INTEGRATED FLIGHT TESTS AT WAKE ATOLL FINAL ENVIRONMENTAL ASSESSMENT

May 2015

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14. ABSTRACT

This Environmental Assessment (EA) has been prepared by the Missile Defense Agency (MDA) to analyze the impacts of performing Integrated Flight Tests (IFTs) at Wake Atoll and in the surrounding broad ocean area (BOA). IFTs would include up to five targets (ballistic missile targets and air-breathing remotely-piloted drones) in flight simultaneously. Aegis Standard Missile (SM) interceptors could engage short, medium, and intermediate range targets, and/or air-breathing drones. Terminal High Altitude Area Defense interceptors could engage short, medium, and intermediate range ballistic Missile targets. Phased Array Tracking Radar to Intercept Of Target interceptors could engage short or medium range ballistic missile targets or air-breathing targets. Target missiles or interceptors, but not both, could be launched from Wake Island in a single test event.

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ACRONYMS AND ABBREVIATIONS

15 CES	15th Civil Engineer Squadron
611 CES	611th Civil Engineer Squadron
AAQS	Ambient Air Quality Standards
ABMD	Aegis Ballistic Missile Defense
AEDC	Arnold Engineering Development Center
AEU	Antenna Equipment Unit
AFB	Air Force Base
ALE	Air Launch Equipment
ALSE	Air Launch Support Equipment
AMD	Air and Missile Defense
AN/TPY-2	Army-Navy Transportable Radar Surveillance and Control Model-2
AN/TPY-2 (FBM)	AN/TPY-2 Forward Based Mode
AN/TPY-2 (TM)	AN/TPY-2 Terminal Mode
ARAV-B	Aegis Readiness Assessment Vehicle-B
ARTCC	Air Route Traffic Control Center
ASV	Antenna Support Vehicle
AWS	Aegis Weapon System
BASH	Bird Aircraft Strike Hazards
BMD	Ballistic Missile Defense
BMDS	Ballistic Missile Defense System
BOA	Broad Ocean Area
BOS	Base Operations Support
BQM-74	Air-breathing Drone Target
C2BMC	Command, Control, Battle Management, and Communications
C3	Command Control and Communication
CAA	Clean Air Act
CDIN	C2BMC Deployable Interface Node
CEC	Cooperative-Engagement Capability
CES	Carriage Extraction System
CEQ	Council on Environmental Quality
CEU	Cooling Equipment Unit
CH_4	Methane
CFCs	Chlorofluorocarbons
CFR	Code of Federal Regulations
CHS	Common Hardware/Software
CITES	Convention for the International Trade of Endangered Species

cm^2	Square Centimeter
CNIPs	Communications Network Interface Processors
CNP (CSP)	Central North Pacific (Central South Pacific)
CO	Carbon Monoxide
CO_2	Carbon dioxide
CSV	Cable Support Vehicle
CTS	Common Test Set
dB	decibel
dBA	decibel A-weighted filter for hearing
dBW	decibel Watt
DDG	Guided Missile Destroyer
DEP	Document of Environmental Protection
Det. 1, PRSC	Detachment 1, PRSC
DG	Diesel Generator
DoD	Department of Defense
DOI	Department of Interior
DOT	Department of Transportation
DPS	Distinct Population Segments
DTR	Defense Transportation Regulations
EA	Environmental Assessment
EEU	Electronic Equipment Unit
EIAP	Environmental Impact Analysis Process
EIS	Environmental Impact Statement
E-LRALT	Extended Long Range Air Launched Target
ELTS	Early Launch Tracking System
EMR	Electromagnetic Radiation
eMRBM	Extended Medium Range Ballistic Missile
EO	Executive Order
ESQD	Explosive Safety Quantity Distance
FAA	Federal Aviation Administration
FMTV	Family of Medium Tactical Vehicles
FONSI	Finding of No Significant Impact
FOS	Fiber Optic System
FSA	Forward Staging Area
ft	Foot/Feet
FTO-02	Flight Test Operational-02
FTO-02 E1	Flight Test Operational-02 Event 1
FTO-02 E2	Flight Test Operational-02 Event 2

FTS	Flight Termination System
FTT	Flight Test THAAD
FY	Fiscal Year
gal	Gallon(s)
GHG	Greenhouse gases
gpm	gallons per minute
GPS	Global Positioning System
HA CNE	High Availability Communications Nodal Equipment
HALO	High Altitude Observatory
HEMTT	Heavy Expanded Mobility Tactical Truck
HMU	Habitat Management Unit
HPO	Historic Preservation Office
HPP	Historic Preservation Plan
HTPB	Hydroxyl-Terminated Polybutadiene
HVAC	Heating, Ventilation, Air Conditioning
ICAO	International Civil Aviation Organization
ICRMP	Integrated Cultural Resources Management Plan
ID	Identification
IDS	Intrusion Detection System
IFTs	Integrated Flight Tests
IRBM	Intermediate Range Ballistic Missile
IUCN	International Union for the Conservation of Nature
kg	Kilogram
km	Kilometer(s)
kVA	Kilovolt Amperes
kW	Kilowatt
L	Liter(s)
lb	Pound
LCS	Launch Control Station
L/day	Liters per day
LHA	Launch Hazard Area
L/hr	Liter per hour
LS	Launch Site
LWIR	Long Wavelength Infrared
$\mu g/m^3$	Micrograms per Cubic Meter
µPa	Micropascal
m	Meter(s)
m^2	Square Meter

MBTA	Migratory Bird Treaty Act
MDA	Missile Defense Agency
MEP	Mobile Electric Power
MGD	Million Gallons per Day
MGSE	Mechanical Ground Support Equipment
MMPA	Marine Mammal Protection Act
MSS	Mission Support Shelter
MLP	Mobile Launch Platform
MR	Missile Rounds
MRBM	Medium Range Ballistic Missile
MRP	Missile Round Pallet
MW	Megawatt
N_2O	Nitrous oxide
NAAQS	National Ambient Air Quality Standards
NESHAPs	National Emission Standards for Hazardous Air Pollutants
NEPA	National Environmental Policy Act
NHL	National Historic Landmark
NHPA	National Historic Preservation Act
nm	Nautical Mile
NMFS	National Marine Fisheries Service
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
NOTAM	Notice to Airmen
NRHP	National Register of Historic Places
NTIA	National Telecommunications and Information Agency
O_3	Ozone
OP	Operating Procedure
OSHA	Occupational Safety and Health Administration
PACAF	Pacific Air Forces
PATRIOT	Phased Array Tracking Radar to Intercept Of Target
PEL	Personnel Exposure Limit
PL	Protection Level
$PM_{2.5}$	Particulate Matter (smaller than 2.5 microns in diameter)
PM_{10}	Particulate Matter (smaller than 10 microns in diameter)
PMRF	Pacific Missile Range Facility
POL	Petroleum, Oil and Lubricants
ppm	part(s) per million
PPU	Prime Power Unit

