birds to avoid starvation during a sustained American blockade of Japanese supply shipments to the Atoll (Jones 1993). Predation by feral cats (*Felis catus*) has also been suggested as a possible factor in the extinction of this species (Jones 1993).

Terrestrial Flora

The most recent compilation of terrestrial flora at Wake Atoll is reported in Herbst (1994). This investigation found 204 species of terrestrial plants at the atoll, of which 20 are considered indigenous (*i.e.*, a species which is native or probably native to Wake Atoll), 55 are considered naturalized (*i.e.*, a species which has been accidentally or deliberately introduced to Wake Atoll and has since become naturalized), and 129 are considered propagated (*i.e.*, a species which is found only as a cultivated plant in a garden, a pot or as a landscape plant).

The distribution and composition of terrestrial plant communities at Wake Atoll vary among the three islands and reflect such primary community influences as elevation, climatic conditions (*e.g.*, windward exposure vs. leeward exposure) and degree of human disturbance and intervention. Generally, the terrestrial plant communities on Wilkes Island and Peale Island have been relatively less disturbed by contemporary human activities and exhibit more indigenous and mature vegetation than the cultivated and operational areas of Wake Island.

The undisturbed lagoon shorelines of all three islands are typically characterized by *Pemphis* scrub communities (dominated by *Pemphis acidula*) and *Pemphis-Sesuvium* communities (dominated by *Pemphis acidula* and sea purslane [*Sesuvium portulacastrum*]) (Herbst pers. comm.).

The undisturbed ocean shorelines of all three islands are generally characterized by *Tournefortia* scrub forests (dominated by beach heliotrope [*Tournefortia argentea*]) and kou [*Cordia subcordata*]) and ironwood forests (dominated by ironwood [*Casuarina equisetifolia*] and occasional beach heliotrope [*Tournefortia argentea*] and false kamani [*Terminalia catappa*]). The *Tournefortia* scrub forest on the exposed windward ocean shoreline of Wake Island has a more open structure than the *Tournefortia* scrub forests on Wilkes and Peale Islands and is dominated by beach heliotrope (*Tournefortia argentea*) and occasional kou (*Cordia subcordata*), naupaka (*Scaevola taccada*) and ironwood (*Casuarina equisetifolia*) (Herbst pers. comm.).

Terrestrial Fauna

Other than birds, the native terrestrial fauna at Wake Atoll is relatively limited and includes insects and several species of land crabs (USAF 1994a). The insects of Wake Atoll have been partially described by Bryan (1926) and Holck (1993). The following orders of insects have been recently reported at Wake Atoll (Holck 1993): Lepidoptera (butterflies and moths), Hymenoptera (wasps, bees and ants), Diptera (houseflies, gnats and mosquitos), Odonata (dragonflies and damselflies), Isoptera (termites) and Coleoptera (beetles). The populations of certain species of flies, ants, diptera larvae, earwigs and other scavengers at Wake Atoll could be limited by competition with the large numbers of land hermit crabs (*Caenobyta brevimanus* and *Caenobyta perlata*) which feed on dead bird carcasses (Bryan 1926).

A number of terrestrial arthropods have been introduced to Wake Atoll. Active colonies of the Formosan termite (*Coptotermes formosanus*) have been recently reported on Wake Island infesting infrastructure such as the wooden bridge spanning the Peale-Wake channel, telephone poles and the roof of a potable water tank. Two species of ants considered pests have been reported from Wake Island: the Argentine ant (*Iridomyrmex humilis*) and the fire ant (*Solenopsis* spp.). At least three families of economically- or medically-important flies are now present at the Atoll including: Muscidae (house flies), Sarchophagidae (flesh flies) and Hippoboscidae (parasitic flies or louse flies). Venomous arthropods have also been reported at Wake Atoll including: centipedes, wasps, honey bees (*Apis mellifera*) and brown recluse spider (*Loxosceles reclusa*) (Holck 1993). Other exotic arthropods such as cockroaches, mites and scorpions are considered pests at Wake Atoll and subject to control measures (Johnson 1996, Johnson pers. comm.).

Skinks and geckos, introduced species, can be found on all three islands. Bryan (1959) reported two species of geckos, the mourning gecko (*Lepidodactylus lugubris*) and the stump-toed gecko (*Peropus mutilatus*), and two species of skinks, the snake-eyed skink (*Cryptoblepharus boutonii poecilopleurus*) and the azure-tailed skink (*Emoia cyanura*), at Wake Atoll. Schreiber and Kleen (1968) reported the following reptile species at Wake Atoll: mourning gecko, snake-eyed skink and blue-tailed skink.

The brown tree snake (*Boiga irregularis*), a species known to clandestinely immigrate throughout the Pacific in military and civilian cargo, has been reported at Wake Atoll. In March 1949, a specimen was collected in a tree on Wake Island (Bryan 1959). No recent accounts of brown tree snakes have been reported on Wake Atoll (Timmons pers. comm.), however, the potential for such an introduction at Wake Atoll has been recognized (Holck 1993).

Exotic terrestrial mammalian species have been introduced, accidentally or deliberately, to Wake Atoll. Three domestic dogs (*Canis familiaris*) were observed on Wake Island associated with the human population. Feral cats (*Felis catus*) were observed on all three islands and evidence of predation by these cats on seabird nests was evident at Kuku Point on Peale Island. These feral cats are successfully reproducing and a litter of four, unweaned

kittens was observed during this survey in the old VORTAC building at Kuku Point on Wilkes Island immediately adjacent to the sooty tern colony. Domestic cats, under human care, were observed on Wake Island in the resident housing area and at the boat harbor. A limited, feral cat eradication effort is currently being undertaken by resident contractor personnel (Gunter pers. comm.).

Rats (*Rattus* spp.) were also observed on Wake Island nesting under construction debris during this survey. At least one species of rat, the Polynesian rat (*Rattus exulans*), has been long known on Wake Atoll and two additional species of rat, the common house rat (*Rattus rattus*) and the Norway rat (*Rattus norvegicus*), are suspected among the Atoll's rodent population (Bryan 1959). Resident contractor personnel routinely use rodenticides to control rodent populations around warehouse-type buildings on Wake Island (Gunter pers. comm.).

Discrete areas of infestation by the exotic African snail (*Achatina fulica*) were observed on Peale Island and on Wake Island. Concentrations of live African snails together with accumulations of empty shells were usually associated with dense patches of cotton plants (*Gossypium hirsutum*) or in dense ironwood (*Casuarina equisetifolia*) forested areas with heavy leaf litter accumulations. Hermit crabs (*Caenobyta* spp.) were observed on all three islands occupying the empty shells of this terrestrial snail.

Avifauna

The birds of Wake Atoll have been described in recent accounts: Jones (1993), Jones (1995), Pratt *et al.* (1987), Rowland (1989) and USAF (1994). Taken together, these accounts report 32 species of birds comprising the avifauna recorded at Wake Atoll including resident species, migrants, visitors, vagrants, accidentals and exotics. Included among these 32 bird species are 15 species of seabirds, 9 species of shorebirds, 4 species of land birds and 3 species of waterbirds. Of these 32 species, 30 species are considered indigenous and 2 species (domestic chicken [*Gallus gallus*] and domestic pigeon [*Columba livia*]) are exotic. A summary the known occurrences of the bird species reported from Wake Atoll is provided in Table 1.

Pratt *et al.* (1987) described the reported occurrences of albatrosses at Wake Atoll as "visitor." More recent data, however, suggest that the black-footed albatross (*Diomedea nigripes*) and the Laysan albatross (*Diomedea immutabilis*) should be considered "winter resident" (Jones 1995). A population of albatrosses, either nascent or remnant, returns to Wake Island at Wake Atoll each year in November for the courtship and nesting season. During this past 1997 - 1998 winter season, five individual black-footed albatross and three individual Laysan albatross over-wintered at Wake Island displaying courtship behavior and nesting. Atoll residents reported observing one black-footed albatross nest with one egg and one Laysan albatross nest with one egg, both on Wake Island, however, neither nest produced a chick (Henz pers. comm., Timmons pers. comm.). Predation by feral cats and possibly rats has been suspected in the repeated albatross nesting failure on Wake Island (Jones 1995).

Table 1. Reported bird species occurrences at Wake Atoll, arranged alphabetically by common name (Pratt *et al.* 1987, USAF 1994a, Jones 1995).

common name	scientific name	general description[1]	federal status[2]	occurrence at Wake Atoll[3]
albatross, black-footed	*Diomedea nigripes*	seabird	migratory	visitor
albatross, Laysan	*Diomedea immutabilis*	seabird	migratory	visitor
booby, brown	*Sula leucogaster*	seabird	migratory	resident
booby, masked	*Sula dactylatra*	seabird	migratory	resident
booby, red-footed	*Sula sula*	seabird	migratory	resident
chicken, domestic	*Gallus gallus*	land bird	-	introduced
curlew, bristle-thighed	*Numenius tahitiensis*	shorebird	migratory	visitor
dunlin	*Calidris alpina*	shorebird	migratory	visitor
egret, cattle	*Bubulcus ibis*	land bird	migratory	visitor
frigatebird, great	*Fregata minor*	seabird	migratory	resident
garganey	*Anas querquedula*	waterbird	migratory	visitor
golden-plover, lesser	*Pulvialis dominica*	land bird	migratory	winter resident
kite, black	*Milvus migrans*	land bird	migratory	visitor
noddy, black	*Anous minutus*	seabird	migratory	visitor
noddy, brown	*Anous stolidus*	seabird	migratory	resident
owl, short-eared	*Asio flammeus*	land bird	migratory	visitor
pigeon, domestic	*Columba livia*	land bird	-	introduced
pintail, northern	*Anas acuta*	waterbird	migratory	visitor
sanderling	*Calidris alba*	shorebird	migratory	visitor
sandpiper, sharp-tailed	*Calidris acuminata*	shorebird	migratory	visitor
shearwater, Christmas	*Puffinus nativitatis*	seabird	migratory	visitor
shearwater, wedge-tailed	*Puffinus pacificus*	seabird	migratory	visitor
shoveler, northern	*Anas clypeata*	waterbird	migratory	visitor
snipe, common	*Gallinago gallinago*	shorebird	migratory	visitor
tattler, Siberian (gray-tailed)	*Heteroscelus brevipes*	shorebird	migratory	visitor
tattler, wandering	*Heteroscelus incana*	shorebird	migratory	winter resident
tern, sooty	*Sterna fuscata*	seabird	migratory	resident
tern, spectacled (gray backed)	*Sterna lunata*	seabird	migratory	visitor
tern, white	*Gygis alba*	seabird	migratory	visitor
tropicbird, red-tailed	*Phaethon rubricauda*	seabird	migratory	resident
tropicbird, white-tailed	*Phaethon lepturus*	seabird	migratory	resident
turnstone, ruddy	*Arenaria interpres*	shorebird	migratory	winter resident
yellowlegs, greater	*Tringa melanoleuca*	shorebird	migratory	?

[1] "seabird" is a bird associated with salt water but not necessarily pelagic.
"land bird" is a bird associated with non-aquatic, terrestrial habitats.
"shorebird" is a wading bird of the Order Charadriiformes associated with shorelines, mudflats or salt marshes.
"waterbird" is a swimming bird such as a duck.

[2] as defined in the Migratory Bird Treaty Act.

[3] "introduced" means that the species is non-native and introduced to Wake Atoll by humans.
"resident" means that the species is present all year, but not necessarily breeding.

"visitor" includes passage migrants, vagrants and accidentals.
"winter resident" means that the species is resident at Wake Atoll during the non-breeding season
"?" means that the species' occurrence is uncertain and that records are unconfirmed.

Current Survey of Avifauna

Detailed observations on the avifauna at Wake Atoll were recorded during this survey with particular attention paid to those behaviors, including feeding and reproduction, which could provide an exposure opportunity to discharges from the three point source outfalls of interest. During this survey, 13 species of birds were observed at Wake Atoll. Ten of these 13 species present during the period of the survey were observed nesting. Another species, the white-tailed tropicbird (*Phaethon lepturus*), was observed multiple times in so-called "courtship flight" over Wake Island, however, no nests could be found. Table 2 provides a summary of the observations of these 13 bird species including notes on certain relevant behaviors exhibited.

Table 2. Birds species observed at Wake Atoll (including Wake Island, Wilkes Island, Peale Island, lagoon and nearshore areas) from 6/18/98 through 6/29/98 (arranged alphabetically by common name) with associated notes on observed behaviors (including flying, roosting/resting, feeding, courtship and nesting).

observed bird species		observed behaviors				
common name	scientific name	flying	roosting/ resting	feeding	courtship	nesting
booby, brown	*Sula leucogaster*	✔	✔			✔
booby, masked	*Sula dactylatra*	✔	✔			✔
booby, red-footed	*Sula sula*	✔	✔			✔
chicken, domestic	*Gallus gallus*		✔	✔		✔
frigatebird, great	*Fregata minor*	✔	✔			
noddy, black	*Anous minutus*	✔	✔	✔		✔
noddy, brown	*Anous stolidus*	✔	✔			✔
pigeon, domestic	*Columba livia*	✔	✔	✔		✔
tern, sooty	*Sterna fuscata*	✔	✔			✔
tern, white	*Gygis alba*	✔	✔	✔		✔
tropicbird, red-tailed	*Phaethon rubricauda*	✔	✔		✔	✔
tropicbird, white-tailed	*Phaethon lepturus*	✔				
unidentified seabird[1]	unidentified	✔				

[1] Multiple observations over three nights were made of a solitary, nocturnal seabird with dark plumage, resembling a shearwater or petrel, flying within an area illuminated by a streetlight on Wake Island, however, positive identification of the species could not be confirmed.

In particular, nesting activity provides an increased potential exposure opportunity to point source discharges. Potential exposure of nesting avifauna to point source discharges is most likely to occur, if at all, by direct contact with the discharge on land or by ingestion during feeding. Direct contact exposure potential is probably highest for adults, eggs and young of the ground-nesting species at Wake Atoll such as the two albatross species, the three booby species, the brown noddy (*Anous stolidus*), the red-tailed tropicbird (*Phaethon rubricauda*) and the sooty tern (*Sterna fuscata*), which lay and incubate their eggs directly on the ground surface. None of these species, however, was observed nesting in the immediate vicinity of any of the point source outfalls. Domestic chickens, an introduced species at Wake Atoll, were observed nesting in the immediate vicinity of the Power Plant Outfall on Wake Island.

Conceptually, the ingestion exposure potential for birds is likely increased during nesting because the increased energy demand associated with chick rearing requires an increased feeding or foraging frequency by the adults who might then exploit a broader, perhaps less discriminating range of habitats and food sources to satisfy this increased energy demand. During this survey, black noddies (*Anous minutus*) and white terns (*Gygis alba*), both of which are among those ten species observed in active nesting on Wake Atoll, were also observed feeding in nearshore ocean waters around the Atoll. No avian feeding activity, except for domestic chickens, was observed in the vicinity of any of the point source outfalls.

The preponderance and greatest diversity of resident seabird nesting activity observed at Wake Atoll during this investigation occurred on Wilkes Island in and around the margins of the cleared, open field area in the northwest corner of the island at Kuku Point in the area designated and managed as a "Bird Sanctuary." Six species of seabirds, including ground-nesters and arboreal-nesters, were observed nesting on Wilkes Island during this survey: brown booby (*Sula leucogaster*), masked booby (*Sula dactylatra*), red-footed booby (*Sula sula*), brown noddy (*Anous stolidus*), sooty tern (*Sterna fuscata*) and red-tailed tropicbird (*Phaethon rubricauda*). This "Bird Sanctuary" area on Wilkes Island is geographically distant from the point source outfalls. Table 3 provides a summary of seabird nesting activity observed on Wilkes Island during this survey.

Hundreds of intact, addled sooty tern eggs were observed during this survey in the cleared, open field area at the northwestern end of Wilkes Island at Kuku Point. A large number of these addled eggs were concentrated in accumulations of wave-washed debris as far inland as the Old VORTAC building. Nearby, but in a physically distinct part of the open field area, there were three distinct colony clusters of sooty terns nesting. Each colony cluster was in a different but apparently synchronous phase of nesting: one was incubating eggs, another had newly hatched chicks and another had older chicks displaying juvenile plumage but which had not yet fledged.

On February 11, 1998, (4+ months before this survey), 20-foot (6-m) wave swells filled the lagoon at Wake Atoll. These waves were reportedly caused by a large storm system in the

north Pacific at that time. Particularly during the afternoon high tide that day, these waves caused significant flooding, erosion and redeposition of sand and rubble along the lagoon shorelines of all three islands, the ocean shoreline of Peale Island and the ocean shoreline of Wake Island from the Peale-Wake channel eastward to Heel Point. The "Bird Sanctuary" area of Wilkes Island at Kuku Point was directly hit by these large waves and widely flooded. The sooty tern nesting colony in that area at that time was reported destroyed (Hitchcock 1998).

Table 3. Active seabird nesting activity observed on Wilkes Island at Wake Atoll on 6/21/98 (arranged alphabetically by common name), including both arboreal-nesting and ground-nesting species.

observed nesting seabird species		observed nest contents description					total number of occupied nests
common name	scientific name	1 egg	2 eggs	1 egg + 1 chick	1 chick	2 chicks	
booby, brown	*Sula leucogaster*	8	14	4	97	3	126
booby, masked	*Sula dactylatra*	1	1	1	2	0	5
booby, red-footed	*Sula sula*	-	-	-	41	-	100[1]
noddy, brown	*Anous stolidus*	6	0	0	0	0	6
tern, sooty	*Sterna fuscata*	1,000[2]	0	0	20,000[2]	0	21,000[2]
tropicbird, red-tailed	*Phaethon rubricauda*	0	0	0	1	0	1

[1] These nests were in the upper branches and crowns of beach heliotrope (*Tournefortia argentea*) trees in the scrub forest and the contents of most of the nests could not be directly observed. The density of the scrub forest prevented actual enumeration of each nest, therefore, the "total number of nests observed" is an informed estimate rather than an actual count.

[2] Because of the large number of birds and the density of the nesting colony, the nesting activity reported is an estimate rather than an actual count.

Predation on sooty tern nests by rats and/or feral cats was evident in and around the three sooty tern colony clusters on Wilkes Island. Freshly killed, partially consumed carcasses of sooty tern chicks were observed around the inland margins of the colony clusters and in the abandoned old VORTAC building.

Resident seabird nesting activity was also observed on Wake Island during this survey although the numbers of nests and diversity of nesting species was less than on Wilkes Island. Four species of seabirds, including ground-nesters and arboreal-nesters, were observed nesting on Wake Island during this survey: black noddy, brown noddy, white tern and red-tailed tropicbird. White-tailed tropicbirds were observed multiple times in "courtship flight" over Wake Island, however, no nests were observed. Table 4 provides a summary of seabird nesting activity observed on Wake Island during this survey.

Table 4. Active seabird nesting activity observed on Wake Island at Wake Atoll on 6/19/98 through 6/24/98 (arranged alphabetically by common name) including both arboreal-nesting and ground-nesting species.

observed nesting seabird species		observed nest contents description[1]					total number of occupied nests
common name	scientific name	1 egg	2 eggs	1 egg + 1 chick	1 chick	2 chicks	
noddy, black	*Anous minutus*	-	-	-	-	-	108[3]
noddy, brown	*Anous stolidus*	-	-	-	-	-	10[3]
tern, white	*Gygis alba*	-	-	-	2	-	2
tropicbird, red-tailed	*Phaethon rubricauda*	-	-	-	1	-	1

[1] Information on "nest contents" is provided for those species whose nests could be directly and unobtrusively observed. Where no information on "nest contents" is provided, occupied nests were observed but nest contents could not be observed unobtrusively.

[2] All of these nests were observed in the branches of mature ironwood trees (*Casuarina equisetifolia*) at the northern end of Wake Island.

[3] Eight of these ten nests were observed in the branches of ironwood trees (*Casuarina equisetifolia*) at the northern end of Wake Island. Two of these ten nests were observed on remnant concrete pilings in the lagoon immediately offshore of the water catchment area on Wake Island and, therefore, not directly on Wake Island.

All the active seabird nesting activity observed on Wake Island during this survey occurred in close proximity to operational areas and sustained human activity on the northern end of the island. No active seabird nesting was observed on Wake Island in the immediate vicinity of any of the three point source outfalls.

Both of the exotic bird species currently found on Wake Atoll, the domestic chicken (*Gallus gallus*) and domestic pigeon (*Columba livia*), were observed nesting on Wake Island at the northern end of the island in the vicinity of resident housing. The domestic chickens were observed nesting both in captivity and ferally. The domestic pigeons, although free flying, are under human care and were not observed nesting ferally.

Notable among the observations of seabird nesting activity on Wake Island during this survey is the presence of nesting black noddies (*Anous minutus*). Previous ornithological surveys of Wake Atoll reported the black noddy as "rare" and that its nesting at the Atoll has not been suspected (Jones 1995). Pratt *et al.* (1987) describes the black noddy occurring as a "visitor" at Wake Atoll, not "resident." During this survey, 108 active black noddy nests were observed in the upper branches of mature ironwood trees (*Casuarina equisetifolia*) in a dense ironwood forest on the windward side of the northern end of the island. Eight active brown noddy (*Anous stolidus*) nests were observed among this predominately black noddy nesting colony. The ironwood forested area used by this nesting colony is in the immediate vicinity of the resident and transient housing area which sustains routine daily human foot traffic and vehicular traffic.

Resident seabird nesting activity was also observed on Peale Island during this survey. Only one

species of resident seabird, the brown noddy (*Anous stolidus*), was observed nesting on Peale Island. Two active brown noddy nests were observed on the concrete remnants of the former Pan American Airways pier in the lagoon offshore of Peale Island. Table 5 provides a summary of seabird nesting activity observed on Peale Island during this survey.

Table 5. Active seabird nesting activity observed on or around Peale Island at Wake Atoll on 6/19/98 through 6/24/98.

observed nesting seabird species		observed nest contents description					total number of occupied nests
common name	scientific name	1 egg	2 eggs	1 egg + 1 chick	1 chick	2 chicks	
noddy, brown	*Anous stolidus*	2	-	-	-	-	2[1]

[1] These two nests were observed on the concrete remnants of the former Pan American Airways pier in the lagoon immediately offshore of Peale Island and, therefore, not directly on Peale Island itself.

Feral domestic chickens (*Gallus gallus*) were observed nesting on Peale Island at Flipper Point during this survey.

Previous ornithological surveys of Wake Atoll have reported large sooty tern nesting colonies on the southeastern portion of Peale Island (Jones 1995, USAF 1994). This area of Peale Island formerly reported as sooty tern nesting habitat was inundated during the February 11, 1998, high-water flooding incident, 4+ months prior to this survey (Hitchcock 1998). Previous surveys have also reported red-tailed tropicbird (*Phaethon rubricauda*) nesting on Peale Island (Jones 1995, USAF 1994).

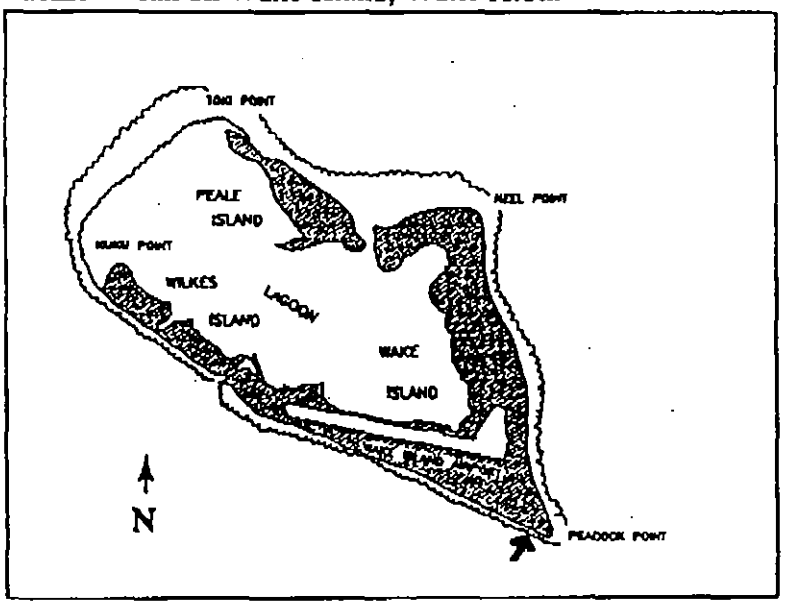
Sewage Outfall

Description of Sewage Outfall

The sewage outfall on Wake Island is located approximately 300 feet (90-m) offshore of the southern side of Peacock Point in the Pacific Ocean (Figure 2.). Sewage is gravity fed through a 10-inch (25-cm) diameter outfall pipe, visible at the shoreline and discharged from this point source at a depth of 35 feet (11-m) into the ocean at the perimeter of the Atoll (USCHPPM 1998).