PRIMNM	Pacific Remote Islands Marine National Monument
PRSC	PACAF Regional Support Center
PVC	Poly Vinyl Chloride
RCC	Range Commander's Council
RMI	Republic of the Marshall Islands
RO	Reverse Osmosis
RTS	Reagan Test Site (Ronald Reagan Ballistic Missile Defense Site)
SATCOM	Satellite Communications
SHPO	State Historic Preservation Officer
SIC	Single Integration Center
SM	Standard Missile
SM-2	Standard Missile-2
SM-3	Standard Missile-3
SM-3 Blk IA	SM-3 Block IA
SO_2	Sulfur Dioxide
SRALT	Short Range Air-launched Target
SRBM	Short Range Ballistic Missile
SRM	Solid Rocket Motor
SSG	Station Support Group
STP	Sewage Treatment Plant
THAAD	Terminal High Altitude Area Defense
TFCC	THAAD Fire Control and Communications
TOC	Tactical Operations Center
TOS	Tactical Operation Station
TTS	Transportable Telemetry System
UPS	Uninterruptable Power Supply
UHF	Ultra High Frequency
U.S.	United States
USAF	United States Air Force
U.S.C.	United States Code
USDA	U.S. Department of Agriculture
USAKA	U.S. Army Kwajalein Atoll (includes RTS)
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
UXO	Unexploded Ordnance
V	Volt
W	Watt
WIA	Wake Island Airfield

WILC	Wake Island Launch Complex

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1.0 PURPOSE AND NEED

1.1 INTRODUCTION

This Environmental Assessment (EA) has been prepared by the Missile Defense Agency (MDA) to analyze the impacts of performing Integrated Flight Tests (IFTs) at Wake Atoll and in the broad ocean area (BOA), which includes offshore waters generally surrounding the atoll. Figure 1-1 provides a regional map of the area. Figure 1-2 shows Wake Atoll.

This EA is in compliance with the National Environmental Policy Act (NEPA) of 1969, as amended (42 United States Code (U.S.C.) § 4321 et seq.); the Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of NEPA (Title 40 Code of Federal Regulations [CFR] Parts 1500 – 1508 (2005); 32 CFR 989, Environmental Impact Analysis Process; Executive Order (EO) 12114, Environmental Effects Abroad of Major Federal Actions; and 32 CFR 187, Environmental Effects Abroad of Major Department of Defense Actions.

1.2 BACKGROUND

Wake Atoll consists of three islands: Wake, Wilkes, and Peale. Wake Island is less than 7.8 square kilometers (km^2) (3 square miles [mi^2]) in area and lies in the middle of the Pacific Ocean, roughly half-way between Hawaii and Japan. The United States (U.S.) annexed Wake Atoll in 1899 for a cable station. In subsequent years, Wake was developed as a stopover and refueling site for military and commercial aircraft transiting the Pacific as well as for emergency landings. Wake Atoll has the capability to support missile launches.

In June 1972, the Federal Aviation Administration (FAA) gave control of Wake Atoll to the U.S. Air Force (USAF). Beginning with the U.S. Army's HAVE MILL project in 1974, Wake Island has been used for test missile launches. In 1987, as part of the Strategic Defense Initiative, the predecessor of the present-day MDA, Wake Island was selected as a test location for Project Starbird anti-missile defenses, with facilities located near Peacock Point. In 1994, the U.S. Army assumed administrative command of Wake Island to support further missile testing. The Army used Wake Island to test the Theater Missile Defense system in support of the Ballistic Missile Defense Organization's target and defensive missile systems. To support this mission, target missiles were launched from Wake Island and intercepted by defensive missiles launched from the U.S. Army Kwajalein Atoll (USAKA), currently named U.S. Army Garrison – Kwajalein Atoll. Missiles were not kept on the island, but shipped there and launched for specific tests. In 1999, the Army's mission was further expanded to include liquid propellant target missile launches, which were used as targets for anti-missile interceptors. (USAF, 2015) On October 1, 2002, the USAF officially assumed operational responsibility for Wake Atoll from the U.S. Army (USAF, 2010). Currently, less than 100 personnel reside on Wake. Four of the personnel are active-duty USAF assigned to Wake Atoll. Wake Atoll is an unincorporated U.S. territory that is administered by the Department of the Interior (DOI), Office of Insular Affairs. The Department of Defense (DoD) has historically maintained facilities, defensive areas and airspace reservations at Wake Atoll.