The carrier water for this sewage system is primarily brackish groundwater which is used to flush toilets. Per capita wastewater generation (including toilets, showers, food preparation, laundry) on Wake Island has been estimated at 46 gallons (174 liters) per person per day. The volume of sewage output through the outfall has been estimated to average approximately 5,000 gallons (18,925 liters) per day. This sewage is discharged in pulses, rather than continuously, occurring two to four times per day and lasting three to four minutes per pulse (USCHPPM 1998).

Figure 2. Location of Peacock Point sewage outfall into the Pacific Ocean on Wake Island, Wake Atoll.



Application of the U.S. Environmental Protection Agency computer dilution model, PLUMES, used to predict pollutant mixing zone sizes (expressed as the radial distance from the end of the discharge pipe to the zone boundary) based on the physical and chemical characteristics of the discharges compared to federal and State of Hawaii water quality criteria, reported the following model outputs for the sewage discharge (based on a sewage discharge rate of 590 gallons [2,233 liters] per minute (USCHPPM 1998):

- the predicted "zone of initial dilution" (ZID) size was 5.5 m (18 feet);
- chronic mixing zones for copper, mercury and ammonia were contained within the ZID;
- chronic mixing zone for phosphorous was 447 m (1,466 feet);
- chronic mixing zone for nitrogen was 517 m (1,696 feet);
- acute mixing zones for copper and ammonia were contained within the ZID;
- applying State of Hawaii water quality criteria, total nitrogen had a mixing zone of 870 m (2,854 feet).

Description of Terrestrial Habitat and Resources at Sewage Outfall

The shoreline in the vicinity of the location where the sewage outfall enters the ocean on Wake Island is an exposed, high energy, open ocean shoreline subject to constant wave action. The shoreline substrate is a consolidated calcium carbonate formation with a clearly visible compositional matrix of long-dead reef corals and mollusk shells such as giant clams (*Tridacna maxima*) and turban shells (*Turbo argyrostoma*). This cement-like formation extends from the high water mark inland for approximately 75 feet (23 m) and has a variable and irregular surface

with depressions and crevasses providing tidepool habitat within the intertidal and the wave splash zones. Farther inland beyond this limestone pavement formation is a beach composed of large rubble from weathered and eroded reef corals and mollusk shells.

The vegetation line begins at the upper margin of this rubble beach beyond the wave surge zone. The plant community here appears transitional or disturbed. Dominant plants include young ironwood trees (*Casuarina equisetifolia*), naupaka (*Scaevola taccada*) and beach heliotrope (*Tournefortia argentea*). Ground cover, where present, is comprised of beach morning glory (*Ipomea pes-caprae*) and the native grass *Lepturus repens* and the exotic sedge *Fimbristylis cymosa*.

The overall quality of the habitat in the vicinity of the sewage outfall is diminished by its proximity to the active landfill/trash burn area immediately shoreward of the outfall. Bulldozer tracks were evident in the beach rubble. Debris originating from this landfill/trash burn area, including large pieces of metal, wire, plastic and glass, perhaps mobilized by wind or wave action, was widely scattered along this immediate shoreline. The seaward margin of the landfill/trash burn area has been recently pushed as far as the vegetation line, removing all the vegetative buffer between the landfill and the open ocean shoreline. The large numbers of flies (family Muscidae) associated with the landfill/trash burn area become pestilential throughout the immediate area when the trade winds abate.

This shoreline, particularly the intertidal zone, supports a large number of grapsid crabs of all size classes up to large individuals with 2-inch (5-cm) wide carapaces. An average of eight individual crabs were visible in the intertidal zone per linear yard (1 m) of shoreline in the area of the sewage outfall during this survey. Scattered individual land hermit crabs (*Caenobyta* spp.) were observed in shady, sheltered areas of the limestone formation.

No avian activity (including flying, roosting/resting, feeding or nesting) was observed during this survey in, near or around the vicinity of the sewage outfall. White terns (*Gygis alba*) and black noddies (*Anous minutus*) were observed during this survey elsewhere along the Wake Island shoreline feeding in nearshore ocean waters.

Effects of Sewage Outfall on Terrestrial Resources

No overt evidence of detrimental impacts to nearby terrestrial habitats and living resources from the sewage outfall could be discerned during this survey. The terrestrial shoreline habitat in the vicinity of the sewage outfall, however, has been visibly degraded by operations and conditions at the adjacent active landfill/trash burn area.

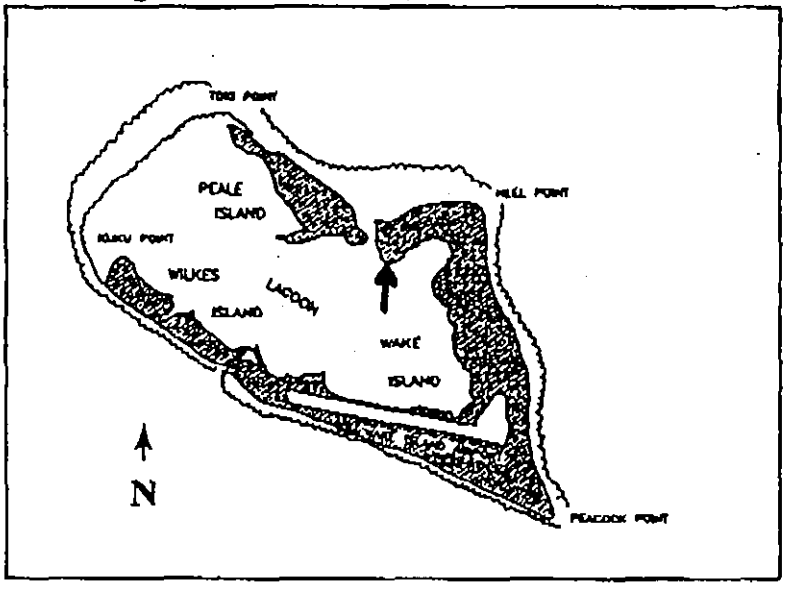
Power Plant Outfall

Description of Power Plant Outfall

The Power Plant outfall on Wake Island is located directly on the lagoon shoreline at the northwestern end of the island near the Peale-Wake channel immediately shoreward of the

Power Plant (Figure 3.). This Power Plant has been in uninterrupted operation since 1957 (Timmons pers. comm.). A continuous (*i.e.*, 24 hours per day, 7 days per week) discharge of heated (30.96°C; 87.73°F) brackish water is emitted as cooling water from the Power Plant directly onto the lagoon shoreline from a 24-inch (70-cm) diameter pipeline. This cooling water originates from three shallow, brackish water, on-site wells and is discharged from the outfall onto the lagoon shoreline at an estimated rate of 1.22 million gallons (4.62 million liters) per day (USCHPPM 1998).

Figure 3. Location of the Power Plant cooling water outfall into the lagoon on Wake Island, Wake Atoll.



Approximately 50 feet (15 m) west of the pipeline outfall along the lagoon shoreline, a secondary discharge of cooling water is emitted onto the lagoon shoreline. This cooling water flows spring-like through the rocky rubble comprising the landfilled shoreline at this location. Workers at the Power Plant stated that this secondary outfall is called the "bypass outfall" for the Power Plant cooling water. This secondary outfall was not discussed in the USCHPPM (1998) report.

Application of the U.S. Environmental Protection Agency computer dilution model, PLUMES, used to predict pollutant mixing zone sizes (expressed as the radial distance from the end of the discharge pipe to the zone boundary) based on the physical and chemical characteristics of the discharges compared to federal and State of Hawaii water quality criteria, reported the following model outputs for the Power Plant cooling water discharge (based on a discharge rate of 847 gallons [3,206 liters] per minute (USCHPPM 1998):

- the discharge did not create a "zone of initial dilution" because of the nature of the shoreline outfall;

- the discharge's thermal load required a mixing zone of 40 m (131 feet) to meet temperature water quality criteria;
- no other pollutants exceeded water quality criteria.

Description of Terrestrial Habitat and Resources at Power Plant Outfall

The shoreline in the vicinity of the two discharges (including the 24-inch [70-cm] open culvert and the nearby "bypass culvert") comprising the Power Plant outfall is a man-made, landfilled shoreline on the lagoon in an active operational and residential portion of the northwestern part of Wake Island. To the west of the outfall, the shoreline is landfilled limestone rubble interspersed with exposed human debris including electronic equipment, hollow blocks, construction rubble and old pipes. Immediately to the east of the outfall, the shoreline has been hardened with cement bags arranged in a sloping terrace designed to protect a nearby house from wave action.

The shoreline vegetation in the immediate vicinity of the two outlets comprising the Power Plant outfall is more an association of individual, cultivated trees rather than a defined natural plant community. These trees include mature specimens of: coconut (*Cocos mucifera*), beach heliotrope (*Tournefortia argentea*), ironwood (*Casuarina equisetifolia*), sea grape (*Cocoloba uvifera*) and *Pemphis acidula*.

Domestic chickens (*Gallus gallus*) are the dominant, if not exclusive, avifauna using the shoreline habitat in the vicinity of the Power Plant outfall. Two large chicken coops sit on the shore just above the high tide line 10 feet (3 m) west of the open culvert. One census during this survey counted 36 chickens in the vicinity. These chickens were observed to range freely outside the enclosures, feed along the shoreline and walk through the discharged Power Plant cooling water. Table scraps from the dining hall, including rice, meat bones and vegetables are deliberately and regularly disposed on the shoreline by residents as forage for the chickens.

These regularly discarded table scraps also support a large population of land hermit crabs (*Caenobyta* spp.). Dense assemblages of these hermit crabs were observed along this shoreline concentrated in sheltered areas within tree roots and under construction debris.

Effects of Power Plant Outfall on Terrestrial Resources

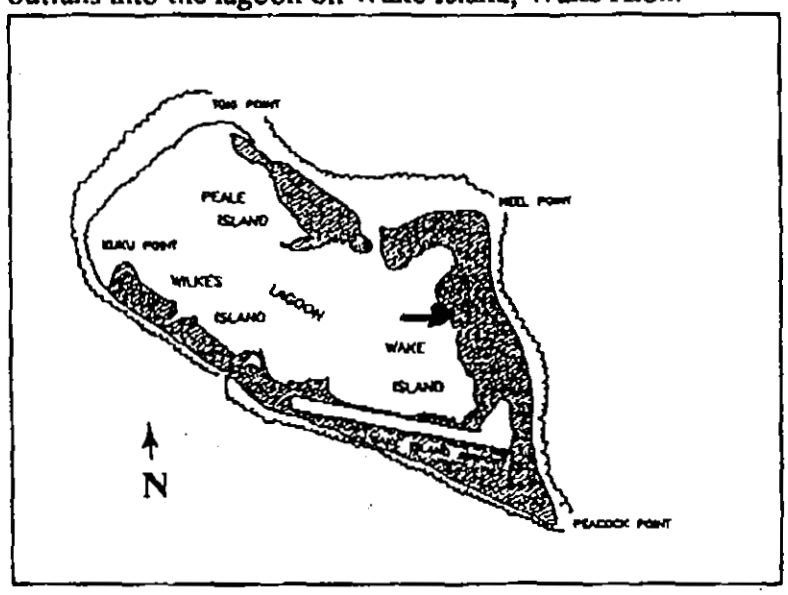
The terrestrial habitat and resources in the vicinity of the Power Plant outfall have been modified by historical and current operational activities and the area is essentially urban/industrial in character. The proximity of resident housing, the presence of large numbers of domestic chickens and the routine disposal of dining hall table scraps appear to be the predominate influences affecting the character and quality of the terrestrial habitat and resources at the Power Plant outfall. No overt evidence of detrimental impacts to nearby terrestrial habitats and living resources, exclusively attributable to discharges from the Power Plant outfall, could be discerned during this survey.

Desalination Plant Outfall

Description of Desalination Plant Outfall

The Desalination Plant outfall on Wake Island is located directly on the lagoon shoreline on the north central part of the Island (Figure 3.) Three 8-inch (20-cm) diameter open culverts are spaced approximately 50-feet (15-m) apart along the lagoon shoreline immediately shoreward of the Desalination Plant. These three culverts each discharge directly onto the shoreline at the head of a small, shallow bight (approximately 100 yards [91 m] wide and 200 yards [182 m] deep) with restricted water circulation along the lagoon shoreline. This wastewater discharge was not examined by USCHPPM (1998).

Figure 4. Location of the three Desalination Plant brine outfalls into the lagoon on Wake Island, Wake Atoll.



This Desalination Plant, employing a flash evaporation technology, has not been used since 1994 because rainwater, captured by the catchment system and then stored, has provided sufficient quantities of potable water to satisfy current demand (Timmons pers. comm.). No wastewater discharge was observed emitting from these pipes during this survey. In August 1998, two months after this survey, a decision was made to shut down the Desalination Plant. This facility is no longer being maintained in an operable condition (Gunter pers. comm.).

Description of Terrestrial Habitat and Resources at Desalination Plant Outfall

The shoreline vegetation in the vicinity of the three pipes comprising the Desalination Plant outfall on Wake Island, like the shoreline vegetation in the vicinity of the Power Plant outfall, is more an association of individual, cultivated trees rather than a defined natural plant community. These trees include mature specimens of: beach heliotrope (*Tournefortia argentea*), false kamani (*Terminalia catappa*) and ironwood (*Casuarina equisetifolia*). A less disturbed and more typical *Pemphis-Sesuvium* community (characterized by *Pemphis acidula* and sea purslane

[*Sesuvium portulacastrum*]) dominates the shoreline of the small bight in both directions starting approximately 50 feet (15 m) on either side of the Desalination Plant outfall. Ground cover in the vicinity of the outfall is primarily ironwood leaf litter and occasional patches of sea purslane.

The shoreline substrate is composed of fine-grained sediments and small limestone rubble. Because the shoreline is sheltered at the head of a small, narrow bight in the lagoon, wave action and associated erosion and deposition is minimized. Land hermit crabs (*Caenobyta* spp.) are numerous along the shoreline, using the roots of mature trees for daytime shelter. The intertidal area in the shallow bight into which the outfall discharges would appear to be favorable shorebird habitat although none of these migrants or winter residents were observed at the Atoll during this survey.

Fine-grained sediments in the shallow bight into which the three Desalination Plant outfalls empty visibly appear anaerobic. Wave action and water circulation within this narrow and shallow bight is limited although the entire bight apparently flushes with each ebb tide. These dark, anaerobic sediments in this bight were unlike any observed elsewhere around the Atoll, including other sheltered lagoon shorelines. Since the Desalination Plant has not been in operation for the past five years, it seems unlikely that current operations are a factor in the anaerobic quality of these sediments.

White terns (*Gygis alba*) and brown noddies (*Anous stolidus*) were observed hovering around and resting in the branches of the mature ironwood trees in the immediate vicinity of this outfall. No nesting or feeding activity by these two species, or any other seabird species, was observed in this area during this survey.

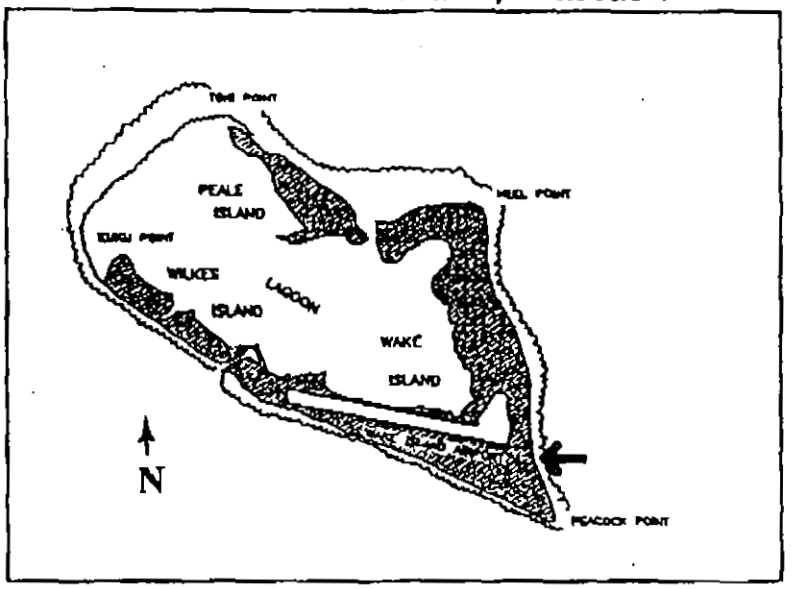
Effects of Desalination Plant Outfall on Terrestrial Resources

The Desalination Plant has not been used since 1994 and is currently not being maintained in an operable condition. There has been no discharge of wastewater from the Desalination Plant outfall for approximately 5 years. No overt evidence of detrimental impacts to terrestrial habitats and living resources, exclusively attributable to discharges from the Desalination Plant outfall could be discerned during this survey.

Runway Stormwater Runoff Outfall

The runway stormwater runoff outfall is located directly on the ocean shoreline of Wake Island immediately east of the runway (Figure 5). A pipe carrying episodic discharges of stormwater runoff from the runway discharges directly onto the ocean shoreline on the southeastern part of Wake Island. This point discharge was not examined by USCHPPM (1998).

Figure 5. Location of the Runway Stormwater Runoff Outfall into the Pacific Ocean on Wake Island, Wake Atoll.



The shoreline onto which the runway stormwater runoff outfall discharges is an exposed, high-energy, windward, open ocean shoreline composed of weathered limestone rubble and mollusk shells (including giant clams [*Tridacna maxima*] and turban shells [*Turbo argyrostoma*]). The only vegetation in the vicinity of the outfall are occasional, small (less than 3-feet [1-m] tall) beach heliotrope (*Tournefortia argentea*).

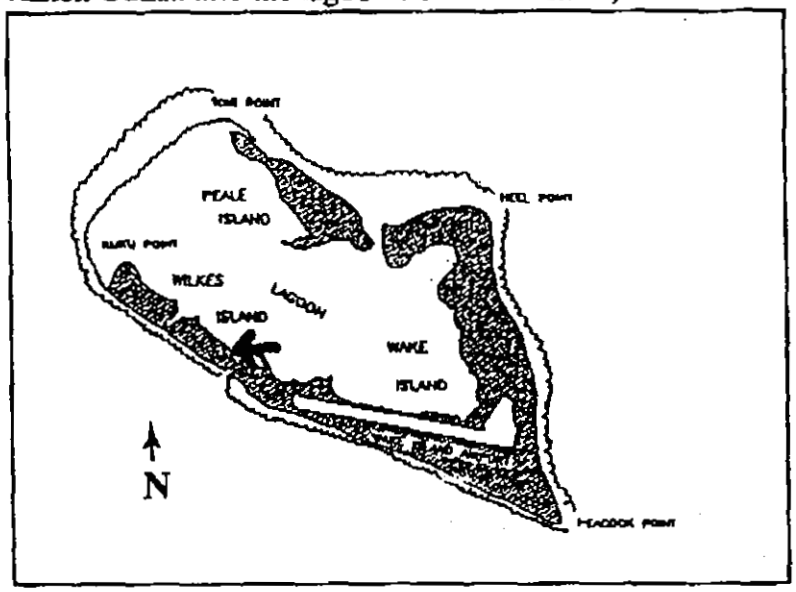
It seems unlikely that episodic discharges of stormwater runoff from the runway through this outfall onto the ocean shoreline would detrimentally impact the nearby terrestrial habitat and living resources. Such discharges of fresh rainwater, limited to occasional storm events, onto this windward shoreline exposed to constant wave action, would be quickly dissipated.

1800 Area Tank Farm Stormwater Runoff Outfall

The 1800 Area Tank Farm stormwater runoff outfall is located on the lagoon shoreline toward the eastern end of Wilkes Island (Figure 6). Two 24-inch (70-cm) diameter culverts, with flap valves on the distal ends, discharge stormwater runoff, captured within the Tank Farm containment basin, directly onto the lagoon shoreline in the intertidal zone. This point discharge was not examined by USCHPPM (1998).

The shoreline in the vicinity of the 1800 Area Tank Farm stormwater runoff outfall is a steeply sloped lagoon shoreline composed of limestone boulders, rubble and sand. Entangled debris and erosional evidence of the February 11, 1998 flooding event still remain in this area. Vegetation in this area is primarily young ironwood trees (*Casuarina equisetifolia*), *Pemphis acidula*, the native grass *Lepturus repens*, the exotic sedge *Fimbristylis cymosa* and occasional beach morning glory (*Ipomea pes-caprae*).

Figure 6. Location of the 1800 Area Tank Farm Stormwater Runoff Outfall into the lagoon on Wilkes Island, Wake Atoll.



It seems unlikely that episodic discharges of stormwater runoff from the 1800 Area Tank Farm containment basin through this outfall onto the lagoon shoreline would detrimentally impact the nearby terrestrial habitat and living resources. Such discharges of fresh rainwater onto this shoreline, limited to occasional storm events, would be quickly dissipated. If, however, spilled oils and fuels within the 1800 Area Tank Farm containment basin are mobilized and discharged along with the stormwater (*e.g.*, a catastrophic tank failure during a typhoon), such discharges could be expected to have certain predictable detrimental consequences to nearby terrestrial habitats and living resources.

Recommendations

Although outside the scope of this focused survey, observations made during the course of this survey provide a corollary opportunity to offer certain informed recommendations to enhance terrestrial habitat and wildlife stewardship and management at Wake Atoll. These recommendations are exclusively personal professional opinion and are herein provided as a discretionary option for consideration:

1) The dense, arboreal-nesting colony of black noddies (*Anous minutus*) and brown noddies (*Anous stolidus*) in the ironwood forest area on the windward side of the northeastern end of Wake Island could be actively managed as another "Bird Sanctuary" area at the Atoll. Among those actions which might be considered in the management of this area for wildlife purposes are: informative/interpretative signage, predator control, tree trimming/cutting restrictions, restricted or partially restricted human access, and briefings for transient personnel.

2) Feral cats, evident on all three islands at the Atoll, are successfully reproducing and are conspicuously predating on nesting seabirds. Consideration should be given to undertaking a broader or more effective feral cat control and/or eradication program at Wake Atoll.

3) A qualified examination of the potential risks, if any, to native flora and fauna posed by the presence of free-ranging domestic chickens and domestic pigeons should be considered. Some of the domestic chickens have gone feral and are apparently successfully reproducing on Wake Island and Peale Island. This examination should compare the recreational, cultural, historical and subsistence values provided to the resident human population by the presence of these exotic species with the impacts, if any, their presence is having or could have on native species and habitat at the Atoll.

4) At least three species of resident seabirds, including white tern (*Gygis alba*), black noddy (*Anous minutus*) and brown noddy (*Anous stolidus*), use the mature ironwood trees on Wake Island for nesting. If, for maintenance or other operational reasons, these mature ironwood trees are trimmed, cut or removed, the affected and nearby trees should be closely inspected beforehand to avoid disturbance or destruction of seabird nests.

References

Bryan, E.H. 1926. Insects of Hawaii, Johnston Island and Wake Island. Bernice P. Bishop Museum Bulletin 31, Tanager Expedition Publication No. 3; Honolulu, Hawaii; 94 pp.

Bryan, E.H, Jr. 1959. Notes on the Geography and Natural History of Wake Island. *Atoll Research Bulletin* 66: 1 - 22; The Pacific Science Board, National Academy of Sciences - National Research Council, Washington, DC.; dated May 15, 1959.