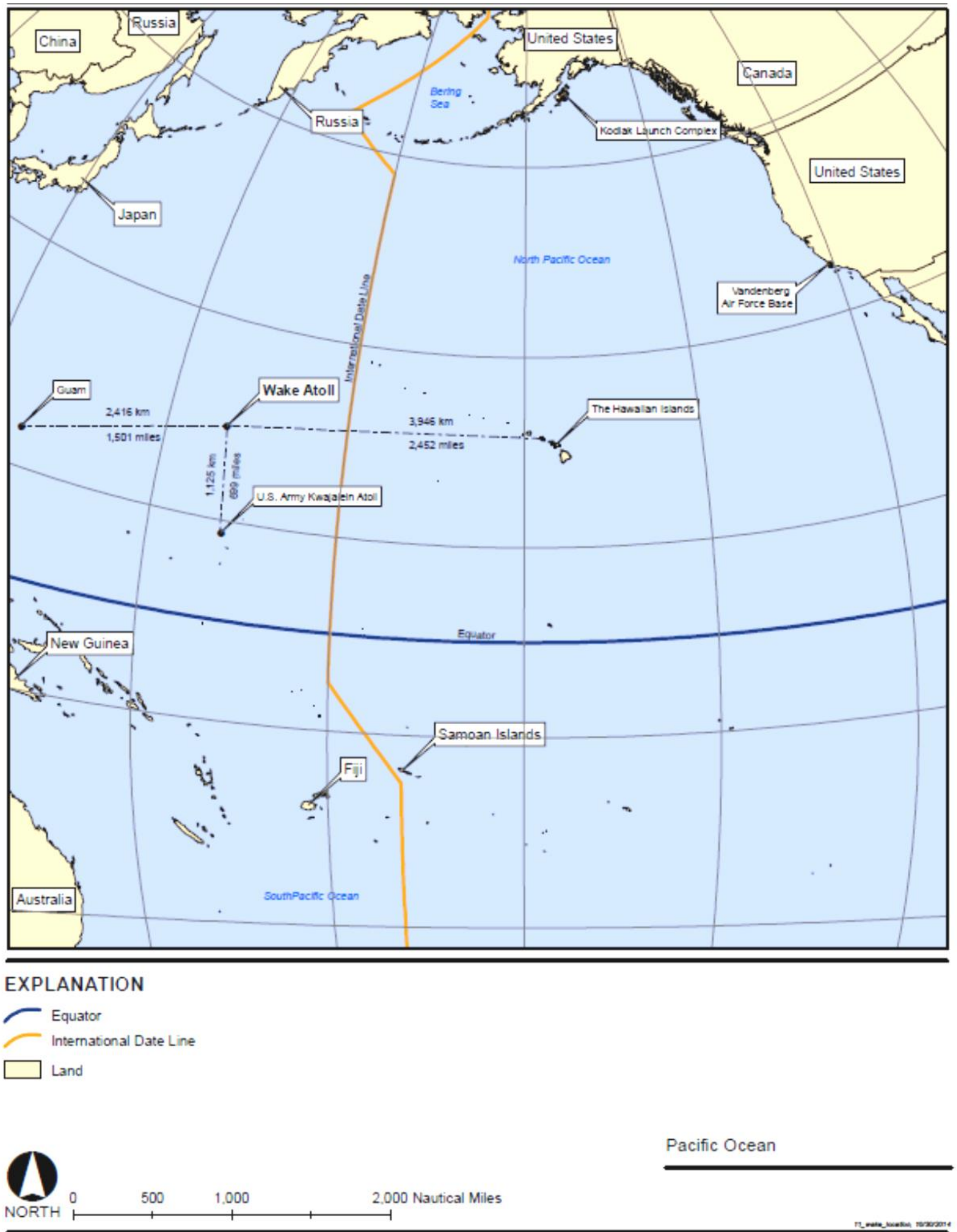

Figure 1-1 Wake Atoll Location

Figure 1-2 Wake Atoll

MDA is currently planning to demonstrate a series of IFTs by using Wake Island and the BOA. The BOA is the area offshore of Wake Atoll and is subject to EO 12114. The use of Wake Atoll to support Ballistic Missile Defense System (BMDS) testing, to include test assets such as missile interceptors, missile targets and their associated sensors, has been extensively analyzed for more than two decades in the following environmental documents. All of the NEPA analyses referenced resulted in a FONSI being issued, determining that the various proposed actions of missile intercepts and target launches, radar use and flight tests would not significantly affect the quality of the natural or human environment. The analyses in these environmental documents assessed the environmental impacts of missile testing at levels that were anticipated to be significantly higher than those associated with this Proposed Action, and these analyses concluded that no significant impacts would result. Previous environmental documents for these programs are listed below in Section 1.7.

The entire Atoll is within the Wake Island National Historic Landmark (NHL), designated on September 16, 1985, and is listed on the National Register of Historic Places.

Wake Atoll (along with Baker, Howland, and Jarvis Islands, Johnston and Palmyra Atolls, and Kingman Reef), is also included in the Pacific Remote Islands Marine National Monument (PRIMNM) established by Presidential Proclamation 8336 on January 6, 2009. This proclamation set the seaward boundary of each unit of the PRIMNM (e.g., the Wake Atoll unit) at approximately 93 kilometers (km) (50 nautical miles [nm]) from its shore baseline (i.e., the mean low water line). On January 16, 2009, the DOI, in consultation with the USAF, created the Wake Island National Wildlife Refuge, which includes some of the atoll’s emergent land and adjacent submerged lands seaward to 22 km (12 nm) from shore.

On September 25, 2014, Presidential Proclamation 9173 expanded the seaward limit of the PRIMNM out to the extent of the U.S. Exclusive Economic Zone, or 370 kilometers km (200 nm) from the shore baseline of each unit, for Wake and Johnson Atolls and Jarvis Island. Figure 1-3 depicts the PRIMNM and the 2014 expansion. Nothing in Proclamation 9173 changed the management of the PRIMNM as specified in Proclamation 8336. Based on the proclamations, the Secretary of the Interior, in consultation with the Secretary of Commerce, has responsibility for management of the PRIMNM, including out to 370 km (200 nm) from the baseline, pursuant to applicable legal authorities. The Secretary of Commerce, through the National Oceanic and Atmospheric Administration, and in consultation with the Secretary of the Interior, has primary responsibility for management of the PRIMNM between 22 and 370 km (12 and 200 nm), with respect to fishery-related activities regulated pursuant to the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. 1801 et seq.) and any other applicable legal authorities. The Secretaries of Commerce and the Interior shall not allow or permit any appropriation, injury, destruction, or removal of any feature of this monument except as provided for by the proclamations and shall prohibit commercial fishing within boundaries of the PRIMNM.

Through the proclamations, the U.S. continues to preserve lawful uses of the seas within the PRIMNM, such as the conduct of military activities, exercises and surveys; and continues to protect the training, readiness, and global mobility of U.S.

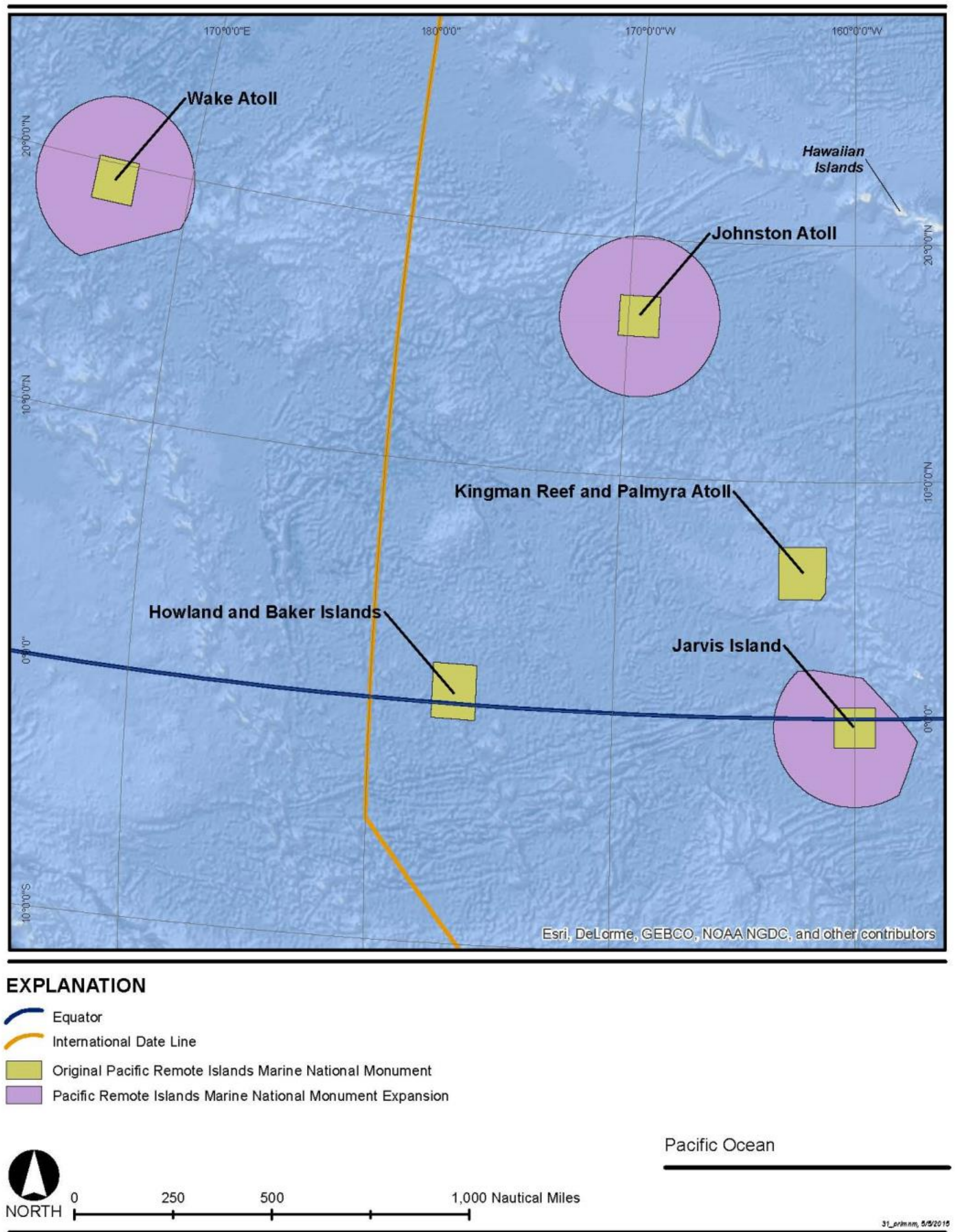

Figure 1-3 Pacific Remote Islands Marine National Monument

Armed Forces. The proclamations also allow the Secretary of Defense to continue to manage Wake Atoll, according to the terms and conditions of an Agreement between the Secretary of the Interior and Secretary of the Air Force, unless and until such Agreement is terminated. With respect to U.S. Armed Forces Actions, both proclamations specifically state:

> "1. The prohibitions required by this proclamation shall not apply to activities and exercises of the Armed Forces (including those carried out by the United States Coast Guard).
> 2. The Armed Forces shall ensure, by adoption of appropriate measures not impairing operations or operational capabilities, that its vessels and aircraft act in a manner consistent, so far as is reasonable and practicable, with this proclamation.
> 3. In the event of threatened or actual destruction of, loss of, or injury to a monument [or 'Monument Expansion'] resource or quality resulting from an incident, including but not limited to spills and groundings, caused by a component of the Department of Defense or the United States Coast Guard, the cognizant component shall promptly coordinate with the Secretary of the Interior or Commerce, as appropriate, for the purpose of taking appropriate actions to respond to and mitigate any actual harm and, if possible, restore or replace the monument [or 'Monument Expansion'] resource or quality.
> 4. Nothing in this proclamation or any regulation implementing it shall limit or otherwise affect the Armed Forces' discretion to use, maintain, improve, manage, or control any property under the administrative control of a Military Department or otherwise limit the availability of such property for military mission purposes, including, but not limited to, defensive areas and airspace reservations."

1.3 SCOPE OF THE ENVIRONMENTAL ASSESSMENT

This EA is prepared in compliance with the following statutes and regulations that direct DoD lead-agency officials to consider potential environmental consequences when authorizing or approving federal actions:

- The National Environmental Policy Act of 1969, as amended
- The Council on Environmental Quality regulations that implement NEPA (40 CFR Parts 1500 – 1508)
- DoD Instruction 4715.9, Environmental Planning and Analysis
- 32 CFR Part 989, Environmental Impact Analysis Process (EIAP)

This EA evaluates the potential environmental effects of the proposed demonstrations of the integrated Ballistic Missile Defense System (BMDS) operational effectiveness against short, medium, and intermediate range missiles, and anti-ship warfare targets in an operationally realistic flight test. The EA identifies and addresses potential environmental impacts at Wake Atoll and the BOA along the flight path. Impacts could result from site preparation and pre-flight activities at launch and other support locations, missile flight tests, missile launches during operational flight tests, successful intercept events, and post-flight activities. The EA also considers the alternative of No-action. If this alternative were chosen, the IFT activities described in the EA would not take place. On-going and future activities for which potential environmental effects have been analyzed and documented would continue.

The EA addresses all of the reasonably foreseeable activities in the particular geographical areas affected by the Proposed Action and the No-action Alternative and focuses on the activities ripe for decision by the Department of Defense, FAA, and other related federal and resource agencies. The majority of activities would use existing facilities and/or be on previously disturbed land.