Gunter, Gary. Personal Communication. Environmental Protection Specialist, Department of the Army, U.S. Space and Missile Defense Command, Huntsville, AL 35807-3801.

Henz, Mark. Personal communication. Logistics Manager, Chugash Development Corporation, Wake Atoll, Mid-Pacific 96898.

Herbst, Derral R. 1994. Botanical Survey Report for Wake Atoll Outdoor Recreational Plan. Unpublished report prepared for Wilson Okamoto & Associates, Inc., Honolulu, Hawaii; 15 pp. + map.

Herbst, Derral R. Personal communication. Botanist, Bernice P. Bishop Museum, Honolulu, Hawaii.

Hitchcock, Lou. 1998. High-Water Flooding on 11 February 1998. Unpublished manuscript

dated March 16, 1998. Air Operations Specialist, Chugash Development Corporation, Wake Atoll, Mid-Pacific 96898; 3 pp. + 1 map.

Holck, CAPT Alan R. 1993. Consultative Letter, AL-CL-1993-0002, Pest Management Program Review, Wake Island Air Force Station, Pacific Trust Territories. Memorandum from Det 3 Armstrong Laboratory/ECB (Capt Holck, DSN 634-1769) to 15 CES/DEV, Attn: 1Lt Eldridge, 75 H street, Hickam AFB, HI 96853-5300; dated February 22, 1993; 5 pp. + 3 attachments.

Johnson, B.R. (Billy Ray). Personal communication. Facilities Engineering Manager, Chugash Development Corporation, Wake Atoll, Mid-Pacific 96898.

Johnson, B.R. 1996. Wake Island Launch Center, Land Management Plan. Prepared by Chugach Development Corporation, Anchorage, AK, for U.S. Army Space and Strategic Defense Command, Huntsville, AL; Contract no. DASG60-96-C-0023, Item no. A00M; 29 March 1996; unnumbered pages.

Jones, H. Lee. 1993. Ornithological Survey Report for Environmental Assessment for Long-Term Activities at Wake Atoll. Report prepared by: MBA International, 1188 Bishop Street, Suite 3411, Honolulu, Hawaii 96813-3314; April 1993; 19 pp.

Jones, H. Lee. 1995. Bird Observations on Wake Atoll. *Western Birds* 26(2): 65 - 75.

Pratt, H. Douglas, Phillip L. Bruner and Delwyn G. Berrett. 1987. A Field Guide to the Birds of Hawaii and the Tropical Pacific. Princeton University Press, Princeton, New Jersey 08540; 409 pp. + 45 plates.

Rowland, Craig M. 1989. Biological Survey, Wake Island Starlab Project Sites. Wake Island Starlab Report, April 4 - 12, 1989. U.S. Fish and Wildlife Service, P.O. Box 51067, Honolulu, Hawaii 96850; 25 pp.

Schreiber, Ralph W. and Vernon M. Kleen. 1968. Preliminary Report, Wake Island Survey, 1 - 15 March 1968. Unpublished report; 6 pp.

Timmons, John ("Mike"). Personal communication. Project Manager, Chugash Development Corporation, Wake Atoll, Mid-Pacific 96898.

U.S. Air Force (USAF). 1994a. Environmental Assessment, Transfer and Reuse of Wake Island Airfield. U.S. Air Force, HQ PACAF/CEVP, Hickam AFB, Hawaii; August 1994. Sectionally numbered pages + appendices.

U.S. Air Force (USAF). 1994b. Management Action Plan, Wake Island Airfield. Prepared by: U.S. Air Force, 15th Air Base Wing, Installation Restoration Program, Department of the Air

Force, 15 CES/CEVR, 75 H Street, Hickam Air Force Base, Hawaii 96853-5233; December 1994; sectionally numbered pages + appendices.

U.S. Army Center for Health Promotion and Preventive Medicine (USCHPPM). 1998. Wastewater Management Study, Report No. 32-EE-7847-98, Wake Island Mixing Zone Evaluation, Phase I, 9 - 27 February 1998. Department of the Army, U.S. Army Center for Health Promotion and Preventive Medicine, Aberdeen Proving Ground, MD; 15 pp. + appendices.

U. S. Fish and Wildlife Service (USFWS). 1998. Pacific Islands (excluding Hawaii) Plants and Animals: Listed, Proposed or Candidate Species, as Designated under the U.S. Endangered Species Act, Updated November 5, 1998; unpublished report prepared by U.S. Fish and Wildlife Service, Honolulu, Hawaii; 4 pp.

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Appendix C

BASELINE MARINE BIOLOGICAL SURVEY
PEACOCK POINT OUTFALL AND OTHER POINT-SOURCE DISCHARGES
WAKE ATOLL, PACIFIC OCEAN

prepared by

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March 1999

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INTRODUCTION

Wake Atoll, located approximately 2,100 miles west of Honolulu at 19° 18' North Latitude and 166° 35' East Longitude, is one of the most isolated atolls in the world. The land closest to Wake is Taongi Atoll in the Marshall Islands, which is approximately 300 miles (mi) to the south. Wake is a possession of the United States. It is owned by the U.S. Air Force and leased to the U.S. Army Space and Missile Defense Command (SMDC) in support of the Ballistic Missile Defense Organization (BMDO). The facility is operated by Chugach Development Corporation (CDC), under contract to the SMDC, as a target missile launch complex. The atoll also serves as a refueling and logistical stop for various military and military-contracted aircraft. The atoll is inhabited by approximately 25 U.S. citizens and 100 foreign workers from Thailand, and it hosts a transient population that fluctuates for brief periods throughout the year.

The emergent land area of Wake Atoll is approximately 1,828 acres (ac). This area consists of three low-lying coral islets (Wake, Peale and Wilkes) that border the north, south, and east sides of a shallow lagoon. The western side of the atoll is comprised of a reef flat that is partially exposed at low tide. The area of submerged coral-reef habitat at Wake Atoll is approximately 7,907 ac (Hunter 1995). At the surface of the ocean, the atoll is approximately 4.5 mi long by 2.0 mi wide. The installation has only one sewage outfall pipe, which is located near Peacock Point at the southeastern corner of the atoll. Solids in the raw sewage are allowed an opportunity to settle within a series of basins before the liquids are allowed to pass, untreated, through the outfall pipe into the marine environment. The end of the outfall pipe is located approximately 70 feet (ft) from shore, at a depth of 35 ft. Normally, the effluent is discharged through the pipe for approximately 15 minutes, twice daily.

On behalf of the SMDC, biologists from the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) were invited to Wake Atoll in June 1998. The purpose of the visit was to conduct baseline marine biological surveys in the vicinity of the Peacock Point outfall pipe and to examine the sites of other point-source discharges to the marine environment (*i.e.*, power plant, desalinization plant, and stormwater outlets). The biologists were asked to (1) generally characterize the coral-reef habitats within the vicinity of the outfall, (2) document the primary species of reef fishes, corals, other macroinvertebrates, and algae that exist in those habitats, and (3) investigate whether the reef communities at the other sites appeared to have been impacted by the discharges. This report contains the results of these surveys.

SURVEY METHODOLOGY

For the purposes of the Peacock Point Outfall survey, six stations were established on the seaward reef slope along the southern exposure of the atoll (Figure 1). These included one station upcurrent of the outfall (W-1), a station that was centered at the end of the outfall pipe (W-2), two stations downcurrent of the outfall (W-3 and W-4), and two control stations that were downcurrent and estimated to be outside the influence of the outfall (W-5 and W-6).

Station W-1 was located at coordinates 19° 16.120' N and 166° 39.318' E, approximately 500 ft southeast (upcurrent) of the outfall pipe and within the discharge's Zone of Mixing (ZOM). Station W-2 was located at coordinates 19° 16.190' N and 166° 39.262' E, at the end of the outfall pipe and at the center of the discharge's Zone of Initial Dilution (ZID), which was estimated to have a radius of approximately 18 ft from the end of the pipe. Station W-3 was located at 19° 16.213' N and 166° 39.139' E, within the ZOM approximately 500 ft northwest (downcurrent) of the pipe. Station W-4 was located at coordinates 19°16.359' N and 166° 38.858' E, near the downcurrent limit of the ZOM approximately 1640 ft from the end of the pipe. Station W-5 was located at 19°16.819' N and 166° 37.710' E, approximately 1.5 mi northwest of the pipe. Finally, Station W-6 was located at 19°17.853' N and 166° 35.902' E, approximately 4.5 mi northwest of the pipe.

A standardized Rapid Ecological Assessment (REA) technique was used to record observations on species and habitat conditions at each station. The technique included timed 30-minute scuba dives from a 28-ft boat that was provided by the SMDC and operated by CDC staff. During each dive, biologists swam over the reef in a meandering fashion with a minimum amount of backtracking. Species of reef fishes, corals, other macroinvertebrates, and algae were recorded. Emphasis was given to identifying conspicuous, diurnally active species. As a result, small, cryptic, and nocturnally active species are under represented in the data. For molluscs, many species identifications were based on empty shells. Observations on the presence of sea turtles were made opportunistically.

The relative abundances of observed species were ranked as Abundant, Common, Occasional, or Rare. These categories were defined as follows: Abundant (A) = the species contributes substantial abundance or coverage (25+% of total) or is very numerous in the survey area or is dominant within parts of the survey area; Common (C) = the species is present as several or more individuals or as a few larger colonies or is conspicuous in only one or a few parts of the survey area; Occasional (O) = the species is uncommon or present only as a few individuals or as a few large colonies but not contributing substantially to abundance or substrate coverage anywhere within the survey area; and Rare (R) = the species is present on the basis of only one individual seen within the survey area.

In addition, a general description of the reef habitat at each station, including the percent composition of reef substrate cover, was recorded. The latter was calculated from 50 observation points that were evenly spaced along a 165-ft transect line located at a depth of 35 ft at each station. Seven general types of cover were used to characterize the reef substrate including Hard Coral, Soft Coral, Coralline Algae, Macroalgae, Turf-Covered Boulders, Coralline-Algal Rubble, and Sand.

The survey team responsible for the investigation included USFWS biologists Michael Molina (corals and reef substrate cover) and Kevin Foster (noncoral macroinvertebrates and algae) and NMFS biologist John Naughton (fishes and station habitat descriptions). The identity of certain species of algae were confirmed by Dr. Isabella Abott, Department of Botany, University of Hawaii.

RESULTS

Peacock Point Outfall

The types and percentages of substrate cover recorded at a depth of 35 ft at each of the six stations established for the Peacock Point outfall survey are given in Table 1. Lists of the dominant species of marine organisms observed at the six stations are presented in tables 2 through 7. These include reef fishes (Table 2), corals (Table 3), molluscs (Table 4), echinoderms (Table 5), other macroinvertebrates (Table 6), and macroalgae (Table 7).

Station W-1:

Habitat

This station is located in a high energy environment near the eastern tip of the atoll, which is exposed to the prevailing wind and swell. The reef slopes seaward at 25° to 45° and drops precipitously from approximately 30 to 60 feet. Steep ridges and deep channels form an irregular substrate that is comprised of coral (44%), macroalgae (22%), coralline algae (12%), sand (12%), soft coral (8%), and coralline-algal rubble (2%). Relatively high coral cover and bottom relief provided excellent habitat for a variety of marine life. Water clarity was relatively good with visibility being estimated to be approximately 100 ft. No evidence of algal fouling was observed.

Biota

Seventy-seven reef-fish species belonging to 21 families were observed. Most of these species were wrasses, surgeonfishes, parrotfishes, and butterflyfishes. The most abundant fish species included the surgeonfish *Zebrasoma flavescens*, the butterflyfishes *Chaetodon ephippium* and *C. ulietensis*, the damselfish *Chromis acares*, the snapper *Lutjanus monostigmus*, the goatfish *Mulloides vanicolensis*, the squirrelfish *Sargocentron spinniferum*, the soldierfish *Myrpristis murdjan*, and schools of the rudderfish *Kyphosus cinerascens*. Twenty-one species of corals from eight families were represented. Most of these corals belong to the families Faviidae and Acroporidae. The most abundant corals included *Pocillopora eydouxi* and *Porites lutea*. Twenty-two species of other macroinvertebrates were observed, including six molluscs, six echinoderms, and ten species from other phyla. The sea urchins *Echinometra mathaei* and *Echinostrephus* sp. were abundant. Twelve species of macroalgae, primarily belonging to the phyla Chlorophyta (green algae) and Phaeophyta (brown algae), were recorded. The most abundant algae were the blue-green alga *Lyngbya majuscula* and the brown alga *Dictyota divaricata*. An unidentified alga of the genus *Dictyota* was particularly abundant in the reef channels.

Station W-2:

Habitat

This station is located in a relatively low to moderate energy environment, which results from the natural protection from wind and swell afforded to it by the orientation of the atoll. The reef slopes gradually seaward, and widely spaced coral-covered pinnacles are present at depths from 35 to

60 ft. The pinnacles provided the best habitat for marine organisms. Dense swarms of newly recruited larval fish and suspended algal particles contributed to relatively poor water clarity with visibility estimated to be approximately 50 ft. In general, the substrate is comprised of sand (52%), coralline-algal rubble (30%), coralline algae (8%), coral (6%), and macroalgae (4%). No signs of algal fouling were observed although debris (*e.g.*, metal pipes, valves, wire, and parts of netting) clutters the bottom in the vicinity of the outfall.

Biota

Fifty-nine species of reef fish from nineteen families were observed. Most of these species were surgeonfishes, wrasses, parrotfishes, and butterflyfishes. The most abundant fish species included the surgeonfishes *Acanthurus triostegus* and *Ctenochaetus hawaiiensis* and the damselfish *Chromis acares*. Thirteen species of corals from six families were recorded. Most of these corals belong to the families Faviidae and Acroporidae. The most abundant corals included *Pocillopora eydouxi* and *Porites lutea*. Twenty three species of other macroinvertebrates were observed, including eight molluscs, ten echinoderms, and five species from other phyla. None of these species were considered abundant. Sixteen species of macroalgae, primarily belonging to the phyla Chlorophyta (green algae) and Phaeophyta (brown algae), were recorded. The most abundant alga present was the blue-green alga *Lyngbya majuscula*.

Station W-3:

Habitat

This station is also located in a relatively low to moderate energy environment due to it being protected from wind and swell by the atoll. The reef slopes gradually seaward with coral-covered pinnacles being denser than at Station W-2. Again, the pinnacles provided the best habitat for marine life, and suspended algal particles and larval fish contributed to relatively poor water clarity. Visibility at this station was fair and estimated to be approximately 65 ft. The substrate is generally comprised of sand (36%), coralline-algal rubble (28%), macroalgae (26%), turf-covered boulders (8%), and coral (2%). No signs of algal fouling were observed although some metal debris was observed on the bottom.

Biota

Fifty-eight species of reef fish within eighteen families were observed. The majority of these species were wrasses, butterflyfishes, parrotfishes, and surgeonfishes. The most abundant fish species included the surgeonfish *Ctenochaetus hawaiiensis* and the damselfish *Chromis acares*. Observed corals included 15 species belonging to six families, with the family Faviidae being most well represented. The corals *Favia pallida*, *Pocillopora eydouxi*, and *Porites lutea* were most abundant. Thirteen species of other macroinvertebrates were observed, including two molluscs, five echinoderms, and six species from other phyla. None of these species were considered abundant. Twelve species of macroalgae, primarily belonging to the phyla Chlorophyta (green algae) and Phaeophyta (brown algae), were recorded. The blue-green alga *Lyngbya majuscula*, the green alga *Halimeda opuntia*, the brown alga *Dictyota divaricata*, and the same unidentified species of *Dictyota* that was seen in the channels at Station W-1 were most abundant.

Station W-4:

Habitat

This station is also located in a relatively low to moderate energy environment. The reef drops sharply from 15 to 55 ft and from there slopes gradually seaward to a depth of approximately 90 ft with large pinnacles rising from the bottom. At 90 ft, the reef drops vertically to greater depths. Water clarity was fair with visibility estimated to be approximately 65 ft. The substrate at this station is comprised of coralline-algal rubble (38%), sand (26%), turf-covered boulders (16%), coral (14%), and macroalgae (6%).

Biota

Sixty-three species of reef fish belonging to 20 families were recorded. Most of these species were wrasses and surgeonfishes. The butterflyfish *Heniochus acuminatus* and the damselfishes *Chromis acares* and *C. agilis* were the most abundant species observed. Twenty-five species of coral from six families were seen. Most of these species belong to the families Faviidae and Acroporidae. *Favia pallida*, *Pocillopora eydouxi*, and *Porites lutea* were the most abundant corals. Twenty species of other macroinvertebrates were observed, including six molluscs, six echinoderms, and eight species from other orders. The giant clam *Tridacna maxima* was observed to be abundant. Three green sea turtles (*Chelonia mydas*) were seen at a depth of approximately 45 ft. Fourteen species of macroalgae, primarily belonging to the phyla Chlorophyta (green algae) and Phaeophyta (brown algae), were recorded. The blue-green alga *Lyngbya majuscula*, the green alga *Halimeda opuntia*, the brown alga *Dictyota divaricata*, and the same unidentified species of *Dictyota* that was seen in the channels at Station W-1 were most abundant.

Station W-5:

Habitat

Station 5 is located in a relatively low to moderate energy environment. A relatively wide reef shelf extends out from the shoreline and slopes seaward at an angle of approximately 20° from 5 to 15 ft in depth. From there, the reef drops sharply and levels at 55 ft before descending at an angle of approximately 30° to a depth of 90 ft. Below 90 ft, the reef drops sharply. High coral cover and vertical relief provides good habitat for marine life. Water clarity was good at this station with visibility estimated to be approximately 100 ft. The substrate is comprised of coral (54%), macroalgae (34%), coralline algae (10%), and soft coral (2%).

Biota

Sixty reef-fish species belonging to 19 families were observed. The majority of these species were surgeonfishes and wrasses. Only one fish species, the fairy basslet *Pseudanthias pascalus*, was considered abundant. Twenty-one species of coral within seven families were recorded, with the families Faviidae and Acroporidae being the most well represented. The corals *Favia pallida*, *Pocillopora eydouxi*, and *Porites lutea* were the most abundant species seen. Eighteen species of other macroinvertebrates, including five molluscs, seven echinoderms, and six species from other orders were observed. None of these species were considered to be abundant. Two adult *Chelonia*

mydas were observed at a depth of approximately 40 ft. Fourteen species of macroalgae, primarily from the phyla Cholorophyta (green algae) and Phaeophyta (brown algae), were identified at this station. The green alga *Halimeda opuntia*, the brown alga *Dictyota divaricata*, and the blue-green alga *Lyngbya majuscula* were the most abundant of these species.

Station W-6:

Habitat

This station is located in a relatively moderate energy environment. The reef gradually slopes seaward to 25 ft and then drops abruptly to 50 ft where it continues to descend at an angle of approximately 30° to a depth of 80 ft. Below 80 ft, the reef drops sharply into deeper water. Water clarity at this station was good with visibility estimated to be 100 ft. The substrate is comprised primarily of macro-algae (40%), coral (38%), coralline algae (10%), sand (8%), and coralline-algal rubble (4%).

Biota

Fifty-two species from eighteen families of reef fishes were seen at this station. Among these species, butterflyfishes, surgeonfishes, parrotfishes, and wrasses were most well represented. The most abundant species included the butterflyfish *Chaetodon lunula*, the parrotfish *Bolbometopon muricatum*, and the damselfish *Chromis acares*. Thirty-four species of coral within nine families were recorded. The majority of these species belong to the families Faviidae and Acroporidae. *Favia pallida*, *Pocillopora eydouxi*, and *Porites lutea* were the most abundant corals. Seventeen species of macro-invertebrates were observed. Among these species were three molluscs, six echinoderms, and eight species from other phyla. The crab *Trapezia* sp. 1 was particularly abundant at this location and could easily be found in the branches of the coral *P. eydouxi*. One green sea turtle was observed at a depth of approximately 55 ft. Eleven species of macroalgae, primarily from the phyla Chlorophyta (green algae) and Phaeophyta (brown algae) were represented. The green alga *Caulerpa peltata* was the most abundant algal species at this site.

Other Point-Source Discharges

Power Plant:

The power plant discharges cooling water into the lagoon. The substrate fronting the plant was primarily sand, with less than 5% coral cover. Cooling water was being discharged at an established point and from an unexpected second point located about 100 ft to the west. A smell similar to that of hydrogen sulfide emanated from both drainage streams, and metal debris littered the bottom and shoreline adjacent to the plant. The temperature of the discharge is cooler than the ambient temperature of the receiving water in the lagoon, and no evidence of thermal stress was observed. *Enteromorpha* sp., a green alga, was present in the drainage plume, and corals (*Pocillopora damicornis*), green algae (*Caulerpa peltata*) and giant clams (*Tridacna maxima*) were commonly observed on the surrounding lagoon substrate.

Desalinization Plant:

Although the desalination plant was inactive during the survey period, it also discharges cooling water into the lagoon when operational. The ambient water temperature surrounding the discharge point was estimated to exceed 100 ° Fahrenheit at the time of the survey. The substrate fronting the plant was primarily sand that appeared to lack the invertebrate and algal species commonly seen at other locations in the lagoon, and this may be evidence of natural thermal stress. The bottom sediments near the discharge were dark colored and possibly anoxic due to frequently stagnant water conditions. When mobilized, the sediments gave off a strong smell similar to that of hydrogen sulfide.

Airport Runway:

Stormwater from the airport is collected and discharged onto the shallow, seaward reef flat located off the eastern end of the runway. This reef flat appeared to be typical of other similar reef flats found on Wake, with relatively low coral density and no sign of algal fouling. Surgeonfishes (*Acanthurus sordidus* and *A. triostegus*), parrotfishes (*Scarus* sp.), seacumbers (*Holothuria* sp.), corals (*Pocillopera verrucosa* and *P. eydouxi*), algae (*Caulerpa* sp.), giant clams (*Tridacna maxima*), and rock crabs (*Grapsus* sp.) were observed at the outfall site. These species appeared to be in good health and and behaving normally. There was no sign of algal fouling.

Fuel Farm:

Stormwater collected at the fuel farm is discharged into the lagoon through three outlets. The algal community fronting these drains appeared normal, with no sign of algal fouling. Animal species casually observed at these discharge points included: flounders (*Bothus mancus*), butterflyfishes (*Chaetodon ariga*), mullet (*Crenimugil crenilabis*), giant clams (*T. maxima*), rock crabs (*Grapsus* sp.), octopus, tube worms, and bryozoans. All of the organisms observed appeared to be healthy and behaving normally.

Housing Area (near bridge between Wake and Peale islets):

The outlet appears to have been covered by sediments and is no longer operable.

DISCUSSION

A total of 122 species of reef fishes, 41 species of corals, 39 species of other macroinvertebrates, and 19 species of macroalgae were recorded at Wake Atoll during this survey. Undoubtedly, many more species among all groups are present at the atoll, but a more complete inventory was beyond the scope of the survey. None of the species observed are considered to be endemic to Wake. Marine endemism at Wake is expected to be low due to the atoll's downcurrent proximity to sources of planktonic larval recruitment. Although relatively isolated, Wake receives larvae transported by the North Equatorial Current and the Subtropical Countercurrent from reefs in the Marshall, Caroline, and Mariana islands. Nevertheless, overall marine species diversity at Wake is expected to be much lower than it is within these other island chains due to its more northern latitude. For some marine species, Wake's location is very near or at the northern limit of their known range.

Peacock Point Outfall

The survey results indicate that the marine resources at Wake are not at risk from exposure to the sewage effluent discharged at the Peacock Point Outfall. There did not appear to be any algal fouling present either at the outfall or at any of the other survey stations. Reef fish and macroinvertebrate behavior appeared normal at all survey stations. The relative abundances and distributions of these species did not appear to vary significantly among stations. Although coral species diversity appeared to be least at and immediately downcurrent of the outfall, this is likely the result of a paucity of suitable substrate for successful coral establishment at stations W-2, W-3, and W-4, where sand, rubble, and boulders made up between 64% and 82% of the substrate cover. Furthermore, no sign of degradation or decay of corals was seen at any of the stations within the ZID and ZOM. However, without quantitative analyses of potential contaminant bioaccumulation and biomagnification in the tissues of these organisms, it is difficult to be absolutely certain of health of these resources.

A dense mat of blue-green algae was observed on the reef flat between the outfall and the east end of Peacock Point, which is also the site of an old WWII dump that is still used. Although it does not appear that the outfall discharge is adversely impacting the adjacent reef, it is possible that the dump is having a deleterious effect. The continued presence of the algal mat may be the result of elevated iron levels contained in runoff from the dump, which contains a very large concentration of metal debris at the end of the point. If this is the case, it is possible that the algal mat may grow in size and possibly spread to lower energy subtidal areas. Due to the close proximity of the algal mat to the outfall, the possibility of the algal mat fouling the outfall is plausible.

Other Point-source Discharges

The results of our inspections of the reef at the other point-source discharge sites revealed no indication that either the reef habitats or the biotic communities they support have been degraded by the discharges. No algal fouling was seen at any of the discharge points. Also, the marine organisms present at each discharge point appeared to be healthy and behaving normally.

At the power plant, the temperature of the discharge is actually lower than the ambient receiving water temperature and thermal stress from the discharge seems unlikely However, the second discharge noted at the power plant may have indicated the existence of a break in the discharge pipe, and it was noted that this second discharge was causing some shoreline erosion. At the desalination plant, little marine life was seen near the discharge point. This is probably the result of naturally elevated water temperatures due to stagnant water conditions rather than due to a discharge since the plant is currently not active. The discharge points at the fuel farm and airport runway exhibited no signs of algal fouling, and the marine communities present appeared healthy and normal.

Recommendations

1. Remove the metal debris at the eastern end of the dump as soon as possible;

2. Monitor the effects of the metal removal-activities on the blue-green algal mat;

3. Monitor the general reef area downcurrent (southwest) of the dump for the establishment of similar colonies of blue-green algae;

4. Sample and analyze tissues from reef organisms near the outfall for the presence of PCBs, metals, dioxin, and other contaminants; and

5. Investigate the power plant's discharge pipe for breaks, and repair the pipe as soon as possible, if necessary.

REFERENCES

Colin, P.L. and Arneson, C. 1995. Tropical Pacific Invertebrates - A Field Guide to the Marine Invertebrates Occurring on Tropical Pacific Coral Reefs, Seagrass Beds and Mangroves. Beverly Hills, California: Coral Reef Press. 296 p.

Hunter, C.L. 1995. Review of Status of Coral Reefs Around American Flag Pacific Islands and Assessment of Need, Value, and Feasibility of Establishing a Coral Reef Fishery Management Plan for the Western Pacific Region. Final report prepared for the Western Pacific Regional Fishery Management Council. 30 p.

Myers, R.F. 1989. Micronesian Reef Fishes - A Practical Guide to the Identification of the Coral Reef Fishes of the Tropical Central and Western Pacific (2nd ed.). Agana, Guam: Coral Graphics. 298 p.

Randal, J.E. and Randal, H.A. 1987. Annotated checklist of the fishes of Enewetak Atoll and other Marshall Islands. In: D.M. Devaney, E.S. Reese, B.L. Burch, and P.Helfrich (eds.), The Natural History of Enewetak Atoll, Volume II, Biogeography and Systematics. U.S. Department of Energy, Office of Scientific and Technical Information, Oak Ridge, Tennessee. Pages 289-324.

Veron, J.E.N. 1993. Corals of Australia and the Indo-Pacific. Honolulu, Hawaii: University of Hawaii Press. 644 p.

Figure 1. Baseline Marine Biological Survey Stations, Peacock Point Outfall, Wake Atoll

Table 1. Substrate cover at each of six stations surrounding the Peacock Point Outfall, Wake Atoll, in June 1998. Values are expressed as the percentage of total cover contributed by each substrate type. Blanks in the table indicate that the respective substrate type was not recorded on the transect at a particular station. See text for additional details.

SUBSTRATE TYPE	Survey Stations					
	W-1	W-2	W-3	W-4	W-5	W-6
Hard Coral	44	6	2	14	54	38
Soft Coral	8				2	
Coralline Algae	12	8			10	10
Macroalgae	22	4	26	6	34	40
Turf-Covered Boulders			8	16		
Coralline-Algal Rubble	2	30	28	38		4
Sand	12	52	36	26		8
TOTAL	100	100	100	100	100	100

Table 2. Reef-fish species observed at six stations surrounding the Peacock Point Outfall, Wake Atoll, in June 1998. Relative abundance is indicated as A = Abundant, C = Common, O = Occasional, and R = Rare. Observed fish schools are indicated by an asterisk (*). Blanks in the table indicate that the respective species was not recorded at a particular station. See text for additional details.

FAMILY *Genus/species*	Survey Stations					
	W-1	W-2	W-3	W-4	W-5	W-6
CARCHARHINDIDAE (Requiem Sharks)						
Carcharhinus amblyrhynchos	R			R		
MYLIOBATIDAE (Eagle Rays)						
Aetobatis narinari	R					
MURAENIDAE (Moray Eels)						
Gymnothorax javanicus	R			R		R
CHANIDAE (Milkfish)						
Chanos chanos			R			C*
HOLOCENTRIDAE (Squirrelfishes, Soldierfishes)						
Myripristis berndti	C		O		C	
M. murdjan	A				C	
Neoniphon opercularis					O	
Sargocentrum spiniferum	A	O	O		C	
FISTULARIIDAE (Coronetfishes)						
Fistularia commersonii		R		O*		R
SERRANIDAE (Fairy Basslets, Groupers)						
Pseudanthias pascalus					A	A
Cephalopholis argus	C	C	C	C	C	C
C. urodeta			R	R		
Epinephelus fasciatus		R	R	R		O
E. merra	R			R	R	
E. microdon	R	R	R			R
E. tauvina	R		O		R	
E. hexagonatus	R					
CIRRHITIDAE (Hawkfishes)						
Paracirrhites arcatus	C	R	O	O	O	
P. forsteri		O	O	O	O	
P. hemistictus				R	R	

Table 2. (Continued)

FAMILY *Genus/species*	Survey Stations					
	W-1	W-2	W-3	W-4	W-5	W-6
CARANGIDAE (Jacks, Trevallies)						
Decapterus macarellus		C		O	C	
Carangoides orthogrammus			R			
Caranx lugubris	R	R				O
C. melampygus	O	C	C	C*	C*	O
C. sexfaciatus						C*
Scomberoides lysan		C*				R
Trachinotus bailloni						O
LUTJANIDAE (Snappers)						
Aphareus furca	R					R
Macolor niger	R					
Lutjanus fulvus	C	O	O	O	O	R
L. monostigmus	A	C	R	O	C	
LETHRINIDAE (Emperors)						
Monotaxis grandoculus	C	O	R	O	O	O
Lethrinus kallopterus				C		R
L. ramak	C	R	R			R
MULLIDAE (Goatfishes)						
Mulloides vanicolensis	A				O	
Parupeneus barberinus		R	O	R		
P. bifasciatus	C	O	O	O	O	O
P. multifasciatus	O		R		O	
PEMPHERIDAE (Sweepers)						
Pempheris oualensis					C	R
KYPHOSIDAE (Rudderfishes)						
Kyphosus bigibbus	O			O	R	O
K. cinerascens	A*	C	O	C		C
CHAETONDONTIDAE (Butterflyfishes)						
Chaetodon auriga	O		C	R		R
C. ephippium			R			R
C. lunula	A	C	C	C	O	A
C. lineolatus		R				
C. ornatissimus	O	O	R			O
C. oxycephalus			R			
C. quadrimaculatus	R	C	C	O	O	R
C. punctatofasciatus					R	
C. ulietensis		O		R	O	R
Hemitaurichthys thompsoni	A			A		
Heniochus acuminatus	R					

Table 2. (Continued)

FAMILY *Genus/species*	Survey Stations					
	W-1	W-2	W-3	W-4	W-5	W-6
POMACANTHIDAE (Angelfishes)						
Centropyge flavissimus	C	C	O	C	C	O
C. loriculus	R	O			R	
OPLEGNATHIDAE						
Oplegnathus punctatus	O				R	
POMACENTRIDAE (Damselfishes)						
Chromis acares	A	A	A	A	C	A
C. agilis	C	C	C	A	C	
C. vanderbilti	C		C			
Abudefduf saxatilis				C		
A. sordidus				O		
LABRIDAE (Wrasses)						
Cheilinus chlorourus	R	R	O		R	
C. undulatus	R	R	R	R		R
C. unifasciatus	O	R	R	O	R	
C. fasciatus	O					
Epibulus insidiator	O	O	O	R		R
Novaculichthys taeniourus				R		
Anampses caeruleopunctatus	R			R	R	
Coris aygula	R		R	O	R	R
Gomphosus varius	R	C	C		O	
Halichoeres hartzfeldii					R	
H. chrysus					O	
H. margaritaceus		O				O
H. melanurus	R					
Hemigymnus fasciatus	R	O		O	R	R
H. melapterus	R	R			R	
Stethojulis bandanensis	R			C		
Thalassoma amblycephalum	O		C	C	C	
T. lutescens		C	C	C	C	O
T. quinquevittatum					R	
Labroides bicolor					R	
L. pectoralis	R		R	R	R	
SCARIDAE (Parrotfishes)						
Bolbometopon muricatum	R	R		R		A
Cetoscarus bicolor	O					
Hipposcarus longiceps	O	O	O	R		

Table 2. (Continued)

FAMILY *Genus/species*	Survey Stations					
	W-1	W-2	W-3	W-4	W-5	W-6
SCARIDAE (continued)						
Scarus altipinnis			C	O		O
S. forsteni	C	C	C	C	C	C
S. frontalis		C	C			C
S. ghobban		O			C	
S. globiceps	O					
S. microrhinus	C		O		R	C
S. oviceps	O		R			R
S. rubroviolaceus	O	O				
S. sordidus	R				O	O
SPHYRAENIDAE (Barracudas)						
Sphyraena barracuda		R				R
ACANTHURIDAE (Surgeonfishes)						
Acanthurus achilles	R			C	C	C
A. blochii	O	O				
A. guttatus		C			C	
A. nigricauda		O	C		O	O
A. nigrofuscus		O		O	C	
A. nigroris	C	C	C	C	C	C
A. olivaceus	O	O	O			
A. triostegus	C	A	A	C	C	O
Ctenochaetus hawaiiensis	C	A	C	C	C	
C. striatus	C					O
Zebrasoma flavescens	A	C	C	C	C	O
Z. veliferum	O	O			R	
Naso hexacanthus	R			C*		
N. lituratus	C	O	C	C	C	O
N. unicornis			C			
ZANCLIDAE (Moorish Idols)						
Zanclus cornutus	O		R		R	
SIGANIDAE (Rabbitfishes)						
Siganus argenteus		R	R	O		
BOTHIDAE (Lefteye Flounders)						
Bothus mancus	R					

Table 2. (Continued).

FAMILY *Genus species*	Survey Stations					
	W-1	W-2	W-3	W-4	W-5	W-6
BALISTIDAE (Triggerfishes)						
Balistoides viridescens				R		
Melichthys niger	O	O		C		C
M. vidua	C	C	C	O	C	O
Rhinecanthus aculeatus			R			
R. rectangulus						
Sufflamen bursa	R	R	O	O		O
TETRAODONTIDAE (Puffers)						
Arothron meleagris				R		
A. stellatus				R		
Canthigaster amboinensis						
DIODONTIDAE (Porcupinefishes)						
Diodon hystrix				R		
TOTAL FAMILIES	21	19	18	20	19	18
TOTAL SPECIES	77	59	58	63	50	62

Table 3. Coral species observed at six stations surrounding the Peacock Point Outfall, Wake Atoll, in June 1998. Relative abundance is indicated as A = Abundant, C = Common, O = Occasional, and R = Rare. Blanks in the table indicate that the respective species was not recorded at a particular station. See text for additional details.

FAMILY *Genus/species*	Survey Stations					
	W-1	W-2	W-3	W-4	W-5	W-6
POCILLOPORIDAE						
Pocillopora eydouxi	A	A	A	A	A	A
P. meandrina	O	R		R	O	R
P. verrucosa						R
ACROPORIDAE						
Montipora danae					R	
M. foveolata				R		O
M. hoffmeisteri	O	O		C	C	C
M. informis						R
M. monasteriata	O	O	R	O	O	O
M. verrucosa		R	R		R	O
Acropora aculeus					R	R
A. nasuta				O	R	R
A. valida						R
Astreopora myriophthalma	O			O		
PORITIDAE						
Porites lutea	A	A	A	A	A	A
P. solida				O		R
AGARICIIDAE						
Pavona varians			R	R	C	O
Leptoseris mycetoseroides					R	R
FUNGIIDAE						
Fungia scutaria	O					R
MUSSIDAE						
Acanthastrea echinata	C	C	C	C	C	C
Symphyllia radians				R	R	
S. recta	O	R	R			
MERULINIDAE						
Merulina ampliata	R	R				R

Table 3. (Continued)

FAMILY *Genus/species*	Survey Stations					
	W-1	W-2	W-3	W-4	W-5	W-6
FAVIIDAE						
Favia favus	O		O	O	C	C
F. pallida	C	C	A	A	A	A
F. stelligera	R					
F. abdita	O		O	O	R	O
F. flexuosa					R	R
F. halicora						R
Goniastrea retiformis	C	O	C	C	C	C
G. pectinata					R	O
G. favulus					R	
Platygyra daedalea	O			O		O
P. sinensis	O		R	R		O
Leptoria phyrgia			R		R	R
Montastrea curta						R
M. valenciennesi		R		R	R	R
Leptastrea purpurea			O	O	O	
Cyphastrea microphthalma	O	O		C		O
C. serailia	R			O	R	R
Echinophora lamellosa	O		O	R		R
MILLEPORIDAE						
Millepora exaesa	R				R	O
TOTAL FAMILIES	8	6	6	6	7	9
TOTAL SPECIES	21	13	15	23	25	34

Table 4. Mollusc species observed at six stations surrounding the Peacock Point Outfall, Wake Atoll, in June 1998. Relative abundance is indicated as A = Abundant, C = Common, O = Occasional, and R = Rare. Blanks in the table indicate that the respective species was not recorded at a particular station. See text for additional details.

FAMILY *Genus/species*	Survey Stations					
	W-1	W-2	W-3	W-4	W-5	W-6
TRIDACNIDAE (Giant Clams)						
Tridacna maxima	C	C	C	A	C	O
STROMBIDAE (Conchs)						
Lambis truncata	O			O		
CONIDAE (Cones)						
Conus sp.	R					
C. imperialis	O	O		R	O	
C. flavidus		O			R	O
C. marmoreus		R	O			
C. abreviata	O	O		R	R	
TEREBRIDAE (Augers)						
Terebra maculata		R		O		
FASCIOLARRIDAE (Tulips)						
Pleuroploca sp.	R	R				
Fasciolaria sp.				R		
CYMATIIDAE (Tritons)						
Cymatium muricinum		R				
LIMIDAE (Files)						
Lima sp.					R	
OCTOPODIDAE (Octopus)						
Octopus cyanea						R
TOTAL FAMILIES	4	5	2	5	3	3
TOTAL SPECIES	6	8	2	6	5	3

Table 5. Echinoderm species observed at six stations surrounding the Peacock Point Outfall, Wake Atoll, in June 1998. Relative abundance is indicated as A = Abundant, C = Common, O = Occasional, and R = Rare. Blanks in the table indicate that the respective species was not recorded at a particular station. See text for additional details.

FAMILY *Genus/species*	Survey Stations					
	W-1	W-2	W-3	W-4	W-5	W-6
OPHIDIASTERIDAE (Starfishes)						
Linckia multifora	C	C	C	C	C	C
OPHIONEREIDAE (Brittle Stars)						
Ophioneris sp.		O				
OPHIOCOMIDAE (Brittle Stars)						
Ophiomastix sp.				O	O	O
HOLOTHURIDAE (Sea Cucumbers)						
Bohadschia sp.		O				
Holothuria atra		O				O
Holothuria edulis	C	C	C	C	C	C
STICHOPODIDAE (Sea Cucumbers)						
Thelenota ananas		O				
T. anax			O	C	C	
Stichopus sp.		O				
ECHINOMETRIDAE (Sea Urchins)						
Echinometra mathaei	A	C	C	C	C	C
Heterocentrotus trigonarius	C	O			R	
Echinostrephus sp.	A	C	C	C	C	C
SPATANGIDAE (Heart Urchins)						
Maretia planulata	C					
TOTAL FAMILIES	4	5	4	5	5	4
TOTAL SPECIES	6	10	5	6	7	6

Table 6. Other macroinvertebrate species observed at six stations surrounding the Peacock Point Outfall, Wake Atoll, in June 1998. Relative abundance is indicated as A = Abundant, C = Common, O = Occasional, and R = Rare. Blanks in the table indicate that the respective species was not recorded at a particular station. See text for additional details.

FAMILY *Genus/species*	Survey Stations					
	W-1	W-2	W-3	W-4	W-5	W-6
PALINURIDAE (Spiny Lobsters)						
Panulirus pencillatus	R			R	R	R
XANTHIDAE (True Crabs)						
Trapezia sp. 1	O	C	O	C	C	A
Trapezia sp. 2	C	C	C	C	C	C
Trapezia sp. 3	C	C	C	C	C	C
Trapezia sp. 4	C	C	C	C	C	C
STENOPODIDAE (Coral Shrimp)						
Stenopus hispidus				C		C
MELITHAEIDAE (Sea Fans)						
Acabaria sp.	O					
SPONGIIDAE (Sponges)						
Hippospongia sp.			O	O	R	O
DIDEMNIDAE (Sea Squirts)						
Diplosoma virens	O					
POLYCITORIDAE (Sea Squirts)						
Eudistoma sp.	O					
Clavelina sp.		R				
SERPULIDAE (Tube Worms)						
Spirobranchus giganteus	C		O	O		O
TERREBELLIDAE (Tube Worms)						
Unidentified Terrebellid	O					
TOTAL FAMILIES	6	2	2	5	3	5
TOTAL SPECIES	10	5	6	8	6	8
TOTAL OF ALL OBSERVED NONCORAL MACROINVERTEBRATE SPECIES	22	23	13	20	18	17

Table 7. Macroalage species observed at six stations surrounding the Peacock Point Outfall, Wake Atoll, in June 1998. Relative abundance is indicated as A = Abundant, C = Common, O = Occasional, and R = Rare. Blanks in the table indicate that the respective species was not recorded at a particular station. See text for additional details.

FAMILY *Genus species*	Survey Stations					
	W-1	W-2	W-3	W-4	W-5	W-6
CYANOPHYTA (Blue-green Algae)						
Lyngbya majuscula	A	A	A	A	A	O
Phormidium crosbyanum		C	O	C	O	
CHLOROPHYTA (Green Algae)						
Halimeda opuntia	C	C	A	A	A	C
Neomeris annulata	R	C	C	C	C	C
Caulerpa peltata	C	C	C	C	C	A
Caulerpa cupressoides	C	C	O	C	C	O
Caulerpa serrulata	C	C	C	C	C	O
Chladophora sp.		O	O	O		
Rhipilia orientalis	O	R		R		C
PHAEOPHYTA (Brown Algae)						
Dictyota divaricata	A	A	A	A	A	C
Dictyota sp. 1		C	O	C	C	
Dictyota sp. 2					C	C
Dictyopteris repens	O	R			O	C
Padina sp.		O				
Lobophora variegata	O	R	O	O		
Hincksia breviarticulata				O	O	
RHODOPHYTA (Red Algae)						
Liagora sp.	R					R
Jania micarthrodia		O	R	O	O	
Agloathamnion boergensenii		O		R		
TOTAL FAMILIES	4	4	4	4	4	4
TOTAL SPECIES	12	16	12	15	13	11

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Appendix D

WAKE ISLAND
FEDERAL FACILITY COMPLIANCE AGREEMENT
between
U.S. Environmental Protection Agency
Region 9
and
Department of the Army
U.S. Army Space and Missile Defense Command

Based on the information available to the Parties on the effective date of the WAKE ISLAND FEDERAL FACILITIES COMPLIANCE AGREEMENT (hereinafter the Agreement), and without adjudication of any issues of fact or law, and upon consent and agreement of the Parties, the United States Environmental Protection Agency (EPA) and the Department of the Army, U.S. Army Space and Missile Defense Command (USASMDC) agree as follows:

A. PURPOSE

1. The general purpose of this Agreement is to set forth those actions necessary for Wake Island (WI) to achieve and maintain compliance with the requirements of the U.S. environmental statutory and regulatory provisions specifically identified herein. The Parties seek to define schedules and actions to achieve compliance, taking into account the special circumstances existing on WI.

B. JURISDICTION

2. The Parties enter into this Agreement pursuant to Executive Order 12088 (October 13, 1978). EPA enters into the subject matter of this Agreement pursuant to the following environmental statutes:

Federal Water Pollution Control Act (33 U.S.C. 1251 et seq.)
Solid Waste Disposal Act (42 U.S.C. 6901 et seq.)
Oil Pollution Act of 1990 (33 U.S.C. 2701 et seq.)

C. PARTIES

3. The Parties to the Agreement are the United States Environmental Protection Agency, Region 9 (EPA), and the United States Army Space and Missile Defense Command (USASMDC). The terms of the Agreement shall apply and be binding upon EPA and USASMDC (the Parties) until such time EPA has sent a termination notice to USASMDC or USASMDC notifies EPA that it has ceased operations on WI, pursuant to section L of this Agreement. The parties understand that USASMDC is operating Wake Island primarily to support programs and missions of the Ballistic Missile Defense Organization (BMDO). Consequently, funding for environmental compliance is provided by BMDO, and USASMDC has no independent source of funds to implement the compliance activities specified in F., below.

4. This Agreement shall not be construed as an agreement to indemnify any person.

5. USASMDC shall notify its employees, agents, and base operating support contractors for WI of the existence of this Agreement. USASMDC shall be responsible for ensuring that all persons, firms, entities and corporations engaged in implementation of this Agreement on behalf of USASMDC comply with the terms and conditions of this Agreement. Failure of USASMDC to provide proper direction to such persons, firms, entities and corporations and any resultant noncompliance with this Agreement shall not be considered a Force Majeure or other good cause for extension event, unless EPA so agrees.

D. ENFORCEABILITY

6. The undersigned representative of each of the Parties hereby certifies that he or she is fully authorized to enter into this Agreement and to execute and legally bind his or her respective Agency or Department.

7. The Parties agree that each Party shall have the right to enforce the terms of this Agreement.

8. Nothing in this Agreement shall be construed as a restriction, waiver or abridgement of any rights a Party or person may possess under the applicable statutes and executive orders.

9. USASMDC admits and agrees that EPA has jurisdiction and authority over the subject matter set forth in this Agreement. USASMDC consents and agrees not to contest EPA's jurisdiction and authority to enter into this Agreement and enforce its terms.

10. The Parties agree to resolve their disagreements over the matters covered by this Agreement

under Section O (Dispute Resolution). Notwithstanding this provision and any other Section of this Agreement, EPA shall retain its right to terminate this Agreement for USASMDC's substantial non-compliance with the terms of the Agreement. EPA's right to terminate this Agreement for substantial non-compliance shall not be subject to Dispute Resolution under section O of this Agreement.

E. STATEMENT OF FACTS AND DETERMINATIONS

11. WI is a U.S. possession approximately 2,460 miles west of Hawaii and 1,590 miles east of Guam. Wake is a typical Pacific atoll consisting of three islands (Wake, Peale and Wilkes) that surround a lagoon. The Atoll is approximately 4.5 miles long and 2.0 miles wide, creating 25 miles of shoreline. The total dry land mass is 1,826 acres forming a V-shaped atoll created by coral growth on top of an underwater volcano. The lagoon formed by the V averages roughly 10 feet in depth. A barrier reef encircles the atoll varying in width from 30 to 1,100 yards.

12. The normal population of WI is approximately 105 Army contractor personnel. During launch operations, which occur about once a quarter, the population typically increases by 75-100 personnel for this period of time.