Consistent with the President's Council on Environmental Quality regulations, the scope of the analysis presented in this EA was defined by the range of potential environmental impacts that would result from implementation of the Proposed Action or the No-action Alternative. Resources that have a potential for impacts were considered in the EA analysis to provide the decision makers with sufficient evidence and analysis for evaluation of the potential effects of the action. For this EA, the environment is discussed in terms of 13 resource areas. Each resource area is discussed at each location addressed in this EA proportionate to the potential for environmental impacts.

1.4 PURPOSE AND NEED FOR THE PROPOSED ACTION

To demonstrate the integrated performance of the BMDS, MDA plans to conduct a series of flight tests at and around Wake Atoll. The first mission is called Flight Test Operational-02 (FTO-02) which includes two events. Event 1 (FTO-02 E1) is planned to be executed in the third quarter of fiscal year (FY) 2015 at the Pacific Missile Range Facility (PMRF), Barking Sands, Kauai, Hawaii, and is not analyzed in this EA. Event 2 (FTO-02 E2) is planned to be conducted at Wake Atoll in the fourth quarter of FY 2015 and is analyzed in this EA. The plan for this test would be to demonstrate the BMDS engagement of short range ballistic missile (SRBM), and a medium range ballistic missile (MRBM) target, as well as an ABMD engagement of an air-breathing cruise missile target. Other IFT activities would be conducted in the future to test various combinations of target missiles, interceptors, and sensor systems to continue to demonstrate the performance of the BMDS. During events, either target missiles or interceptors would be launched from Wake Island during a single test, but not both. Wilkes and Peale Islands would not be used at all.

Several weeks before FTO-02 E2 takes place, a test of the Terminal High Altitude Area Defense (THAAD) system element of the BMDS, designated Flight Test THAAD (FTT) -18, would be conducted and also is analyzed in this EA.

Each BMDS element has proven its individual effectiveness in flight and ground tests. FTO-02 E2 provides a unique opportunity to demonstrate critical interoperability capabilities of the ship-based Aegis Ballistic Missile Defense (ABMD) and THAAD systems in a live-fire integrated test at Wake Atoll. The continued use of Wake Atoll for future IFT activities would demonstrate similar critical interoperability capabilities of other systems. Testing frequency would be on average one flight test per year, but could number as many as up to five flight tests in a given 12-month period.

1.5 DECISION TO BE MADE

The decision to be made, based in part on the analysis in this document, is whether to conduct integrated flight tests, to include FTO-02 E2, at Wake Atoll and the surrounding Pacific BOA. The ABMD would launch interceptor missiles from the Pacific BOA. THAAD and Phased Array Tracking Radar to Intercept Of Target (PATRIOT) elements would launch interceptor missiles from Wake Island. Short, medium, and intermediate range ballistic missile targets would be launched from C-17 or similar aircraft and air-breathing drones would be launched from Gulfstream or similar aircraft. Short-range or medium range ballistic missile targets could also be launched from Wake Island. Additionally, various sensors and other test assets may be used to collect and record critical test data to include employment of interceptor missiles (THAAD or PATRIOT or both or other similar missile systems from Wake and/or ABMD in the adjacent BOA); sensors (Army-Navy Transportable Radar Surveillance and Control Model-2 (AN/TPY-2) Forward Based Mode (FBM) and associated satellite communications/ Command, Control, Battle Management, and Communications (C2BMC) Deployable Interface Node (SATCOM/CDIN), High Frequency (HF) radar, Transportable Telemetry System (TTS), Arnold Engineering Development Center (AEDC) Optics, Early Launch Tracking System (ELTS), etc.); and target missiles (ground launch from Wake and/or as a support area for air launch), noting that a particular integrated flight test would involve either interceptor launches or target launches from Wake but not both.

The decision-maker(s) could also select the No-action Alternative, which would be not to conduct IFTs at Wake Island and the surrounding Pacific BOA. On-going and future actions whose impacts have been appropriately analyzed and approved would continue.

1.6 EXISTING ENVIRONMENTAL DOCUMENTATION

The use of Wake Atoll to support BMDS testing, to include test assets such as missile interceptors, missile targets, and their associated sensors, has been analyzed for more than two decades in the following environmental documents. All of the NEPA analyses referenced resulted in a FONSI being issued, determining that the various proposed actions of missile intercepts and target launches, radar use and flight tests would not significantly affect the quality of the natural or human environment.

Deployment and operation of a THAAD firing battery was described in the *Final Environmental Assessment (EA), Wake Island Environmental Assessment*, U.S. Army Space and Strategic Defense Command, January, 1994. That document described "…extended range tests of target missiles, defensive missiles, and sensor systems at Wake Island." That EA analyzed the impacts of 100 flight tests occurring at Wake Atoll over a 6-year period (1994-2000) with an average of 4 to 20 various target missiles and interceptors, such as THAAD and PATRIOT, launched each year, along with the use of their associated sensor systems. The FONSI for that document concluded that no significant impacts would occur from implementation of the theater missile defense launch activities on Wake Island and new theater missile defense infrastructure improvements.

The location and use of land based and/or airborne mobile sensors was analyzed in the *Mobile Sensors Environmental Assessment* (MDA, 2005), assuming that land based mobile sensors would be used up to 10 times per year at each location *the Final Airborne Laser Supplemental Environmental Impact Statement* (June 2003), the *Ground Based Midcourse Extended Test Range Environmental Impact Statement (EIS)* (February 2003), the *Theater High Altitude Area Defense (THAAD) Pacific Test Flights Environmental Assessment* (Dec 2002) looked at up to 50 THAAD interceptor missiles launched from either the PMRF or Reagan Test Site (RTS) and up to 50 target missiles launched from either Wake or islands in the Republic of the Marshall Islands (RMI) over a 4 year period (2005-2010). THAAD intercepts of target missiles over the BOA were also assessed.

Launching an interceptor missile from a ship to intercept target missiles was analyzed in the *Pacific Missile Range Facility Enhanced Capability EIS* (December 1998). The above NEPA analyses are referenced and their impact determinations are summarized, as appropriate, in this EA. For further reference, they are available on MDA's website at: http://www.mda.mil/mdalink/html/enviro.html.