13. The primary mission of WI is to support periodic USASMDC missile launch operations. Under an arrangement with the United States Air Force, USASMDC currently operates WI in support of its mission to conduct launch operations for the Ballistic Missile Defense Organization.

14. The Parties have determined that the activities at WI enumerated below do not comply with applicable environmental statutes and regulations.

F. IDENTIFICATION AND CORRECTION OF NON-COMPLIANT ACTIVITIES

15. *FEDERAL WATER POLLUTION CONTROL ACT (FWPCA)*

a. Discharge of Partially Treated Domestic Sewage To Waters of the United States

i. Activity.

The Wake Island wastewater treatment facility (WWTF) was constructed in the 1950's to serve a population of approximately 2000 residents. The WWTF consists of a bar screen,

comminutor, and grit chamber. The effluent is discharged through an ocean outfall 200 feet off-shore on the southwest side of Peacock Point. At present, the WWTF has an estimated capacity to serve 500 residents and serves a variable population of approximately 105 to 205 people. The WWTF receives approximately 25,000 gal/day, which is comprised of 15,000 gal/day of wastewater, and 10,000 gal/day of brackish water, assumed to be infiltration. At present, the WWTF provides little, if any, treatment. The WWTF does not have an NPDES (National Pollutant Discharge Elimination System) permit to discharge to waters of the United States.

ii. Compliance Status

The WWTF is in non-compliance with the FWPCA. Under the FWPCA, the WWTF is required to have an NPDES permit and is required to have secondary treatment if discharging pollutants to waters of the U.S. The WI WWTF does not have an NPDES permit and does not provide secondary treatment before discharging pollutants to waters of the U.S.

iii. Compliance Schedule and Activities

aa. USASMDC has completed an analysis of the current wastewater treatment and disposal practices at WI, including the options available to USASMDC to achieve compliance with the FWPCA. Such options include installing secondary treatment facilities prior to discharge of pollutants into the waters of the U.S., or eliminating the point source discharge of pollutants into the waters of the U.S. From these options, USASMDC shall select an alternative that will achieve compliance with the FWPCA. USASMDC shall submit to EPA (1) a copy of the aforementioned analysis, and (2) a description of the selected alternative by **July 30, 1999.**

bb. By **October 30, 1999,** USASMDC shall complete preparation for implementation of the selected alternative, including construction plans if necessary, and submit a copy of said implementation plans to EPA on the same date.

cc. By **January 30, 2000,** USASMDC shall commence implementation, including construction if necessary, of the selected alternative and submit documentation of such implementation (e.g., initiation of construction) to EPA on the same date.

dd. By **December 31, 2000,** USASMDC shall complete implementation, including construction if necessary, and commence operation of the selected alternative and submit

documentation to EPA demonstrating such by the same date.

ee. Concurrent with implementation of the selected alternative pursuant to paragraphs aa through dd above, by **December 31,1999**, USASMDC shall submit an NPDES permit application to EPA for the subject discharge which meets the requirements for permit applications in 40 CFR Part 122. Specifically, the application shall provide for cessation of the current discharge of pollutants into waters of the U.S. by **December 31, 2000** or for installation and operation of secondary treatment by the same date. It shall also include the following information:

- a characterization of the quality and quantity of the existing discharge;

- a characterization of the receiving water impacts from the existing discharge;

- the measures that have and will be taken to eliminate the introduction of toxic and hazardous substances into the wastewater system;

- proposed methods to monitor the quantity and quality of waste discharged.

b. Discharge of Cooling Water to Waters of the United States

i. Activity

Heated water is discharged into Wake Lagoon from the Power Plant. The power plant uses brackish well water for cooling. The return water is discharged into the lagoon through at least two shoreline discharges. The discharge volume varies, depending on the number of generators in use, but is estimated to average 1.22 mgd. The temperature difference between the discharge water and the ambient lagoon water is roughly 2 degrees Centigrade. To achieve a variation from ambient temperature of 1 degree Centigrade or less, a mixing zone of approximately 40 meters is required.

The desalinization plant has been decommissioned and no longer discharges heated water into the lagoon.

ii. Compliance Status

No NPDES permit has been issued to authorize the discharge from the power plant to

waters of the U.S. This facility is required to have an NPDES permit with effluent limitations, as described in 40 CFR 125.70 through 125.73. This facility has also not made the necessary demonstration under section 316 of the FWPCA for establishing alternate effluent limits. Heat is a pollutant under section 502(6) of the FWPCA.

iii. Compliance Schedule and Activities

aa. By **December 30, 1999,** USASMDC shall complete an investigation of the marine environment in and around the area of the subject discharge and characterize the chemical quality of the discharge, in particular the sulfur odor associated with the power plant discharges. The investigation shall provide the information specified at 40 CFR 125.73(c)(1). USASMDC shall submit to EPA the results of the investigation, a description of the alternate effluent limitations along with the justifications required at 40 CFR 125.73(c)(1), and a request for approval of alternate effluent limitations under §316(a) of the FWPCA.

bb. By **March 31, 2000,** EPA shall inform USASMDC of its decision regarding alternate effluent limitations for the subject discharge.

cc. By **May 30, 2000,** USASMDC shall submit an NPDES application for the subject discharge to EPA in accordance with 40 CFR Part 122.

c. Point Source Discharge from Fuel Storage Secondary Containment Areas to Waters of the United States

i. Activity

The operational bulk fuel storage facilities on Wake Island (1800 area) have secondary containment structures. Accumulated rainwater is periodically drained from the containment areas through three surface discharge structures into Wake Lagoon.

ii. Compliance Status

These point source discharges to waters of the U.S. are not authorized by NPDES permits and are, therefore, not in compliance with the FWPCA.

iii. Compliance Schedule and Activities

aa. By **December 30, 1999,** USASMDC shall submit a completed NPDES permit application to EPA in accordance with 40 CFR Part 122 for the subject discharges, together with any investigations or studies regarding the quantity and quality of discharged materials and their impact on the receiving waters.

d. Discharge of Storm Water From Industrial Activities and Other Unidentified Point Sources to Waters of the United States

i. Activity

USASMDC has reported two storm water collection systems at WI: one in the housing area, draining west into the channel between Wake and Peale Islands; one for the runway complex, draining east to the ocean on the eastern end of the runway.

However, a thorough inventory of storm water point source discharges at WI has not been undertaken.

ii. Compliance Status

There are no storm water discharge permits for any of the industrial activities at WI. Therefore, industrial activities that need storm water discharge permits are in non-compliance.

iii. Compliance Schedule and Activities

aa. By **February 28, 1999,** USASMDC shall complete a field inspection of the WI and identify those industrial activities that will require a NPDES storm water discharge permit as well as any additional point source discharges not already identified that also require either individual or general NPDES permits. By **July 30, 1999,** a copy of the inspection report shall be provided to EPA.

bb. By **May 31, 2000,** USASMDC shall submit to EPA a Notice of Intent (NOI) and a Management Plan, as described in 40 CFR Part 122.26 (c) and EPA guidance, to have these discharges covered under the Multi-Sector General Permit for Industrial Activities, 60 Federal Register 50804 (1995), (hereinafter General Permit). The NOI shall cover all identified discharges that are eligible for coverage under the General Permit and not otherwise included in an individual NPDES permit application.

cc. By **July 30, 2000,** USASMDC shall submit to EPA NPDES permit applications for any point sources identified in the field investigation conducted pursuant to paragraph aa above that are not otherwise included in NPDES permit applications required by this Agreement.

e. Discharge of Filter Backwash Water from Drinking Water Treatment Facility into Wake Lagoon Through Surface Discharge

i. Activity

The filters at the drinking water treatment facility are regularly back washed. The backwash is discharged through a conveyance to Wake Lagoon in the same area as the former discharge from the desalinization plant.

ii. Compliance Status

The subject discharge is not authorized by an NPDES permit and is, therefore, in non-compliance with the FWPCA.

iii. Compliance Schedule and Activities

aa. By **December 30, 1999,** USASMDC shall submit a completed NPDES permit application to EPA in accordance with 40 CFR Part 122 for the subject discharge, together with any investigations or studies regarding the quantity and quality of discharged materials and their impact on the receiving waters.

f. The USASMDC may elect to submit one NPDES permit application for Sections a, b, c, and e of the aforementioned FWPCA compliance requirements in paragraph 15. This will allow EPA to issue a single EPA NPDES permit for the WI that will have multiple facilities and discharge points. A separate NPDES storm water permit application shall be submitted for Section d.

g. Oil Pollution Prevention

i. Activity

The WI has petroleum storage tanks which include but are not limited to Tank Nos. 41128, 41129, 41130, 41118, 41120, 41131, 41132, the petroleum storage tank sites located at the

Power Plant, and the Desalinization Plant. Under the provisions of 40 CFR Part 112, the USASMDC is required to have on site a Spill Prevention Control and Countermeasure (SPCC) Plan for petroleum storage tanks. Additionally, under the provisions of the Oil Pollution Act of 1990 (33 U.S.C. 1321(j)(5)), and 40 CFR 112.20, the USASMDC must develop a Facility Response Plan (FRP) for petroleum storage facilities at WI.

ii. Compliance Status

There are no SPCC plans for the WI petroleum storage sites. Although a FRP has been prepared for WI and submitted to the U.S. Coast Guard, no FRP has been submitted to EPA for approval.

iii. Compliance Schedule and Activities

aa. By **December 31, 1999**, USASMDC shall identify all storage facilities that will require a SPCC plan and FRP and submit its findings to EPA.

bb. By **March 30, 2000**, for all identified petroleum storage facilities requiring an SPCC plan, USASMDC shall have available at WI, and submitted to EPA for its approval, SPCC plans that meet the requirements of 40 CFR Part 112.7. The SPCC plan shall contain corrective measures, along with a schedule of construction for implementing these corrective measures, including but not limited to the correction of the following deficiencies:

- inadequate secondary containment and drainage for tank nos. 41128, 41129, and 41130 (1500 area);

- no secondary containment for tank nos. 41118 and 41120 (tank no. 41118 currently out of service) (1700 area);

- inadequate secondary containment for tank no. 41127 (currently out of service) (1800 area);

- inadequate secondary containment and drainage at Power Plant JP-5 storage tanks;

- inadequate secondary containment and drainage at Desalinization Plant JP-5 storage tank.

For tanks currently out of service, USASMDC may, in lieu of undertaking corrective actions, provide a certification to EPA that the tanks are empty and will not be placed into service until such time as the storage facility is in compliance.

cc. By **March 30, 2000,** USASMDC shall submit to EPA for review and approval a Facility Response Plan, in accordance with 40 CFR Part 112.20. The SPCC plan required under paragraph bb above and the Facility Response Plan required under this paragraph may, at USASMDC's discretion, be consolidated into a single plan, provided the substantive requirements applicable to both are met.

dd. By **September 30, 2000,** USASMDC shall complete construction improvements as described in their SPCC plan and submit evidence of such to EPA.

16. *SOLID WASTE DISPOSAL ACT*

a. Disposal of Solid Waste at WI

i. Activity

Approximately 0.5 tons per day of municipal solid waste are generated at WI. WI does not have an integrated solid waste management plan. Current disposal practices include:

- approximately 250 pounds per day of wet waste (primarily from the dining hall) are incinerated at a small, manually charged, multi-chamber incinerator;

- the combustible fraction of the remaining waste (approximately 500 pound per day) is stockpiled at Peacock Point and open burned on roughly a weekly basis;

- the non-combustible waste fraction (approximately 250 pounds per day) is disposed of in a rubble/scrap disposal area near Peacock Point along the ocean side of the island;

- ash from the incinerator and open burn area is disposed of in the Peacock Point area. The ash is spread and metals and other non-combusted items are sorted for disposal at the rubble/scrap disposal area. The ash is sporadically covered.

ii. Compliance Status

WI is generally in non-compliance with 40 CFR Part 258 regarding design and operating

criteria for municipal solid waste landfills. The disposal of solid waste material at WI is in non-compliance with §4005 of the Solid Waste Disposal Act, which prohibits open dumps. WI is also in violation of 40 CFR 258.24(b) which prohibits the open burning of solid waste, except for the infrequent burning of agricultural wastes, land clearing debris, and emergency cleanup debris.

iii. Compliance Schedule and Activities

aa. By **December 30, 1999,** USASMDC shall prepare and submit to EPA an interim integrated solid waste management plan for WI, together with an implementation schedule. The plan shall provide for implementation of the following measures no later than **June 30, 2000:**

- siting, constructing and operating an enclosed or semi-enclosed area for burning of combustible waste;

- constructing barriers or other containment structures, or instituting operational practices so as to eliminate the possibility of ash or waste from entering the waters of the US;

- implementing a system of organized disposal of ash and non-combustible municipal solid waste. Such a system should also ensure that waste is covered on a daily basis and/or buried in established cells; and fugitive dust emissions are eliminated/reduced;

- implementing procedures to eliminate the introduction of hazardous and/or liquid wastes into the solid waste stream;

- implementing record keeping;

- investigating and, as necessary, implementing waste minimization and recycling practices; andinstalling appropriate signage and/or other measures to restrict entry to the solid waste disposal areas.

bb. By **December 30, 2001,** USASMDC shall submit documentation to EPA demonstrating full compliance with all applicable parts of 40 CFR Parts 240 through 258 or it shall submit a request to EPA requesting a deviation or some other form of regulatory relief from those provisions of 40 CFR Parts 240 through 258 for which compliance has not been achieved. The request for relief shall be based upon, and include supporting justification for, the following factors as well as other factors that USASMDC may deem

relevant:

- the legal basis for USASMDC's contention that EPA possesses sufficient administrative authority to grant regulatory relief from the provisions for which it is sought;

- the environmental consequences of continuing with the existing waste disposal practices at WI as of June 30, 2001;

- the costs of achieving full compliance with 40 CFR Parts 240 through 258 as contrasted with the environmental benefits;

- the quantity and type of solid waste disposed of; and,

- the feasibility of off-island disposal options.

cc. In the event that EPA advises USASMDC that its request for regulatory relief has been denied in whole or in part, USASMDC shall achieve compliance with all of the provisions of 40 CFR 240 through 258 or those identified by USEPA, within **36 months** of receiving such notification from EPA.

G. PROJECT MANAGERS

17. Each Party herein designates a Project Manager and an alternate for the purpose of overseeing the implementation of the Agreement.

18. EPA designates as Project Manager:

Norman L. Lovelace
Manager, Pacific Insular Area Programs
U.S. Environmental Protection Agency, EPA, San Francisco, CA

EPA designates as an alternate:

Carl L. Goldstein
Environmental Engineer, Pacific Insular Area Programs
U.S. Environmental Protection Agency, EPA, San Francisco, CA

19. USASMDC designates as Project Manager:

Dennis R. Gallien
Environmental Engineer
USASMDC, Huntsville, AL

USASMDC designates as an alternate:

Gary Gunter
Environmental Engineer
USASMDC, Huntsville, AL

20. The Project Managers shall be responsible on a daily basis for assuring proper implementation of the Agreement in accordance with the terms of the Agreement. The Project Managers shall be reasonably available to consult on work performed pursuant to the Agreement and shall make themselves available to each other for the pendency of the Agreement. The Project Managers shall meet to discuss progress from time to time and shall assist each other in the performance required to implement the Agreement.

21. Unless otherwise specified in this Agreement or agreed to by the Project Managers, all communications regarding implementation of the Agreement shall be between the Project Managers.

22. Either Party may change its Project Manager by so notifying the other Party in writing within five (5) days of the change.

H. ACCESS TO WI

23. EPA shall be allowed to enter WI for purposes consistent with this Agreement, subject to any statutory or regulatory requirements regarding national security or mission essential activities. Such access shall be for the purposes of, but not be limited to, reviewing the progress of USASMDC in carrying out the provisions of this Agreement; ascertaining that the work performed pursuant to this Agreement is in accordance with approved work or sampling plans; conducting tests and inspections; and/or implementing such measures as EPA or the Project Managers deem necessary. Moreover, USASMDC shall assist EPA in any such visits to WI by coordinating air transportation from Hawaii to and from WI, lodging and transportation on WI, and logistical support by USASMDC personnel and contractors on WI.

24. In the event that access requested by EPA is denied by USASMDC, USASMDC shall provide an explanation within forty eight (48) hours of the reasons for the denial, including reference to the applicable regulations and, upon request, a copy of such regulations. USASMDC shall expeditiously make alternative arrangements for accommodating the requested access.

I. PROGRESS REPORTING

25. Commencing at the end of the first full quarter after the effective date of the Agreement, USASMDC shall submit a quarterly progress report by the fifth working day of each fourth month. Progress reports shall summarize the efforts undertaken pursuant to the Agreement during the previous quarter.

26. USASMDC agrees that failure to submit one or more of the Progress Reports, or a Status Report or Final Report requested by EPA shall be a violation of this Agreement.

J. SCHEDULE EXTENSIONS

27. USASMDC shall immediately submit notification to EPA whenever any delay is anticipated in meeting any scheduled compliance date. The notification shall describe in detail the anticipated length of delay, the precise cause of the delay, the measures taken and to be taken to prevent or minimize the delay and the alternate timetable by which the measure(s) will be implemented. EPA shall make a timely determination on whether the compliance schedule shall be revised and so notify USASMDC. If USASMDC disagrees with EPA's determination, the Dispute Resolution procedures under section O of the Agreement shall control.

K. AMENDMENT OR MODIFICATION OF AGREEMENT

28. The Agreement may be deemed amended or modified upon written consent of both Parties. Such amendments or modifications may be proposed by either Party and shall be effective the third business day following the day the last Party signs the amendment or modification and sends its notification of signing to the other Party. By mutual written consent, the Parties may agree to a different effective date of an amendment or modification.

L. EFFECTIVE DATE AND TERMINATION OF AGREEMENT

29. The Agreement comes into effect upon the written signature of both Parties.

30. In the event that USASMDC ceases operations on WI and concludes its arrangement with the United States Air Force, USASMDC shall notify EPA in writing and this Agreement shall terminate upon EPA's receipt of such notification.

31. Otherwise, the provisions of the Agreement shall be deemed satisfied and terminated upon written receipt by USASMDC from EPA that USASMDC has demonstrated that all the terms of the Agreement have been completed. If EPA denies or otherwise fails to grant a termination notice within ninety (90) days of receiving a written USASMDC request for such notice, EPA shall provide a written statement of the basis for denial and describe those USASMDC actions which would be a satisfactory basis for granting a notice of termination. Such denial by EPA shall be subject to dispute resolution pursuant to section M of the Agreement.

M. FUNDING

32. It is the expectation of the parties that all obligations and commitments of USASMDC established by this Agreement will be fully funded by BMDO. USASMDC shall seek to obtain all required funds from BMDO for the purpose of satisfying the Agreement. However, no provisions of this Agreement shall be interpreted to require the obligation or payment of funds in violation of the Anti-Deficiency Act, 31 U.S.C. 1341. In the event that USASMDC is unable to fulfill its obligations and commitments established by this Agreement due to the unavailability of appropriated funds, the parties shall attempt to agree upon appropriate adjustments to the compliance schedule. If USASMDC is unable to obtain adequate funds from BMDO to implement the Agreement and the parties cannot agree on adjustments to the compliance schedule, EPA may refer the matter to the final level of conflict resolution pursuant to paragraph 42 or terminate the Agreement pursuant to paragraph 10 and exercise its enforcement authority under applicable environmental statutes and regulations.

N. FORCE MAJEURE

33. A Force Majeure shall mean any event arising from causes beyond the control of a Party that causes a delay in or prevents the performance of any obligation under the Agreement, including, but not limited to, acts of god; fire; war; insurrection; civil disturbance; explosion; unanticipated breakage or accident to machinery or equipment despite reasonably diligent maintenance; adverse weather conditions that could not be reasonably anticipated; unusual delay in transportation; restraint by court order or order of public authority; inability to obtain, at reasonable costs and after reasonable diligence, any necessary authorizations, approvals, permits or licenses due to action or inaction of any governmental agency or authority other than USASMDC; delays caused by compliance with applicable statutes or regulations governing

contracting, procurement or acquisition procedures. A Force Majeure shall also include any strike or other labor dispute not within the control of USASMDC. Force Majeure shall not include increased costs or expenses of compliance activities whether or not anticipated at the time such compliance activities were initiated.

34. If the Parties agree that the delay or anticipated delay in compliance with this Agreement has been or will be caused by circumstances beyond the control of USASMDC, the time for performance hereunder may be extended as agreed to between the Parties. Delay in achievement of one interim step shall not necessarily justify or excuse delay in achievement of subsequent steps.

35. In the event that EPA does not agree that a delay in achieving compliance with the requirements of this Agreement has been or will be caused by circumstances beyond the control of USASMDC, EPA will notify USASMDC in writing of its decision and any delays shall not be excused.

36. The burden of proving that any delay is caused by circumstances entirely beyond the control of USASMDC shall rest with USASMDC.

O. DISPUTE RESOLUTION

37. Except as specifically set forth elsewhere in this Agreement, if a dispute arises under this Agreement, the procedures of this Section shall apply. Any party may invoke this dispute resolution procedure.

38. In the event of any conflict involving this Agreement, the Parties shall make reasonable and good faith efforts at the Project Manager level to resolve the dispute. If after thirty (30) days, the Project Managers are unable to resolve the dispute in a mutually satisfactory manner, either Project Manager may provide written notification to the other that a dispute exists and formal dispute resolution procedures are invoked.

39. When formal dispute resolution is in progress, work affected by the dispute will discontinue during the pendency of dispute resolution proceedings, unless the Parties agree otherwise in writing. Work unaffected by the disputed matter shall continue in accordance with the Agreement. The completion date for work affected by a dispute shall be extended for a period of time, not to exceed the actual time taken to resolve the dispute.

40. First Level

Upon receipt by either Project Manager of written notification that formal dispute resolution procedures are invoked, the disputed matter shall be referred to the Dispute Resolution Committee (DRC) for resolution within thirty (30) days of receipt of the notification. The USASMDC representative on the DRC shall be the Deputy Commander, USASMDC. The EPA representative shall be the Director, Cross Media Division. The DRC shall consider the dispute to arrive at a mutually satisfactory resolution. If a resolution is achieved, the DRC shall issue a written decision to the Project Managers. If after thirty (30) days, the DRC cannot resolve the dispute, either DRC representative may provide written notification to the other representative that a dispute still exists and the disputed matter is elevated to the next level of dispute resolution. If neither representative provides such notification to the other representative within sixty (60) days of receiving the dispute, the disputed matter may proceed as if no dispute existed.

41. Second Level

Upon receipt of notification that the DRC was unable to satisfactorily resolve the dispute and the matter is elevated, the Regional Administrator of EPA and the Commanding General of USASMDC shall confer within thirty (30) days to resolve the dispute. If the Regional Administrator and the Commanding General resolve the dispute to their mutual satisfaction, their written decision shall be provided to the Project Managers and representatives to the DRC. If the Regional Administrator and the Commanding General are unable to resolve the dispute, either the Regional Administrator or Commanding General may provide written notification to the other that a dispute still exists and the matter is being elevated to the final level of dispute resolution. If neither the Regional Administrator or Commanding General provides such notification within sixty (60) days of receiving the dispute, the disputed matter may proceed as if no dispute existed.

42. Final Level

Upon receipt of notification that the Regional Administrator and the Commanding General were unable to resolve the dispute, the Administrator of the Environmental Protection Agency and the Secretary of the Department of the Army shall confer to resolve the dispute. A written decision describing the nature of the resolution of the dispute shall be provided to the Project Managers, DRC representatives, Regional Administrator and the Commanding General.

43. Except as specifically set forth elsewhere in this Agreement, resolution of a dispute pursuant to this Section of the Agreement constitutes a final resolution of the dispute. All Parties shall abide by all terms and conditions of the final resolution of the dispute obtained pursuant to this Section of this Agreement.

IT IS SO AGREED:

U.S. ENVIRONMENTAL PROTECTION AGENCY

By: _____ **Date:** 6/13/99

Felicia Marcus
Regional Administrator
EPA Region 9

U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND

By: _____ **Date:** 31 Aug 99

ROBERT C. POLLARD, JR.
COL, GS
Chief of Staff

Appendix E

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

REPLY TO ATTENTION OF

MAR 08 1999

Environmental Division

Mr. Eugene Nitta
U.S. National Marine Fisheries Service
2570 Dole Street
Honolulu, Hawaii 96822-2396

Dear Mr. Nitta:

The Ballistic Missile Defense program is an extensive research and development program designed to determine the feasibility of developing an effective ballistic missile defense system. The program includes research of Theater Ballistic Missile Defense (TBMD) technologies necessary for the protection of deployed U.S. forces, as well as U.S. friends and allies throughout the world, from future missile threats.

The experience of the U.S. coalition forces and U.S. allies with ballistic missile attacks during the Gulf War of 1991 (Operation Desert Storm) has highlighted the need for a theater missile defense component of ballistic missile defense. A TBMD system is intended to respond to these dangers of the post-Cold War era by providing protection for deployed U.S. and allied military forces and civilian assets against tactical ballistic missile attacks.

The Wake Island Environmental Assessment (EA) (1994) provided analysis for the launch of solid propellant target missiles and the construction of new launch and support facilities. Since the completion of that document, the U.S. Army Space and Missile Defense Command (USASMDC) has expanded its inventory of target missiles to include Liquid Propellant Target (LPT) missiles. This supplemental EA will analyze the transportation, storage, fueling and launch of these LPT missiles at Wake Island Launch Complex. The proposed action, as described in the supplemental EA, would involve only minimal site preparation activities to establish liquid propellant launch capability at Wake Island.

In compliance with the National Environmental Policy Act (NEPA) and the Council on Environmental Quality (CEQ) regulations implementing NEPA, a supplemental EA is being

prepared by USASMDC. The supplemental EA is being prepared to address the potential for environmental impacts of conducting LPT launches at Wake Island Launch Complex. In order to complete the process, we are requesting an informal Endangered Species Act Section 7 consultation with your office.

The coordinating draft Supplemental EA is enclosed for your review. Appendices B and C contain the Terrestrial Resources Survey and the Baseline Marine Biological Survey for Wake Island.

Please review this information and provide comments to: Deputy Commander, U. S. Army Space and Missile Defense Command, Attention: SMDC-EN-V (Ms. Sharon Mitchell), P.O. Box 1500, Huntsville, Alabama 35807-3801 or by data facsimile (256) 955-5074. Please provide your comments by April 9, 1999.

If you have any questions, please contact Ms. Sharon Mitchell at (256) 955-4392.

Sincerely,

for John L. Ramey
Lieutenant Colonel
Deputy Chief of Staff,
Engineer

Enclosure

Copy Furnished:

Mr. Michael Molina, Fish and Wildlife Service, 300 Ala Moana Boulevard, Room 3-122, P.O. Box 50088, Honolulu, Hawaii 96850

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802-4213
PACIFIC ISLANDS AREA OFFICE
2570 Dole St., Room 106
HONOLULU, HAWAII 96822-2396

APR 30 1999

Lt. Colonel John L. Ramey
Deputy Chief of Staff
U.S. Army Space and Missile Defense Command
P.O. Box 1500
Huntsville, Alabama 35807-3801

Dear Lt. Col. Ramey:

This letter provides our review under Section 7 of the Endangered Species Act of 1973, as amended, of the potential effects on threatened green turtles (*Chelonia mydas*) from the transportation, storage, and fueling, and launch of Liquid Propellant Target (LPT) missiles from Wake Island. The U.S. Army Ballistic Missile Defense program proposes to include LPT missiles as targets for TBMD testing in addition to solid fuel targets that were considered in previous environmental documents. The results of this informal consultation are based on our review of the existing operations and proposed action to include LPT launches for research of Theater Ballistic Missile Defense (TBMD) technologies, and on information provided in the Coordinating Draft Supplemental Environmental Assessment for the Wake Island Launch Center.

Although blue, fin, sei, humpback, and sperm whales, and loggerhead, leatherback, and olive ridley turtles may be found in the broad ocean area around Wake Island, NMFS has determined that the proposed action is not likely to adversely affect these species.

The Hawaiian monk seal may be a rare visitor to Wake. It is currently found throughout the Northwestern Hawaiian Islands (NWHI). Monk seals are also seen in the waters and on beaches in the main Hawaiian Islands. However, the relatively isolated atolls and islands of the NWHI still comprise the known primary terrestrial habitat of the Hawaiian monk seal. Designated critical habitat for monk seals is limited to the NWHI. Given their rare appearances at Wake Island, Hawaiian monk seals are not likely to be affected by this proposed action.

The nesting beach origins of the foraging population of green turtles found at Wake Island are not known; they may be from Hawaii or the Marshall Islands or both. Although hawksbill

turtles are suspected to occur at Wake, there have been no confirmed sightings to date. There are no reliable reports of hawksbill or green turtle nesting from Wake Island. Critical habitat for green turtles or hawksbill turtles has not been designated or proposed within or near the proposed activity areas.

Potential Effects on listed species:

Previous analyses conducted by the U.S. Army and U.S. Navy for the Pacific Missile Range Facility on Kauai indicated that the probability of spent boosters or terminated launch debris striking a whale is less than 4.6 chances in 1 million (4.6×10^{-6}).

Sonic booms would be expected to affect the open ocean marine environment beyond the bathymetric contours where larger numbers of whales might occur, and would be expected to have minimal impact on the species because the numbers of whales per square mile are low and effects on individual whales are not expected to be significant.

The probability of spent boosters or terminated launch debris striking a sea turtle is expected to be at least as small as that of striking a whale. The launch noise or any possible explosion would not be expected to affect any turtles offshore. As with large cetaceans in the broad ocean area, any effects of sonic booms on sea turtles are likely to be insignificant given the expected very low density of turtles per square mile of open ocean.

Based on the best available information, NMFS concludes that the proposed addition of LPT missiles for TBMD testing at Wake Island is not likely to adversely affect any threatened or endangered species under NMFS jurisdiction. This conclusion is based on information provided in the Environmental Assessment, site inspections, existing published and unpublished literature, and anecdotal reports from biologists and managers from these areas.

A marine mammal species or population stock which is listed as threatened or endangered under the ESA is, by definition, also considered depleted under the Marine Mammal Protection Act of 1972 (MMPA). The ESA allows takings of threatened and endangered marine mammals only if authorized by Section 101(a)(5) of the MMPA. However, no listed marine mammals or sea turtles are expected to be taken. Accordingly no takings of listed marine mammals or sea turtles during construction or operations are authorized.

This concludes the informal consultation on the action outlined in your request. As provided in 50 CFR 402.16, reinitiation of consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) incidental take of listed species occurs; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this evaluation; or (4) a new species is listed or critical habitat designated that may be affected by the action.

Please contact Mr. Eugene T. Nitta at (808) 973-2987 should you have any further questions concerning this Section 7 consultation.

Sincerely,

C. Karnella

William T. Hogarth, Ph.D.
Regional Administrator

cc: F/SWRx1 - Karnella, Nitta
GCSW - Feder
USFWS - Molina

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

MAR 08 1999

REPLY TO ATTENTION OF

Environmental Division

Ms. Claudia Nissley
Advisory Council on Historic Preservation
Western Office of Project Review
730 Simms Street, Room 401
Golden, Colorado 80401

Dear Ms. Nissley:

The Ballistic Missile Defense program is an extensive research and development program designed to determine the feasibility of developing an effective ballistic missile defense system. The program includes research of Theater Ballistic Missile Defense (TBMD) technologies necessary for the protection of deployed U.S. forces, as well as U.S. friends and allies throughout the world, from future missile threats.

The experience of the U.S. coalition forces and U.S. allies with ballistic missile attacks during the Gulf War of 1991 (Operation Desert Storm) has highlighted the need for a theater missile defense component of ballistic missile defense. A TBMD system is intended to respond to these dangers of the post-Cold War era by providing protection for deployed U.S. and allied military forces and civilian assets against tactical ballistic missile attacks.

The Wake Island Environmental Assessment (EA) (1994) provided analysis for the launch of solid propellant target missiles and the construction of new launch and support facilities. Since the completion of that document, the U.S. Army Space and Missile Defense Command (USASMDC) has expanded its inventory of target missiles to include Liquid Propellant Target (LPT) missiles. This supplemental EA will analyze the transportation, storage, fueling and launch of these LPT missiles at Wake Island Launch Complex. The proposed action, as described in the supplemental EA, would involve only minimal site preparation activities to establish liquid propellant launch capability at Wake Island.

In compliance with the National Environmental Policy Act (NEPA) and the Council on Environmental Quality (CEQ) regulations implementing NEPA, a supplemental EA is being

prepared by the U.S. Army Space and Missile Defense Command. The supplemental EA is being prepared to address the potential for environmental impacts of conducting LPT launches at Wake Island Launch Complex.

In fulfilling its responsibilities for complying with Sections 106 and 110 of the National Historic Preservation Act and the Advisory Council on Historic Preservation's regulations implementing Section 106 (36 code of Federal Regulations 800), the USASMDC is analyzing the potential for effects to historic properties. We would appreciate any comments or concerns you may have regarding the proposed action and the historic properties in the area.

Please review this information and provide comments to: Deputy Commander, U. S. Army Space and Missile Defense Command, Attention: SMDC-EN-V (Ms. Sharon Mitchell), P.O. Box 1500, Huntsville, Alabama 35807-3801 or by data facsimile (256) 955-5074. Please provide your comments by April 9, 1999.

If you have any questions, please contact Ms. Sharon Mitchell at (256) 955-4392.

Sincerely,

for John L. Ramey
Lieutenant Colonel
Deputy Chief of Staff,
Engineer

Enclosure

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

APR 30 1999

REPLY TO ATTENTION OF
Environmental Division

Mr. Don Klima, Director
Advisory Council on Historic Preservation
Office of Planning and Review
12136 West Bayaud Avenue, Suite 330
Lakewood, Colorado 80228

Dear Mr. Klima :

This notice is being provided in accordance with the National Historical Preservation Act as amended, and as implemented in 36 CFR 800. The U.S. Army Space and Missile Defense Command (USASMDC) is intending to conduct Liquid Propellant Target (LPT) missile launches at Wake Island National Historic Landmark. As Wake Island is an un-organized territory of the U.S., and does not fall under the jurisdiction of any state historic preservation office, this consultation is provided directly to the Advisory Council.

These launches will be conducted to provide sensor and signature data and interceptor missile targets to enhance the missile defense capabilities of the U.S. The following information is provided to your office concerning this undertaking:

a. A description of the proposed undertaking (enclosure 1)

b. Description of the historic properties in the area of the undertaking (enclosure 2)

c. Reasons for believing that the LPT missile undertaking will have no adverse effect on historic properties. (enclosure 3)

Through application of the National Historic Preservation Act, 36 CFR § 800.5 (b) and 36 CFR § 800.8 (a), the USASMDC has determined that this undertaking will have no adverse effect on historic properties.

Your review, comments, and concurrence of this Finding of No Adverse Effect are requested. To carry out this program in an expeditious manner, we request your response within thirty days of your receipt of this correspondence.

Should you have any questions, please contact Ms. Sharon Mitchell at (256) 955-4392.

Sincerely,

Original Signed By
Richard D. Barrineau

John L. Ramey
Lieutenant Colonel
Deputy Chief of Staff,
Engineer

Enclosures

DESCRIPTION OF THE UNDERTAKING

The LPT Missile undertaking is divided into two activities. The first is the storage of liquid propellants and the fueling of the LPT missiles. The second part of the undertaking is the actual launch of the missiles.

Propellant for the LPT Missile is composed of an oxidizer, inhibited red-fuming nitric acid (IRFNA) and petroleum based fuel (kerosene). Propellant storage and transfer activities will occur in the Harbor area on the extreme western end of Wake Island. These constituents must be stored in separate location at least 150 meters apart. A third site, for fueling the missile, will be established at least 150 meters from the propellant storage sites. The storage sites and fueling sites will be temporary rigid frame canopy structures. Each site will be established on firm level ground with an 18 inch to 2 foot earthen berm built up around the periphery of the site. A non-permeable plastic barrier will protect the floor and berm. Above this, an aluminum frame awning will be erected to protect the propellant drums from rain and direct sunlight (see Figure 1-1 and 1-2). No sub-surface excavation will occur to prepare these sites. Berm material will be procured from a previously disturbed aggregate pit. Storage sites, at any given time, will contain enough propellant for two missile launches. The area proposed for propellant storage and missile fueling is shown in Figure 1-3.

During missile fueling, rough terrain forklifts will transport propellant drums from the storage sites to the missile fueling site. The proposed areas that will be used for the storage and fueling sites have few Japanese concrete structures. Those structures will not be near the path of the forklifts as they move from site to site. During fueling, the missile would be mounted on a special missile transport and fueling trailer (TAFT).

Up to 20 LPT Missile would be launched from Wake Atoll over the next 10 years. Missile launches would occur at existing launch pads, the Abandoned Launch Pad and Launch Pad #2 (see Figure 1-4). The self-contained launch vehicle would simply drive onto the existing pad to prepare for launch, and drive away when the launch is completed. No new construction would occur. All communications and fiber optics cables will be installed on the ground surface. No trenching for communications cables would occur.

The launch area at Peacock Point has been used for several purposes since World War II. This includes landfills, burn pits, metal scrap yards and missile storage and launches. In the event of a launch mishap or accident on the launch pad, no cultural resource would be affected due to the disturbed nature of the ground in the immediate launch area.

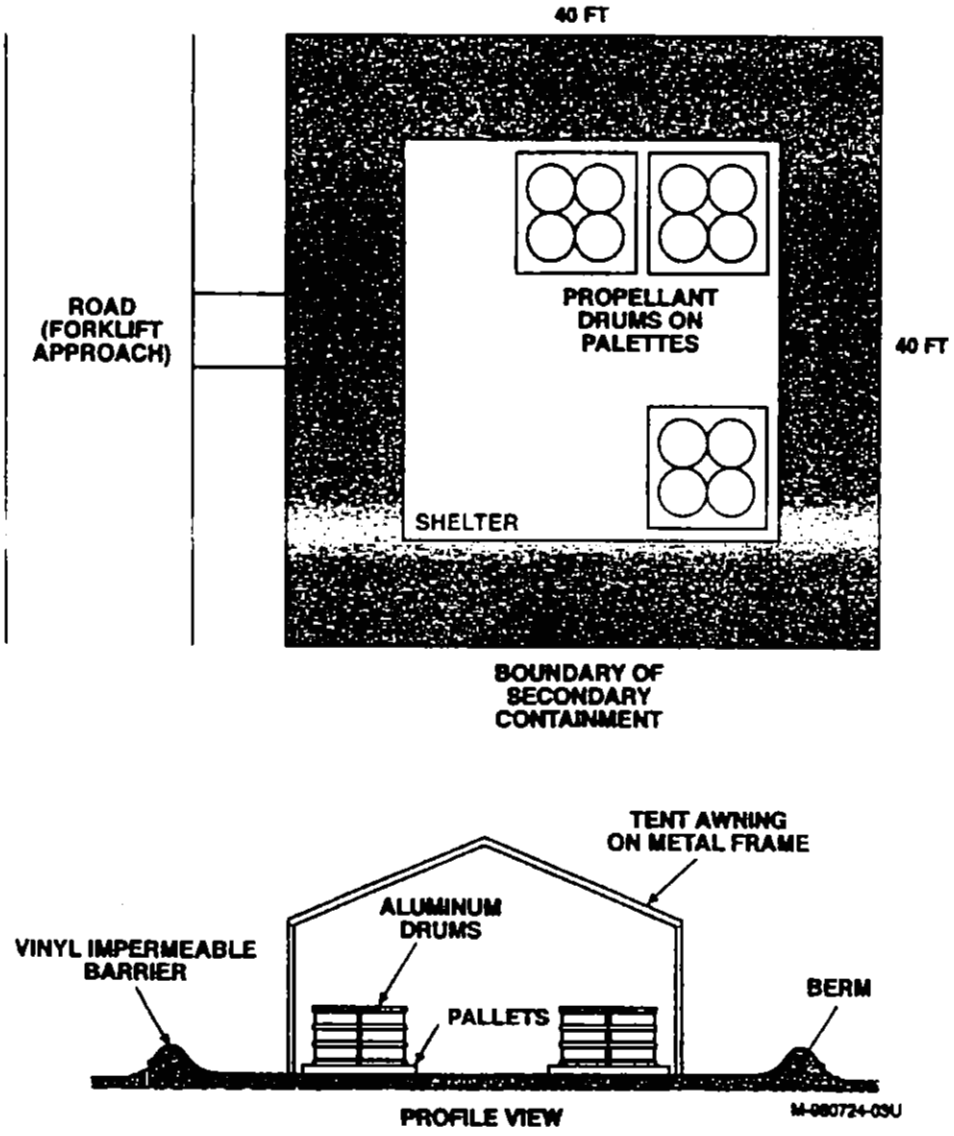


Figure 1-1 Notional Kerosene/IRFNA Storage Site

(identical for each constituent)

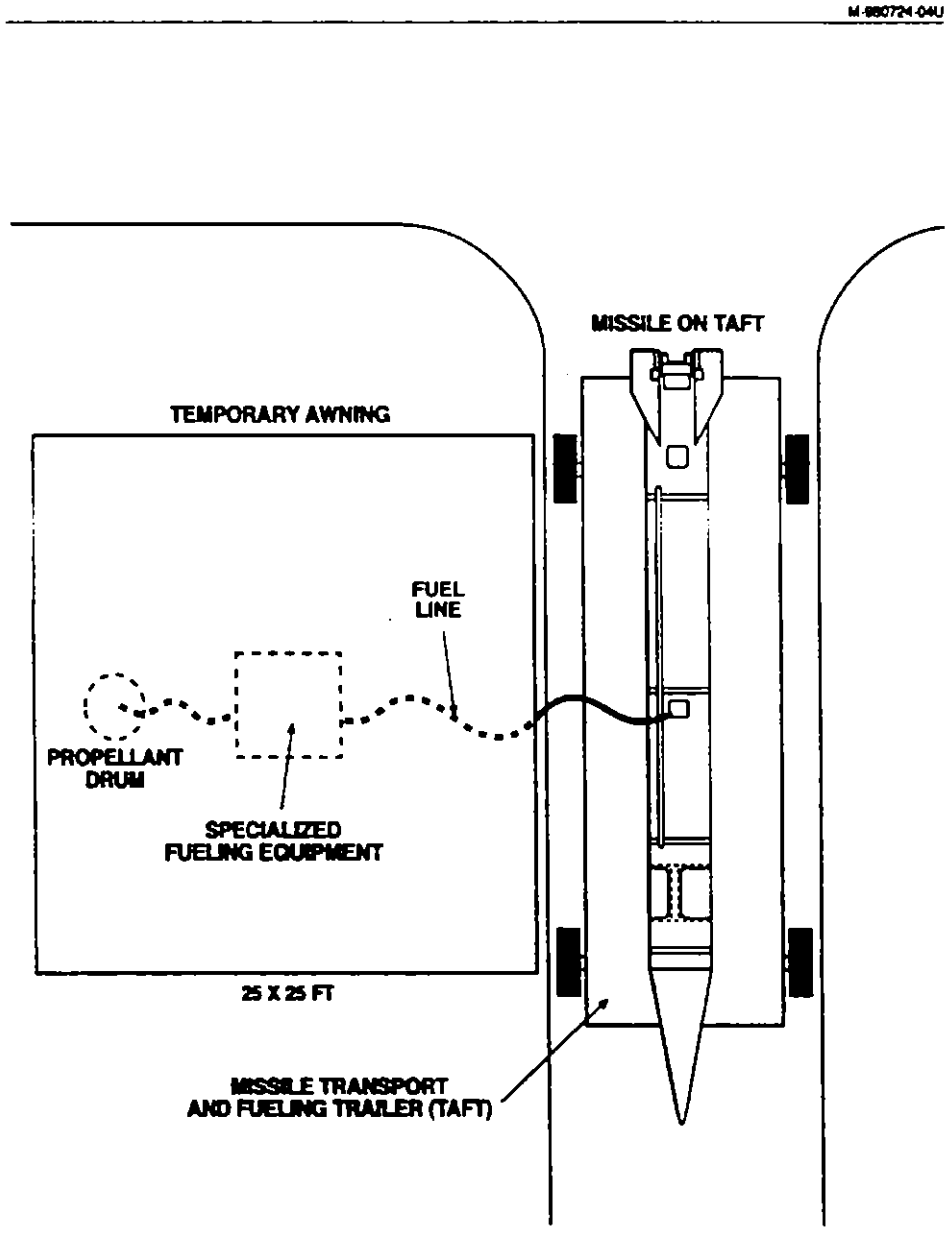


Figure 1-2 Notional Propellant Transfer Area

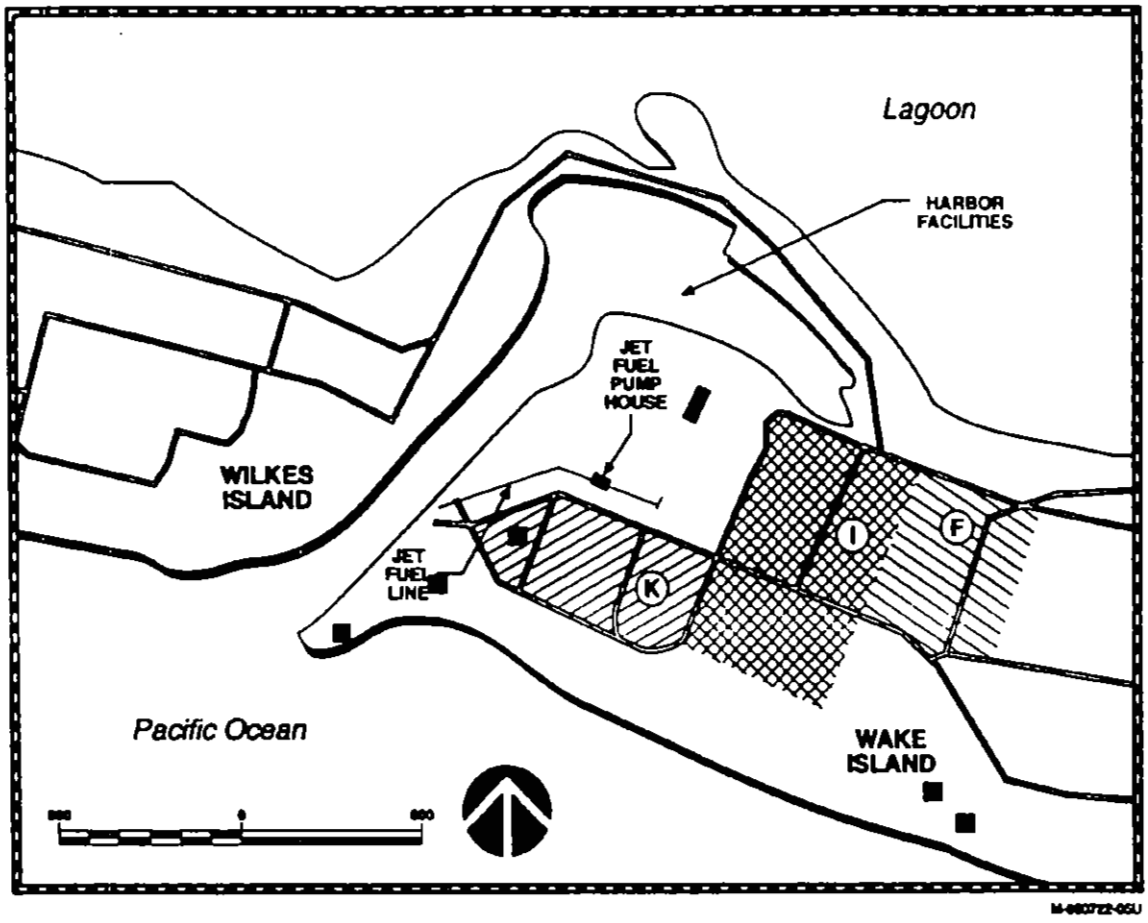


Figure 1-3 Harbor Area Potential Kerosene/IRFNA Storage Areas and Propellant Transfer Areas