The 15th Civil Engineer Squadron (15 CES) determined that tactical deployment of an AN/TPY-2 radar, satellite communications system, and transportable telemetry at Peacock Point on Wake Island qualified for a categorical exclusion in November, 2009. The proposed AN/TPY-2 configuration for FTO-02 E2 would be similar to that analyzed in 2009 though it would be located near Heel Point.

Deployment and use of AN/TPY-2 radar, transportable telemetry systems, satellite communications, and C2BMC assets at Wake Island were analyzed for the *Integrated Flight Tests at U.S. Army Kwajalein Atoll/ Ronald Reagan Ballistic Missile Defense Test Site (USAKA/RTS) Environmental Assessment* (MDA, July 2012). The FONSI for that document concluded that no significant impacts would occur from conducting a series of flight tests at and around USAKA/RTS and Wake, and in the BOA.

1.7 RELATED ENVIRONMENTAL DOCUMENTATION

- *Project Starbird Environmental Assessment, October 1987*
- *Wake Island Environmental Assessment,* January 1994
- *Wake Island Launch Center Supplemental Environmental Assessment,* October 1999
- *Ballistic Missile Defense Organization Cooperative-Engagement-Capability/PATRIOT (CEC/PATRIOT) Interoperability Test*, July 2000
- *Theater High Altitude Area Defense (THAAD) Pacific Test Flights Environmental Assessment*, December 2002
- *Minuteman III Modification Environmental Assessment,* December 2004
- *Missile Defense Agency Mobile Launch Platform (MLP) Environmental Assessment,* June 2004
- *Missile Defense Agency Mobile Sensors Environmental Assessment,* September 2005
- *Missile Defense Agency Wake Island Supplemental Environmental Assessment,* February 2007
- *Flexible Target Family Environmental Assessment,* October 2007
- *Hawaii Range Complex Final Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS),* May 2008
- *Pacific Missile Range Facility Intercept Test Support Environmental Assessment/Overseas Environmental Assessment*, April 2010
- *Integrated Flight Tests at U.S. Army Kwajalein Atoll/Ronald Reagan Ballistic Missile Defense Test Site (USAKA/RTS) Environmental Assessment*, July 2012

1.8 PUBLIC NOTIFICATION AND REVIEW

In accordance with CEQ, USAF, and MDA regulations and procedures for implementing NEPA, the MDA solicited comments on the Proposed Final EA from interested and affected parties. Notices of Availability for the Proposed Final EA and the enclosed

Proposed FONSI were posted in public places on Wake Island and hard copies of the documents were made available for review in the Environmental Office on Wake Island. The documents were also available on the MDA public Web site and electronic copies were provided upon request.

Comments were received from the National Oceanic and Atmospheric Administration, Pacific Islands Regional Office, Marine National Monument Program concerning the expansion of the PRIMNM, the number of tests, and the impacts of debris on the PRIMNM. No other comments were received. Copies of the correspondence, comments and the responses provided are included in Appendix A.

The Final EA and the signed FONSI will both be available on the MDA public Web site (http://www.mda.mil/news/environmental_reports.html).

2.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

2.1 OVERVIEW

MDA was established to manage and integrate all missile defense programs and technologies into one BMD system. MDA is responsible for developing and testing conceptual BMD systems.

Two of the priorities of missile defense are: (1) to defend the United States and its deployed forces, allies, and friends; and (2) to employ a BMD system that consists of layers of defenses to intercept ballistic missiles in all phases of their flight (boost, midcourse, and terminal) against all ranges of threats (short, medium, intermediate, and long). MDA proposes to conduct system-level flight tests that integrate multiple BMDS components.

The IFTs would demonstrate the integrated BMDS operational effectiveness against ballistic missile and air-breathing targets in an operationally realistic flight test. Land-based BMDS elements, such as THAAD and/or PATRIOT, would be located on Wake Island while the ship-based ABMD would operate in the Pacific BOA near Wake Island. These elements would engage appropriate ballistic missile and air-breathing targets and could launch interceptors to collide with and destroy the targets. Various fixed and mobile sensors and other test assets would be used to facilitate data collection and communications. The MDA tactical footprint of approximately 2.4 hectares (6 acres) is less than 1 per cent of the available Wake Atoll land mass of 739 hectares (1,826 acres). MDA proposes to conduct IFTs starting in the fourth quarter of FY 2015.

SRBM, MRBM, and intermediate range ballistic missile (IRBM) targets would be dropped from a C-17 or similar aircraft over the BOA southeast of Wake Atoll. SRBM targets would be launched from a launch rail on Wake Island. Air-breathing remotely-piloted drone targets would be launched from an airborne platform flying above the BOA. MDA proposes to start IFTs during the fourth quarter of FY 2015. Testing frequency would be on average one flight test per year, but could number as many as up to five flight tests in a given 12-month period.

2.2 DESCRIPTION OF THE PROPOSED ACTION

2.2.1 GROUND DISTURBANCE AND VEGETATION REMOVAL

There are components of this project that would require some ground disturbance and vegetation removal. Through a collaborative effort with the 611 CES Natural Resources Environmental Element, the areas identified for the placement and operation of test assets were chosen because they minimize MDAs tactical footprint and minimize vegetation clearing and ground disturbance requirements while still satisfying mission objectives. MDAs tactical footprint totals approximately 6 acres, which is less than 1 per cent of the total Wake Atoll land mass of approximately 739 hectares (1,826 acres). The majority of the tactical footprint consists of existing launch pads and previously disturbed areas and is expected to result in little to no impact to the migratory birds or rare bunch grass (*Lepturus gasparricensis*) species on Wake Atoll. Little to no impact to nesting and/or breeding seabird colonies or rare bunch grass ground cover found within these colonies on Wilkes are expected through the ground disturbance and vegetation removal activities of the Proposed Action. To the extent practicable and consistent with mission requirements, the following will be conducted prior to all vegetation removal related to the placement and operation of test assets:

- A site survey of the area to be disturbed or cleared will be conducted by the 611 CES assigned environmental manager prior to the clearing activities.
- The site survey will include activity logs identifying all bird species and the presence of rare grass species observed within the immediate and surrounding project areas.
- The activity logs will be maintained by the 611 CES Natural Resources Environmental Element Program Manager for record keeping purposes consistent with the migratory bird monitoring protocols set out in the 2015 INRMP (USAF, 2015).
- If nesting birds or rare bunch grasses are identified within the project area, the 611 CES Natural Resources Environmental Element Program Manager will coordinate with MDA to determine whether there are any measures that can be implemented to prevent impacts to these resources. To the extent practicable and consistent with mission requirements, potential measures may include: avoiding specific bunch grass areas and trees with active nests, scheduling vegetation removal outside of the nesting season, using active measures to drive birds away from the project area, and managing project area habitat to make it less attractive to nesting birds.
- In the unlikely event that the required ground disturbance and vegetation clearing related to the placement and operation of test assets, a military readiness activity as defined by 50 CFR 21.3, results in incidental takes of migratory birds authorized by 50 CFR 21.15, then the 611 CES assigned environmental manager will document the take using a bird activity log and incorporate this information into the migratory bird monitoring protocols set out in the 2015 INRMP (USAF, 2015).