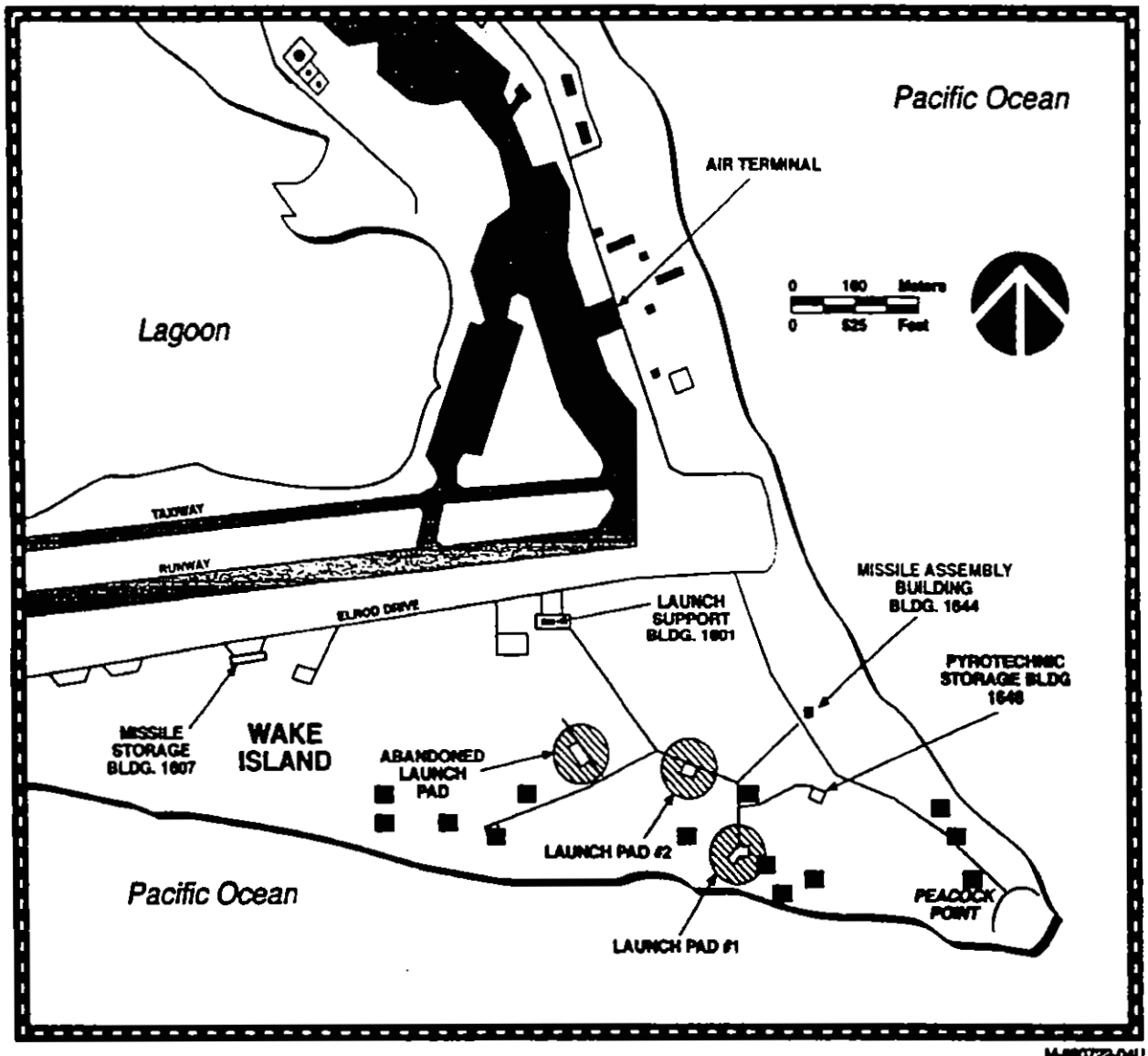


Figure 1-4 Peacock Point Launch and Support Areas

SUMMARY OF THE WORLD WAR II HISTORY OF THE WAKE ISLAND AND THE EXTANT RESOURCES

Wake Island is actually a V-shaped, three islet coral atoll. Its highest point is only 10 feet above sea level and it is sparsely covered with scrub vegetation. One of the northernmost coral atolls in the Pacific Ocean, Wake lies with its two legs pointing northwest and its apex aiming southeast. The overland distance from one toe to the other is nine miles, with a total land area of two and a half square miles. At the point of the "V" is the main islet, also called Wake, which is six and a half miles in length. The two smaller islets, Peale to the north and Wilkes to the south, lie to the east of the islet's northwesterly tips, with narrow channels between them. The atoll surrounds a shallow lagoon that is three miles long and one and a quarter mile wide.

European explorers first charted Wake Atoll in 1796, when British Naval Captain William Wake passed by the Atoll. No evidence of prehistoric or indigenous occupation of the island has been discovered, most likely because of the remoteness of the island, and the lack of fresh water sources. Wake Atoll was claimed as a possession by the United States in 1898, and except for the years 1942-1945, has been under American military control since that time.

In 1935 Pan American Airways, Pacific Division, was established on Wake Atoll and was awarded the Trans-Pacific mail contract. Air service facilities were constructed by Pan American on Peale Island, including a seaplane base and a first class hotel and restaurant.

The intensifying threat of war in the Pacific in the late 1930's prompted American military planners to recognize the strategic value of Pacific outposts such as Wake Atoll. Construction of an air and submarine base at the atoll was initiated in January 1941. In December 1941 the facility was approximately two-thirds complete. Approximately 1,200 civilian construction workers and 535 military personnel were on the island at the outbreak of war. The first attack on Wake Island was launched by Japanese Air Forces on December 8, 1941. On December 11, 1941 a Japanese Naval attack was repulsed by seacoast artillery. On December 23, 1941 a larger, better prepared Japanese force landed on Wake and Wilkes Island. After six hours of savage fighting, in which the Marines were out numbered two to one, the atoll surrendered to the Japanese. The Japanese military remained in possession of the atoll until the garrison surrendered in September 1945, following the conclusion of World War Two. The Japanese transformed the atoll into a formidable fortress with tank traps, barbed wire entanglements and over 200 concrete bunkers, pillboxes, gun positions and revetments. Most of these structures were constructed with American POW labor. Wake Island was designated a National Historic Landmark in 1985 because of the 1941 battle and the plethora of intact Japanese defensive works on the three islands of the Atoll (see Figure 2-1).

The harbor area where propellant storage and transfer will occur has limited resources. Five Japanese concrete structures are in this area, but none are closer that 500 feet to the nearest

propellant storage site. Peacock Point has many Japanese structures, but none are close enough to the launch pads to be at risk of adverse impact from the activities of this undertaking.

During the post war years, the Air Force and the Federal Aviation Administration (FAA) maintained Wake as a major stop for air traffic enroute to the Far East. The heyday of Wake Island occurred during the Vietnam War when military personnel, FAA personnel and dependants formed a community of almost three thousand on the island.

In 1994, the U.S. Army Space and Missile Defense Command (USASMDC) assumed operational control of Wake, and now employs the island as a target and test missile launch facility. Now known as the Wake Island Launch Center (WILC), the atoll is home to approximately 125 personnel who maintain the infrastructure and launch facilities. Visitation to the atoll is limited to Government and contract personnel who are involved in launch and missile program activities.

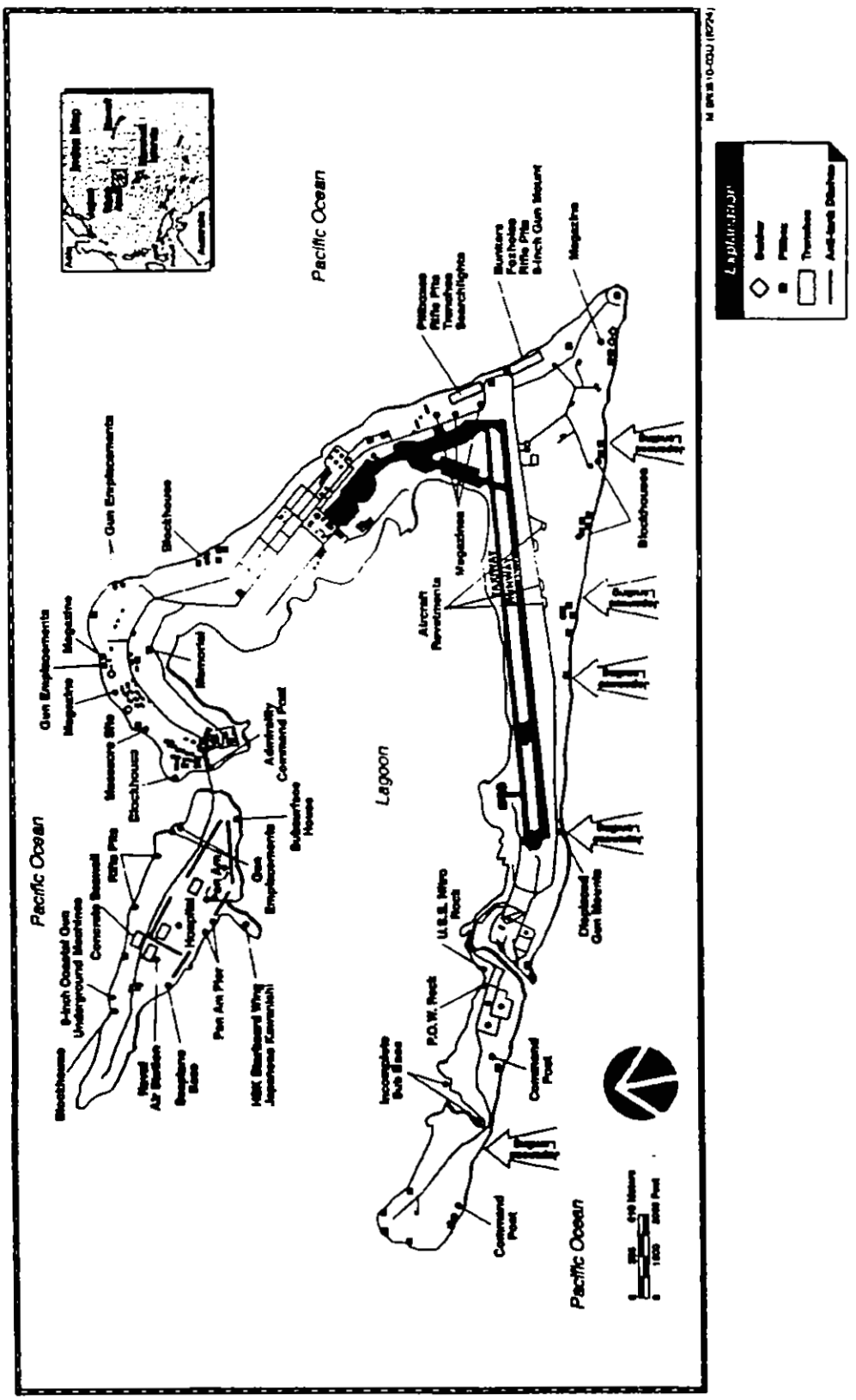


Figure 2-1 Location of Recorded Cultural Resources

REASONS FOR BELIEVING THAT THE LPT MISSILE UNDERTAKING WILL HAVE NO ADVERSE EFFECT

1. There are no known cultural resources in the vicinity of the proposed temporary propellant storage areas and the missile-fueling site. The vehicles, which will move the propellant drums to and from the storage areas and the fueling site, will not pass near any of the Japanese structures.

2. The propellant storage areas and the fueling site will not require any sub-surface disturbance.

3. The LPT missile launches will occur on existing launch pads and will require no new construction or cable trenching.

4. All LPT personnel will be briefed on Wake Island's status as a National Historic Landmark and the requirements of the Archaeological Resources Protection Act. All personnel will be warned about collection or disturbance of cultural resources.

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

REPLY TO ATTENTION OF
Environmental Division

MAR 08 1999

Mr. Michael Molina
Fish and Wildlife Service
300 Ala Moana Boulevard, Room 3-122
P.O. Box 50088
Honolulu, Hawaii 96850

Dear Mr. Molina:

The Ballistic Missile Defense program is an extensive research and development program designed to determine the feasibility of developing an effective ballistic missile defense system. The program includes research of Theater Ballistic Missile Defense (TBMD) technologies necessary for the protection of deployed U.S. forces, as well as U.S. friends and allies throughout the world, from future missile threats.

The experience of the U.S. coalition forces and U.S. allies with ballistic missile attacks during the Gulf War of 1991 (Operation Desert Storm) has highlighted the need for a theater missile defense component of ballistic missile defense. A TBMD system is intended to respond to these dangers of the post-Cold War era by providing protection for deployed U.S. and allied military forces and civilian assets against tactical ballistic missile attacks.

The Wake Island Environmental Assessment (EA) (1994) provided analysis for the launch of solid propellant target missiles and the construction of new launch and support facilities. Since the completion of that document, the U.S. Army Space and Missile Defense Command (USASMDC) has expanded its inventory of target missiles to include Liquid Propellant Target (LPT) missiles. This supplemental EA will analyze the transportation, storage, fueling and launch of these LPT missiles at Wake Island Launch Complex. The proposed action, as described in the supplemental EA, would involve only minimal site preparation activities to establish liquid propellant launch capability at Wake Island.

In compliance with the National Environmental Policy Act (NEPA) and the Council on Environmental Quality (CEQ) regulations implementing NEPA, a supplemental EA is being

prepared by the U.S. Army Space and Missile Defense Command. The supplemental EA is being prepared to address the potential for environmental impacts of conducting LPT launches at Wake Island Launch Complex. In order to complete the process, we are requesting an informal Endangered Species Act Section 7 consultation with your office.

The coordinating draft Supplemental EA is enclosed for your review. Appendices B and C contain the Terrestrial Resources Survey and the Baseline Marine Biological Survey for Wake Island.

Please review this information and provide comments to: Deputy Commander, U. S. Army Space and Missile Defense Command, Attention: SMDC-EN-V (Ms. Sharon Mitchell), P.O. Box 1500, Huntsville, Alabama 35807-3801 or by data facsimile (256) 955-5074. Please provide your comments by April 9, 1999.

If you have any questions, please contact Ms. Sharon Mitchell at (256) 955-4392.

Sincerely,

John L. Ramey
Lieutenant Colonel
Deputy Chief of Staff,
Engineer

Enclosure

Copy Furnished:

Mr. Eugene Nitta, U.S. National Marine Fisheries Service, 2570 Dole Street, Honolulu, Hawaii 96822-2396

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Ecoregion
300 Ala Moana Boulevard, Room 3-122
Box 50088
Honolulu, Hawaii 96850

APR - 9 1999

In reply refer to: KBF

Lieutenant Colonel John L. Ramey
Deputy Chief of Staff, Engineer
Department of the Army
U.S. Army Space and Missile Defense Command
Post Office Box 1500
Huntsville, Alabama 35807-3801

Re: Draft Supplemental Environmental Assessment (DSEA) for the Wake Island Launch Center

Dear Lieutenant Col. Ramey:

The U.S. Fish and Wildlife Service (Service) has reviewed the above referenced action and request for comments on the DSEA, and request for informal consultation under section 7 of the U.S. Endangered Species Act (Act). The DSEA was prepared by the project sponsor, the U.S. Army Space and Missile Defense Command (USASMDC). This letter has been prepared under the authority of and in accordance with provisions of the National Environmental Policy Act of 1969 [42 U.S.C. 4321 *et seq.*; 83 Stat. 852], as amended, the Fish and Wildlife Coordination Act of 1934 [16 U.S.C. 661 *et seq.*; 48 Stat. 401], as amended, the Endangered Species Act of 1973 [16 U.S.C. 1531 *et seq.*; 87 Stat. 884], and other authorities mandating Service concern for environmental values. Based on these authorities, the Service offers the following comments for your consideration.

The proposed project involves the fueling and launching of up to 20 Liquid Propellant Targets (LPT) at the Wake Island Launch Center (WILC) over a ten year period. The LPT's would augment an existing suit of targets used to provide realistic test situations for ground-based missile defenses functioning within a simulated theater of operations. Long-distance missile flight tests, in excess of 715 miles, would support the development and operational effectiveness of Theater Missile Defense missile and sensor systems. Supplies integral to the proposed project that would be transported to Wake Atoll by ship, barge or U.S. Air Force Air Mobility Command (AMC) include: LPT missiles, Ground Handling Launch Equipment (GHLE) vehicle, Launch Control Van, Pad Equipment Shelter, Missile Transportation and Fueling Trailer, 4 100-kw Diesel or Gasoline Generators and Specialized Fueling Equipment.

Draft Supplemental Environmental Assessment
Wake Island Launch Center
Wake Atoll

GENERAL COMMENTS

In general, the Service believes that the DSEA adequately describes the proposed action and the fish and wildlife resources located at the proposed project site. The Service believes that the preferred alternative is the action least likely to impact fish and wildlife resources, relative to the proposed project. Most of the potential impacts to fish and wildlife resources have been adequately addressed in the DSEA. However, the Service is concerned that the DSEA does not include an analysis for impacts to fish and wildlife resources should an LPT explode at the launch pad during flight test-related activities. Therefore, the Service recommends that the USASMDC delineate a 'zone of impact' in the event an LPT explodes at the proposed launch pad. Furthermore, the USASMDC should identify fish and wildlife resources, including federally listed species (*e.g.* green sea turtles), that may be affected within the zone of impact.

The Service is also concerned that there is a potential for impacts to bird colonies if there was an accidental introduction of the brown tree snake (*Boiga irregularis*) through increased cargo shipments and human presence on Wake Atoll. Therefore, the Service recommends that the USASMDC minimize the potential for the brown tree snake to become established on Wake Atoll by developing a plan to control the introduction of brown tree snakes (*e.g.* from Guam). Elements of the plan should include measures to prevent the inadvertent introduction of brown tree snakes during the transportation of LPT Missile systems and supplies associated with flight test launches to Wake Atoll. The Service recommends that the Plan also address potential brown tree snake introductions during the long-term operation of the LPT missile system at Wake Atoll. The plan should include measures that are implemented until the potential for the inadvertent introduction of the brown tree snake to Wake Atoll no longer exists.

Additionally, the Service recommends that a snake quarantine containment area be established for incoming materials, equipment, and supplies from Guam or transhipped through Guam during the operation of USASMDC related-activities at Wake Atoll. This containment area should be established prior to shipments or flights arriving from Guam and be placed in an area of the harbor or airport that is closest to the area receiving cargo. Plans to incorporate the best methods of control and interdiction of the brown tree snake should be done in cooperation with the U.S. Department of Agriculture-Wildlife Services (Wildlife Services), U.S. Department of Agriculture, National Wildlife Research Center (NWRC), U.S. Geological Survey-Biological Resources Division (BRD), and the Service. Comments regarding the design and implementation of the Brown Tree Snake Prevention Plan (Plan) should be solicited from the Wildlife Services, NWRC, BRD, and the Service.

SPECIFIC COMMENTS

On page 3-4, line 32, the Service recommends that you include a map in the DSEA that indicates

the location of nesting sites for Black-footed albatross (*Phoebastria nigripes*) and Laysan albatross (*Phoebastria immutabilis*). Blackfooted albatross and Laysan albatross, afforded protection under the Migratory Bird Treaty Act (16 U.S.C. 703 - 712), are known to occur in the vicinity of the proposed project (M.Rauzon, pers.com.). The Service recommends that you contact Mr. Mark Rauzon (510/531-3887) for information pertaining to the location of albatross nesting sites on Wake Atoll.

On page 3-8, line 29, the DSEA states that "None of the fishes at Wake Atoll are known to be listed as rare, threatened, endangered, or protected." The giant clam or *Tridacna maxima*, is currently afforded federal protection under the Convention for the International Trade of Endangered Species (CITES - 50 CFR 23.23 - Appendix II) and listed in the International Union for Conservation of Nature and Wildlife (IUCN) Red Book Status as Insufficiently Known. Furthermore, the National Marine Fisheries Service (NMFS) has published a request for information on marine species for possible addition to the List of Endangered and Threatened Species under the Endangered Species Act in the January 15, 1999 Federal Register (FR Vol 64, No. 10/Friday, pp. 2629-700). The Service has recommended that the following species be considered for candidate status: the giant clam (*Tridacna gigas*), crocus clam (*T. crocea*), the fluted clam (*T. squamosa*) the strawberry clam (*Hippopus hippopus*), the china clam (*H. hippopus*), the black lipped pearl oyster (*Pinctada margaritifera*), the coconut crab (*Birgus latro*), the grey reef shark (*Carcharinus amblyrhynchos*), the humphead wrasse (*Cheilinus undulatus*), and the humphead parrotfish (*Bolbometopon muricatum*). The Service recommends that a comprehensive marine biological survey be conducted to determine the distribution of these species on Wake Atoll.

On page 4-6, line 19, the Service does not agree with the statement: "Because no Federally protected, threatened, or endangered species or habitats are known to exist at Wake Atoll, no significant impacts to such resources would occur if the proposed action is implemented." The following is a list of species that are reported to occur at Wake Atoll and afforded protection under the various federal laws: U.S. Endangered Species Act - the threatened green sea turtle; CITES protected species - the giant clam; Migratory Bird Treaty Act protected species - black-footed albatross, Laysan albatross, brown booby, masked booby, red-footed booby, bristle-thighed curlew, great frigatebird, lesser golden-plover, black noddy, brown noddy, sharp-tailed sandpiper, christmas shearwater, wedge-tailed shearwater, northern shoveler, wandering tattler, gray-tailed tattler, sooty tern, gray backed tern, white tern, red-tailed tropic bird, white-tailed tropic bird and the ruddy turnstone.

In summary, the Service would not support a finding of no significant impact (FONSI) for the proposed project based on the information currently contained in the DSEA. It is the Service's opinion that the proposed activity described in the DSEA may impact fish and wildlife resources in the event an LPT explodes at the launch pad. The Service recommends that the final

document include a 'zone of impact' delineation and a list of species that may occur within this zone. Furthermore, the Service recommends that the USASMDC develop and implement a plan to minimize the potential inadvertent introduction of brown tree snakes to Wake Atoll. The USASMDC shall periodically assess the effectiveness of the Plan by involving external expertise on snake control techniques and strategies.

We have reviewed the Terrestrial Resources Survey of Wake Atoll (1998), the Baseline Marine Biological Survey Peacock Point Outfall and Other Point-Source Discharges, Wake Atoll and other biological reports of Wake Atoll. Based on this information, and the project description of biological resources provided in the DSEA, the Service concludes that federally listed endangered and threatened species exist at Wake Atoll. Federally listed species known to occur at Wake Atoll include: the threatened green sea turtle (*Chelonia mydas*).

The Service understands that green sea turtles are known to occur in the marine environment in the vicinity of the proposed project. There are no reports that green sea turtles haul out along the southern shore of Wake Atoll. However, it is conceivable that green sea turtles might haul out along this shoreline since the slope of the shoreline is not steep and offers limited basking opportunities. Thus, the Service will concur with a determination that the proposed project will not adversely affect the green sea turtle.

In view of this, we believe that requirements of section 7 of the Endangered Species Act have been satisfied for the green sea turtle. However, obligations under section 7 of the Act must be reconsidered, if: (1) new information reveals impacts of this identified action that may affect listed species or critical habitat in a manner that was not previously considered; (2) this action is subsequently modified in a manner not previously considered in this assessment; or (3) a new species is listed or critical habitat designated that may be affected by the identified action.

The Service appreciates the opportunity to comment on the proposed project. If you have questions or comments, please contact Fish and Wildlife Biologist Kevin Foster (808/541-3441).