Vegetation clearing and site preparation would only take place during daytime hours. The Proposed Action is an operational test and because the test scenarios are representative of the threat, the actual test could occur at any time (day or night). The mission areas would be lit at night for safety and security but those safety/security lights would be the minimum necessary. To the extent practicable, consistent with mission requirements, MDA will incorporate U.S. Fish and Wildlife Service (USFWS) lighting recommendations into project planning. There would not be any increase in the use of night-time lighting except for security measures. Any new lighting would be positioned low to the ground and be shielded, so that light from the shielded source cannot be seen from the beach.

Fiber-optic cables would be laid on the ground or along existing road rights of way. If fiber-optic cables require additional protection from vehicle and foot traffic, they would be placed in cable raceways. Although other components of the Proposed Action would include trenching, no trenching of fiber optic or other cables is anticipated. Personnel would be briefed before ground disturbing activities commence that the ground-disturbing activities would be conducted in a manner that not only protects cultural and archaeological resources but also protects humans and wildlife from WWII munitions that may be encountered. These briefings would also include the significance of these types of resources and the penalties associated with their disturbance or collection. If, during the course of program activities, cultural and/or historic materials (particularly human remains) are discovered, activities in the immediate vicinity of the cultural materials would be halted and coordination/ consultation with the host installation will be done.

2.2.2 PROPOSED INTEGRATED FLIGHT TESTS

MDA proposes to conduct system-level flight tests that integrate multiple BMDS components in operationally realistic test scenarios. The use of Wake Atoll is required for operational realism. The placement and operation of BMDS components is a military readiness activity as defined by 50 CFR 21.3. Integrated flight tests would include up to five targets (ballistic missile targets and air-breathing remotely-piloted targets) in flight simultaneously. One or more system elements (including Aegis Ballistic Missile Defense (ABMD), PATRIOT, and/or THAAD, with their associated C2BMC and sensors) would engage the targets. Intercepts would be planned to occur over the Pacific BOA with intercept debris falling to the ocean surface, possibly within the PRIMNM.

The ABMD, operating in the Pacific BOA near Wake Atoll would use Aegis Standard Missile -2 and -3 (SM-2 and SM-3) to engage SRBM targets, MRBM targets, IRBM targets, and/or air-breathing targets. PATRIOT would use PATRIOT Advanced Capability-2 (PAC-2) and PAC-3 interceptor missiles to engage SRBM targets and/or air-breathing targets. THAAD would engage SRBM, MRBM, and/or IRBM targets. The PATRIOT and/or THAAD elements would be located on Wake Island.

For test events where THAAD and/or PATRIOT elements are located on Wake Island, targets (including SRBM, MRBM, IRBM, and remotely-piloted air-breathing drones) would be dropped from aircraft over the Pacific BOA. Target missiles could be launched from Wake Island for test events when no THAAD or PATRIOT interceptors are launched from Wake Island. To maintain range safety for the area, target missiles and interceptors would not be launched from Wake Island in the same test event. Wake Island could also serve as a forward support area for aircraft supporting the launch of air dropped ballistic missile targets and remotely-piloted air-breathing drones.

Integrated flight tests may use a variety of sensors. Radars that could be located at Wake Island include the AN/TPY-2 Terminal Mode (TM) and AN/MPQ-65 radars that are associated with THAAD and PATRIOT elements, respectively, the AN/TPY-2 (FBM), and a HF radar. Representative test assets that could be located at Wake Island include the TTS, Communication 01 Suite, Arnold Engineering Development Center Optics, Early Launch Tracking System, and the DRX41320M X-band radar.

2.2.2.1 Representative Test Scenarios

For FTO-02E2, IFTs could include up to five targets (ballistic missile targets and air-breathing remotely-piloted drones) in flight simultaneously. An ABMD ship located in the Pacific BOA near Wake Atoll would engage an air-launched extended medium range ballistic missile (eMRBM) target while simultaneously engaging an air-breathing drone target (BQM-74) with Standard Missile-2 and -3 (SM-2 and SM-3) interceptor missiles. A THAAD unit on Wake Island would engage a short range air-launched target (SRALT). MDA proposes to conduct FTO-02 E2 during the 4th quarter of FY 2015 at Wake Island and the surrounding Pacific BOA. A total of approximately, 300 military and civilian personnel would deploy to Wake Island to support the IFT.

A test of only the THAAD system (designated FTT-18) would also occur in the 4th Quarter, within several weeks of FTO-02 E2. System level tests such as a test of the THAAD system intercepting one or more targets by itself, without an ABMD ship, could also occur. The number of personnel required for a system level test is less than the 300 personnel contemplated for the IFT. The two ballistic missile targets and a single air-breathing target for FTO-02 E2 would be launched from aircraft staged from Hawaii or Kwajalein Atoll. The SRALT and eMRBM engagements would occur over the BOA south of Wake Island. Debris resulting from successful missile intercepts is planned to fall into the BOA, possibly within the PRIMNM, in waters that have previously been analyzed for that purpose (MDA, 2004). If an intercept was not successful, the target and interceptor missiles would continue flying on a ballistic path until they were destroyed by impact with the ocean surface in the BOA, with the target missiles possibly impacting within the PRIMNM. No debris hazardous to human health would fall on inhabited land. All debris resulting from FTO-02 E2, to include booster drops and intercept debris, would conform to Range Commander's Council (RCC) Standard 321-10, *Common Risk Criteria Standards For National Test Ranges*, December 2010, or follow range and MDA policies to waive the applicable requirements and have the safety hazards accepted at the appropriate level.