Sincerely,

Robert P. Smith

Robert P. Smith
Pacific Islands Manager

cc: NMFS-PAO, Honolulu
EPA-Region IX, Honolulu
DLNR, Hawaii

DAR, Hawaii
CZMP, Hawaii
CWB, Hawaii

List of Contacts for Brown Tree snake Prevention Plan

Mike Pitzler
USDA-APHIS-WS
1600 Route 16
Suite 103-C
Barrigada, Guam 96921, USA
Tel: 671/635-4400
Fax: 671/635-4401

Earl Wm. Campbell III
USDA-APHIS-WS
National Wildlife Research Center
Hawaii Field Station
P.O.Box 10880
Hilo, HI 96721
Tel: 808/961-4482
Fax: 808/961-4776

Thomas H. Fritts, Ph.D.
National Biological Survey
National Museum of Natural History, MRC 111
Washington, D.C. 20560-0001
Tel: 202/357-1930
Fax: 202/357-1932

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

REPLY TO ATTENTION OF

JUN 07 1999

Environmental Division

Mr. Robert P. Smith
U.S. Department of the Interior
Fish and Wildlife Service
Pacific Islands Eco-Region
300 Ala Moana Boulevard, Room 3-122
P.O. Box 50088
Honolulu, HI 96850

Dear Mr. Smith:

Thank you for your comments on the draft Supplemental Environmental Assessment (SEA) for the Wake Island Launch Center. In response to your comments, we have enclosed copies of the changed pages in the document. We will send you the final SEA as soon as it is available.

Although we share your concern about accidental introduction of the brown tree snake to Wake Island, the cargo shipments of liquid propellant missile systems and supplies for test launches would not come from Guam. Therefore, the proposed action would have no potential for an inadvertent introduction of the brown tree snake to Wake Island. We believe the inclusion of a Brown Tree Snake Prevention Plan is out of scope for this SEA; however, if you would like to pursue this separately from the SEA, we would like to meet with you to discuss the details of the plan and funding mechanisms.

If you have any questions, please contact Ms. Sharon Mitchell at (256) 955-4392.

Sincerely,

John L. Ramey
Lieutenant Colonel, U.S. Army
Deputy Chief of Staff,
Engineer

Enclosure

3.3.2.3 Peale Island

Essentially, the dominant vegetation of Peale Island is tree heliotrope, 2 to 8 m (6.6 to 26 ft) in height. The ground cover is mixed bunch grass and open coral rubble. Along the shore near the Peale Island Bridge, around to and including Flipper Point, and lining the inlets is a thriving Pemphis community with intermittent mats of red-stemmed sea pruslane. Upland from and intermingled with the Pemphis is a burgeoning community of ironwood trees. About 150 m (492 ft) from the Peale Island Bridge on the ocean side of Peale Island Road can be found a scattering of *Pisonia grandis* and kou trees, almost all that is left of what Fosberg referred to as a *Pisonia/Cordia* forest.

About halfway between the Peale Island Bridge and the northwestern tip of Peale Island is a dirt road which leads to the old Pan American Seaplane Ramp. Just at the turn, there is a dense planting of *Opuntia littoralis* (Tour.) Mill., and a little further along the road is a reproducing stand of sisal. On either side of the dirt road are open areas where there are no heliotrope trees. In these open places, huge enclaves of the shrubby, wild cotton that is native to this atoll can be found.

No threatened or endangered plant species as set forth by the U.S. Department of the Interior Fish and Wildlife Service (Endangered Species Act of 1973, [16 U.S. Code 1531-15431 as amended) have been encountered at Wake Atoll.

3.3.3 Marine Resources

During the 1998 marine biological survey, a total of 122 species of reef fishes, 41 species of corals, 39 species of other macroinvertebrates, and 19 species of macroalgae were recorded at Wake Atoll. Undoubtedly, many more species among all groups are present at the atoll but as yet remain uncataloged. The lagoon supports a large population of fish and the surrounding reefs host a diverse assemblage of reef fish. Nearshore fishes important for food and recreational purposes include groupers (*Cephalapholis argus*), porgy (*Monotaxis grandoculis*), and jacks (*Carangidae*). Sharks are abundant. The giant clam (*Tridacna maxima*) is commonly found in the nearshore waters surrounding Wake Atoll. *T. maxima* is currently afforded Federal protection under the Convention for the International Trade of Endangered Species (CITES).

Marine mammals that may occur in the open ocean area surrounding Wake Atoll and between Wake and Kwajalein Atolls include several species of cetaceans: the blue whale (*Balaenoptera musculus*), the finback whale (*Balaenoptera physalus*), the humpback whale (*Megaptera novaeangliae*), Cuvier's beaked whale (*Ziphius cavirostris*), and the sperm whale (*Physeter catodon*). Bottlenose (*Tursiops truncatus*) and spinner dolphins (*Stenella longirostris*) may also be present around Wake Atoll. Hawaiian monk seals (*Monachus schauinslandi*) have also previously been sighted at Wake Island on occasion.

3.3.4 Federally Protected and Threatened/Endangered Species

Federally protected terrestrial biota at Wake Atoll are limited to the migratory seabirds, shorebirds and occasional vagrant waterbirds. These birds are identified as "migratory" and are protected under the Migratory Bird Treaty Act (MBTA) of 1916 (16 U.S.C. 703-712). [illegible] and protected under the MBTA [illegible] black-footed albatross, Laysan albatross, brown booby, masked booby, red-footed booby, [illegible] bristle-thighed curlew, great frigatebird, lesser golden-plover, black noddy, brown noddy, sharp-tailed sandpiper, [illegible] ruddy turnstone, short-eared owl, wandering tattler, gray-tailed tattler, [illegible] gray-backed tern, white tern, red-tailed tropicbird, white-tailed tropicbird, and the ruddy turnstone. There are no exclusively terrestrial biota, including plants and animals, Federally listed as threatened or endangered under the Endangered Species Act, currently known or reported from Wake Atoll (USFWS 1998).

The Federally threatened green sea turtle (*Chelonia mydas*) was observed multiple times in the nearshore ocean and lagoon waters at Wake Atoll during the 1998 terrestrial survey. Shoreline basking and nesting activity, the only terrestrially-based behaviors of this otherwise marine species, were neither observed during the investigation nor reported in the literature as having been observed at Wake Atoll. It is

conceivable, however, that green sea turtles might haul out along the southern shoreline of the atoll since the slope of the shoreline is not steep and offers limited basking opportunities.

The Federally endangered hawksbill sea turtle (*Eretmochelys imbricata*) has been suspected to occur at Wake Atoll (USAF 1994a); however, no records or accounts of confirmed sightings could be found in the literature reviewed. No observations of hawksbill sea turtles were recorded at Wake Atoll during the 1998 survey.

The Wake rail (*Rallus wakensis*), a flightless species endemic to Wake Atoll, has not been observed since WWII and is now considered extinct. Japanese soldiers occupying the atoll during WWII are reported to have hunted and eaten these small birds to avoid starvation during a sustained American blockade of Japanese supply shipments to the atoll. Predation by feral cats has also been suggested as a possible factor in the extinction of this species.

3.4 CULTURAL RESOURCES

Cultural resources are prehistoric and historic sites, structures, districts, artifacts, or any other physical evidence of human activity considered important to a culture, subculture, or community for scientific, traditional, religious, or other reasons. Cultural resources have been divided for ease of discussion into three main categories: prehistoric resources, historic structures and resources, and traditional resources.

Prehistoric archaeological resources are defined as physical remnants of human activity that predate the advent of written records in a particular culture and geographic region. They include archaeological sites, structures, artifacts, and other evidence of prehistoric human behavior. No evidence of prehistoric cultural resources has been discovered on Wake Island.

Historic resources consist of physical properties or locations postdating the advent of written records in a particular culture and geographic region. They include archaeological sites, structures, artifacts, documents, and other evidence of human behavior. Historic resources also include locations associated with events that have made a significant contribution to history or that are associated with the lives of historically significant persons.

Wake Island was designated a National Historic Landmark in 1985 in order to preserve both the battlefield where important WWII events occurred and Japanese and American structures from that period. The Pan American facilities and the U.S. Naval submarine and aircraft base are included in the historic property. Many of the Japanese structures were actually constructed with American labor. A group of 98 American Prisoners of War were forced to build these defenses until mid-1943, when they were executed by the Japanese (Urwin, 1983). These structures include several pillboxes, bunkers and aircraft revetments. Figure 3-2 presents the known WWII-era permanent structures on all three islands of the Atoll. A comprehensive survey of Japanese earthen structures and field fortifications has not been conducted.

The remoteness of the island, and the lack of fresh water sources other than rainfall, are characteristics of the island that discouraged settlement by native Pacific populations, so there is little potential for prehistoric or traditional resources to be present. No unique paleontological or traditional use resources are known to exist on the island.

4.1.2.4 No Action Alternative

Under the no action alternative, LPT missile launches would not occur at WILC. However, missile testing and launching activities would continue with other programs. Those associated impacts were analyzed in previous documents and found not significant.

4.1.2.5 Cumulative Impacts

There would be no cumulative impacts to airspace associated with launching LPT missiles from WILC.

4.1.3 BIOLOGICAL RESOURCES

Native or naturalized vegetation, wildlife, and the habitats in which they occur are collectively referred to as biological resources. Existing information on flora (plant) and fauna (animal) species and habitat types in the vicinity of proposed sites was reviewed with particular attention paid to the presence of any species Federally listed as rare, threatened, or endangered to assess their sensitivity to the effects of the proposed action.

The analytical approach for biological resources involved evaluating the degree to which the proposed activities could impact the vegetation, wildlife, threatened or endangered species, and sensitive habitat within the affected area. Criteria for assessing potential impacts to biological resources are based on the following: the number or amount of the resource that would be impacted relative to its occurrence at the project sites, the sensitivity of the resource to proposed activities, and the duration of the impact. Impacts are considered significant if they have the potential to result in: reduction of the population size of Federally listed threatened or endangered species; degradation of biologically important unique habitats; substantial long-term loss of vegetation; or reduction in the capacity of a habitat to support wildlife.

4.1.3.1 Proposed Action

There is little potential to disturb any type of nesting habitat during the minor construction activities that would occur to accommodate LPT missile testing at Wake Island, because the proposed sites for the storage facilities have been previously disturbed and are situated on improved property. The impacts of launching liquid propellant missiles would be the same or less harmful to the environment than launching solid propellant missiles (which was analyzed in the 1994 *Wake Island EA)*, because the liquid propellant missiles do not release hydrogen chloride as an exhaust product. However, potential impacts could result from launch-related activities such as launch noise, launch emissions, and sonic booms. The effects of noise on birds and wildlife have been extensively reviewed. Several studies have shown that intermittent noises (other than those at or near the threshold of pain) have little if any apparent effect on most animals, including birds. Birds acclimate quickly to most non-constant noises in their environment, and after an initial flushing generally return to the nest. Other wildlife typically exhibits a momentary startle effect. Previous environmental analysis has determined that the noise from missile launches generally causes no significant impacts to birds or other wildlife.

The potential for indirect impacts on birds may result from increased human presence on the island. Human intrusion into seabird colonies can result in abandonment of the colony from repeated or prolonged disturbance. Also, nests exposed when birds are flushed may be susceptible to predation by frigatebirds. Without restrictions, an increased population of humans (and accompanying increases of air and sea-based traffic to the island), could result in an increase of non-native pests that may be inadvertently transported to the island. For example, the inadvertent introduction of the brown tree snake (*Boiga irregularis*) from Guam to Wake Island is a very real threat, the risk of which is likely to increase in direct proportion to the number of cargo shipments to the island, especially if unregulated or unmonitored. Similarly, plant seeds inadvertently carried on incoming aircraft or cargo have already altered the botanical composition of the atoll. Without proper safeguards, an increased frequency of arriving aircraft associated with increased launch activities could exacerbate this condition. This potential can be mitigated by requiring cargo-handling personnel to inspect arriving aircraft for pest species of plants and animals. Program personnel will be briefed on methods for pest detection, and the briefing will include viewing of

the video produced by the Hawaii Chapter of the Wildlife Society entitled *Oahu Snake Menace*. No cargo or equipment associated with the proposed action would be shipped to WILC from Guam. With proper standard operating procedures (SOPs) in place, no adverse impacts to atoll flora, fauna, or avifauna are expected from the proposed action.

An additional possible impact could arise as a result of contamination in the case of an accidental spill. Generally, hazardous materials contamination would be restricted to small areas near the source of pollution. Local spills of petroleum products such as gasoline, jet fuel, and oil could be harmful if they are allowed to come into contact with or are ingested by birds. Spills into the lagoon may spread over the surface of the waters and result in impacts including death of a small number of seabirds that may drink from or land on the water. However, with SOPs already in place, any potential for adverse impacts is judged to be not significant.

Another possible impact could occur as a result of an on-pad catastrophic failure or explosion. The launch hazard areas depicted in Figure 2-6 contain some avian nesting sites, as shown in Figure 3-1. Avian species protected under the MBTA that are known to nest within the proposed LHAs include the red-tailed tropicbird, the blackfooted albatross, and potentially the Laysan albatross. The LHAs also extend into the ocean area several hundred meters, where the Federally protected green sea turtle might be found. Due to implementation of launch safety SOPs, the potential for an on-pad failure or explosion would be very remote and therefore, the potential for impact to the above biological resources is considered to be not significant.

The open ocean area around Wake Island is an extremely large area, and very little is known of the numbers and distribution of marine biological resources, including marine mammals and sea turtles. Of the internationally protected species, sea turtles and marine mammals would have the greatest risk, although extremely remote, of incidental impact from falling missile debris in the booster drop area or in the event of an aborted flight. The taking of a protected species would be a significant impact, but the probability of such an occurrence is judged to be extremely remote. Thus, no significant impacts to marine biota are anticipated from implementing the proposed action.

Although Federally protected, threatened or endangered species or habitats are known to exist at Wake Atoll, no significant impacts to such resources would occur due to the implementation of the proposed action.

4.1.3.2 Alternative 1

This alternative would have the same potential impacts as the proposed action.

4.1.3.3 Alternative 2

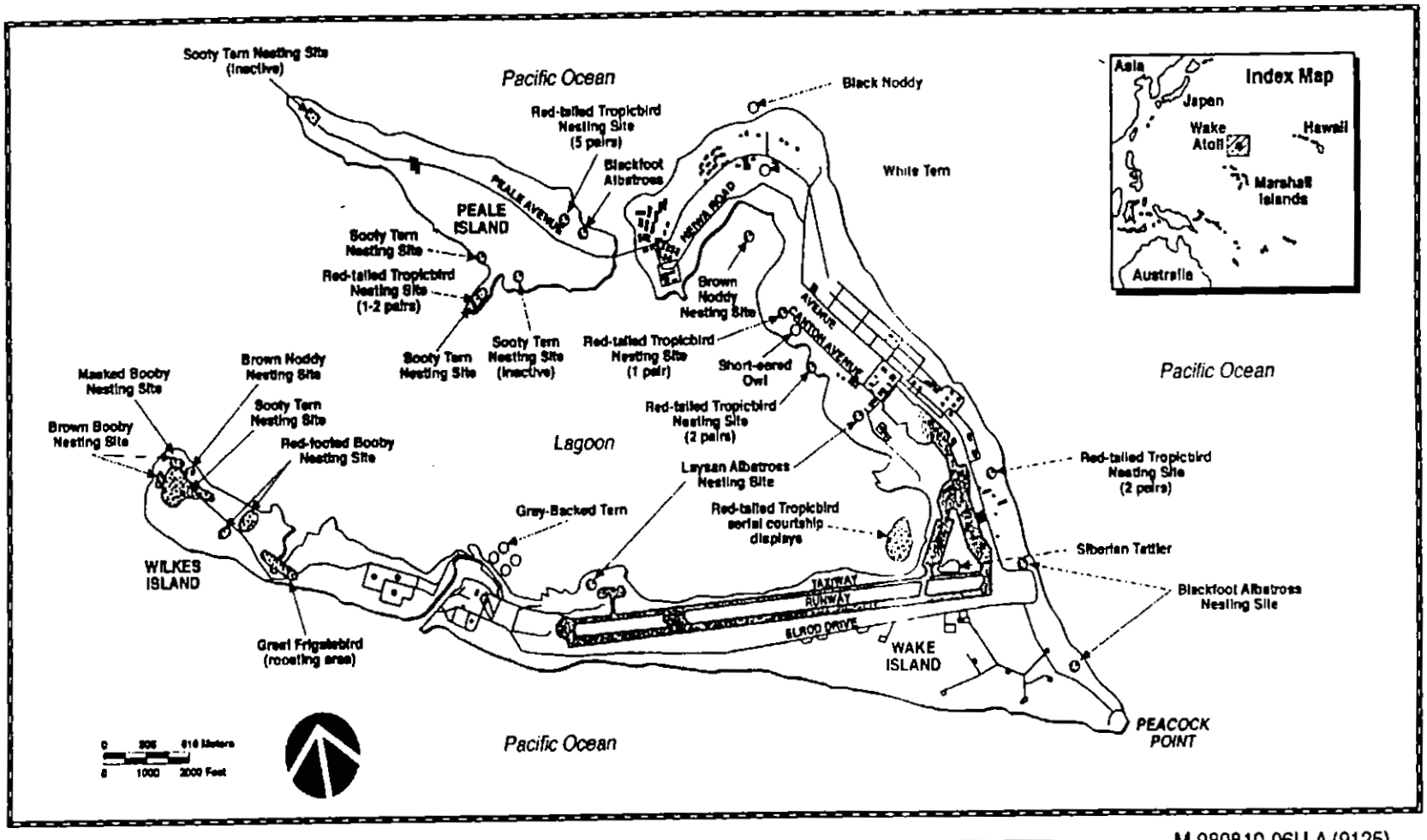
This alternative would have the same potential impacts as the proposed action.

4.1.3.4 No Action Alternative

There would be no impacts to biological resources if the no action alternative is selected.

4.1.3.5 Cumulative Impacts

The increased numbers of personnel represent potential impacts due to the continuing introduction of invasive plant species that can crowd out native vegetation. Bird populations may be subjected to predation by non-native predator species introduced to the atoll. The increased number of personnel present during program launch activities would not represent a significant increase in personnel as compared to other launch activities. With proper SOPs in place, no cumulative impacts are expected from implementing the proposed action.



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Explanation

Sightings of Nesting or Courtship Activity:	Other Sightings:
Sooty tern nesting sites	Black noddy
Red-tailed tropicbird nesting sites (no. of pairs)	Gray-backed tern
Red-tailed tropicbird, aerial courtship display	White tern
Brown noddy nest site	Siberian tattler
	Short-eared owl

Figure 3-1 Location Map Bird Sitings

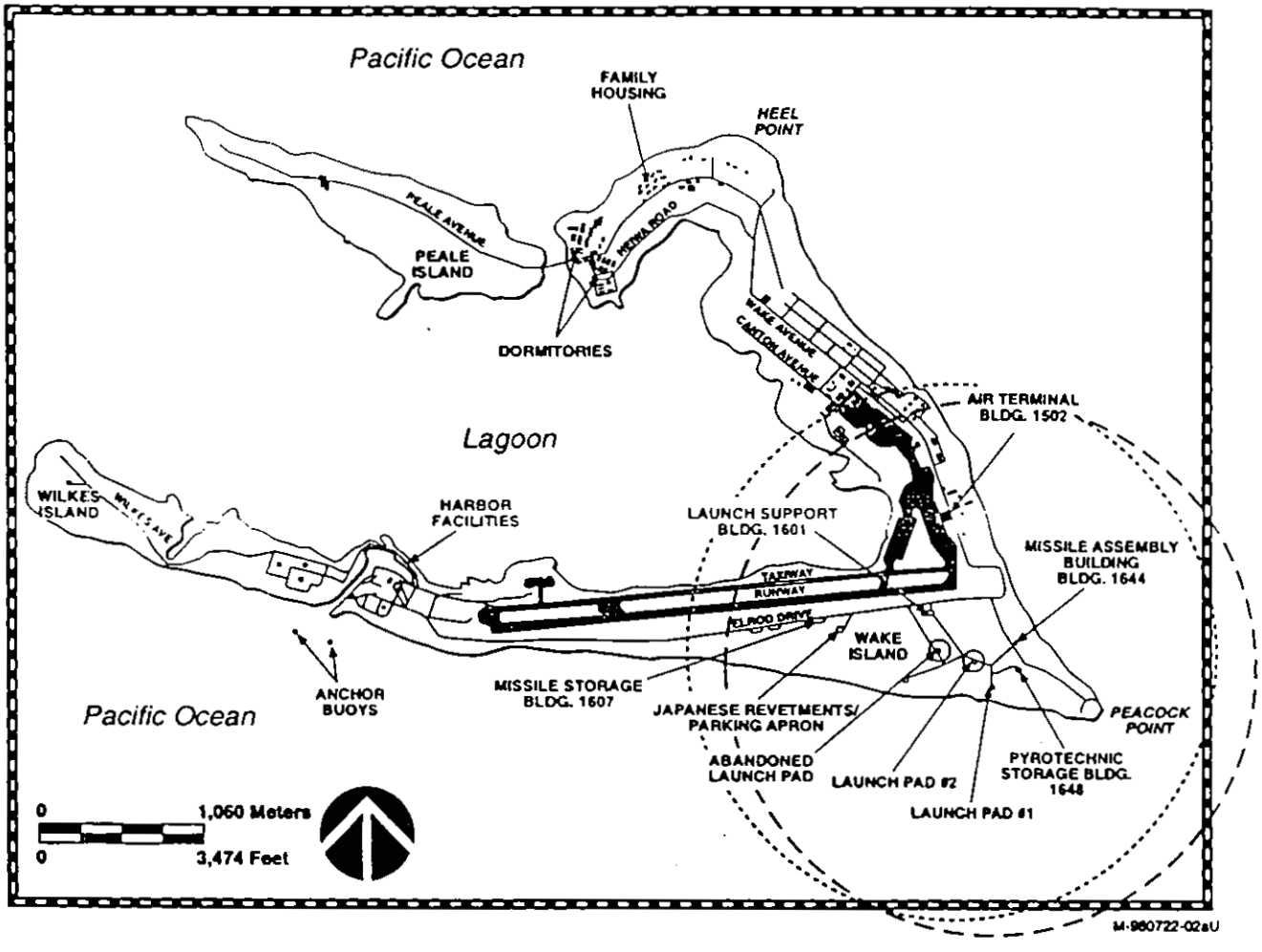

Figure 2-6 Proposed Launch Hazard Areas (LHAs)

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Ecoregion
300 Ala Moana Boulevard, Room 3108
Box 50088
Honolulu, Hawaii 96850

In Reply Refer To: MB:M

SEP 22 1999

Lt. Colonel John L. Ramey
Deputy Chief of Staff, IL&L
U.S. Army Space and Missile Defense Command
ATTN: CSSD-EN-V
106 Wynn Drive
Huntsville, AL 35805

Re: Brown Tree Snake Interdiction at the Wake Island Launch Center, Wake Atoll

Dear Lieutenant Colonel Ramey:

The U.S. Fish and Wildlife Service (Service) has reviewed the revised pages to your draft Supplemental Environmental Assessment (SEA) for the Wake Island Launch Center. We note that prior Service recommendations on the proposed action have been incorporated into the revised text.

With regard to our concern that brown tree snakes (BTS; *Boiga irregularis*) could be introduced to Wake Atoll as a result of the proposed action, we acknowledge your response that cargo or equipment associated with the proposed action will not be shipped to Wake from Guam. Subsequently, we have been informed by your environmental staff that no shipments associated with the proposed action will be received from any location where BTS are known to occur. Accordingly, we agree that the need to develop a BTS Interdiction Plan for the proposed action is beyond the scope of the draft SEA.

Concurrently, we agree that the introduction of BTS as a result of increasing air and ship traffic in general is a valid concern relative to the migratory birds that occur at Wake Atoll. Therefore, we would like to pursue the development and implementation of an appropriate BTS Interdiction Plan for the atoll at your convenience. We look forward to continuing our collaborative efforts with you to protect Federal trust resources at Wake Atoll. Please let us know when your staff would be available to discuss the details and potential funding mechanisms for such a plan.

The Service appreciates the concern the U.S. Army has demonstrated for the protection of the Federal trust resources under its charge. If you have questions regarding this letter, please contact my Environmental Review Program Leader, Michael Molina, by telephone at (808) 541-3441 or by facsimile transmission at (808) 541-3470.

Sincerely,

Robert P. Smith
Pacific Islands Manager

cc: SMDC, Environmental Div., Huntsville

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