The BQM-74E is an air-breathing remotely-piloted drone target and will not be destroyed. After engagement by the Aegis ship, it would be flown into a stall attitude, deploy a parachute and descend to the ocean surface near the Aegis ship, and be recovered.

Proposed land-based activities associated with IFTs are similar to activities described in the *Wake Island Environmental Assessment*, U.S. Army Space and Strategic Defense Command, January 1994. That document noted "Defense missile systems will be launched from mobile launchers at ground sites in the Peacock Point area….Defensive missile flights will be supported by telemetry receivers, optical sensors, and radars for the acquisition of flight data….Ground-based optical sensors, radars, and telemetry stations may be supplemented by ship-based or airborne sensors."

The types of target missiles and launching methods proposed for IFTs were discussed in the *Theater High Altitude Area Defense Pacific Test Flights Environmental Assessment*, U.S. Army Space and Missile Defense Command, 2002. The Finding of No Significant Impact (FONSI) for that document concluded that no significant impacts would occur as a result of the construction and operation of any of the analyzed THAAD test sites and related support facilities.

2.2.2.2 Safety and Range Control

Target missiles are launched from fixed or mobile land-based launchers, sea-based platforms, and air-based platforms, and flown on trajectories that emulate threat missile flight paths. Trajectories and range vary depending on the test or training exercise scenario, including BMD system testing.

Each flight test requires collection and analysis of data on the target, the interceptor, and the intercept event. Tracking data are required for post-exercise or test reconstruction and analysis. Telemetry receivers, optical sensors, and radar support both collection and analysis. Data are transmitted from the target and interceptor to ground stations during flight for recording and analysis. Ground-based optical sensors, radar, and telemetry are supplemented by ship-based and/or airborne sensors.

Each missile flight test event is modeled using computer predictions of the behavior of the missiles. This modeling predicts what the missile may do in a number of situations where the missile, or parts of the missile, may fall to earth. The models incorporate a number of variables such as the missile mass, velocity, trajectory, and altitude that may affect the missile in flight.

The more specific, or accurate, the variables are, the more accurate the prediction of the missile’s behavior can be. Modeling that is done during early mission planning takes into account anticipated seasonal weather conditions, including average winds. Modeling done on the day of test is based on weather measurements made that day. Winds measured on the actual day of the launch/test are used to refine launch predictions/criteria.

Ground hazard areas and launch hazard areas (LHAs) (over water) are established to limit the region that may be impacted by hazardous debris from an early flight termination. The hazard area is determined by size and flight characteristics of the missile, individual flight profile of each exercise or flight test, and reaction time between recognition of a flight malfunction and decision to terminate flight.

Safety regulations are directed at preventing the occurrence of potentially hazardous accidents and minimizing or mitigating the consequences of hazardous events. This is accomplished by employing system safety concepts and risk assessment methodology to identify and resolve potential safety hazards.

2.2.2.2.1 Range Safety

Pacific Air Forces (PACAF) Regional Support Center (PRSC), 11th Air Force is the Wake Island range safety authority. Test events including the launching of target missiles, radar operations and other events that require the preparation and approval of event specific safety plans are outside the normal Base Operations Support at Wake Island. Range Safety at RTS, located 1,100 km (683 mi) south of Wake in the Kwajalein Atoll, includes missile flight control, laser safety, ionizing radiation safety, toxic and thermal hazards safety, directed energy safety, and explosive and ordnance safety. RTS Range Safety has the specific skills and expertise to provide flight and ground safety plans for coordination by the PRSC and address any concerns that are raised for Wake Island range safety during IFTs. RTS Range Safety will include the PRSC in mission planning events to develop insight and awareness of the planned tests.

For missile and weapons system tests, RTS Range Safety establishes criteria for the safe execution of the test operation in the form of Range Safety Approval and Range Safety Operation Directive documents, which are required for all weapon and target systems using RTS. Missile hazards are identified and minimized prior to flight testing as required by applicable military standards. RTS Range Safety currently uses the RCC risk management criteria in Range Safety—RCC Standards, as described below.

Protection of the public on the ground, in aircraft, or on boats and ships is accomplished by adhering to the RCC risk management criteria. These criteria require that RTS operations maintain a very low probability for any harmful or lethal intercept debris, or spent stages, targets, or defensive missiles, to impact outside of pre-established impact zones over the open ocean.

When a missile flight test is planned there are certain prescribed debris impact areas in the BOA, such as the notional ones shown in Figure 2-1. Additional areas (i.e., booster drop zones) will be determined prior to program launches. There are other areas where debris may impact if the test does not proceed as planned. In the case of a missed intercept, the missiles would continue on a ballistic path and a whole body impact would occur within controlled areas, with the target missiles possibly impacting within the PRIMNM. These established areas of the test event may be subject to the risk of mishap, such as an explosion or flight termination. An example of this type of area is the LHA. Clearance areas are defined by the RTS Range Safety Office to encompass the areas where people, ships or aircraft would be at unacceptable levels of risk should a launch or a pre-launch anomaly occur.

Prior to conducting each missile operation, Range Safety officials request the issuing of Notices to Airmen (NOTAMs) from the Federal Aviation Administration (FAA) and Notices to Mariners (NOTMARs) from the U.S. Coast Guard. These notices identify all hazards areas to avoid. Prior to the test event, the impact areas and closure times will be distributed to the PRSC and personnel located on Wake Island.

The RTS Range Safety Office is responsible for establishing ground hazard areas, LHAs, and over water range areas that exclude the public when risks would exceed acceptable levels defined in the safety standard RCC 321, *Common Risk Criteria Standards for National Test Ranges, Subtitle: Inert Debris*, and as adopted in USAKA/KMR Range Safety Manual (1996). The ground and LHAs for missile launches are determined by size and flight characteristics of the missile, as well as individual flight profiles of each flight test. If unauthorized personnel or craft are found within a hazard area, an evaluation is made on whether the encroaching parties are exposed to risks beyond what are acceptable according to existing standards, such as RCC 321. If not, the test may still proceed.

Range Safety—RCC Standards

While range safety is location, facility, and mission-dependent, the DoD has established advisory standards and protocols to eliminate or acceptably minimize potential health and safety risks/hazards. The RCC Standards are guidelines that provide definitive and quantifiable measures to protect mission–essential personnel and the general public.

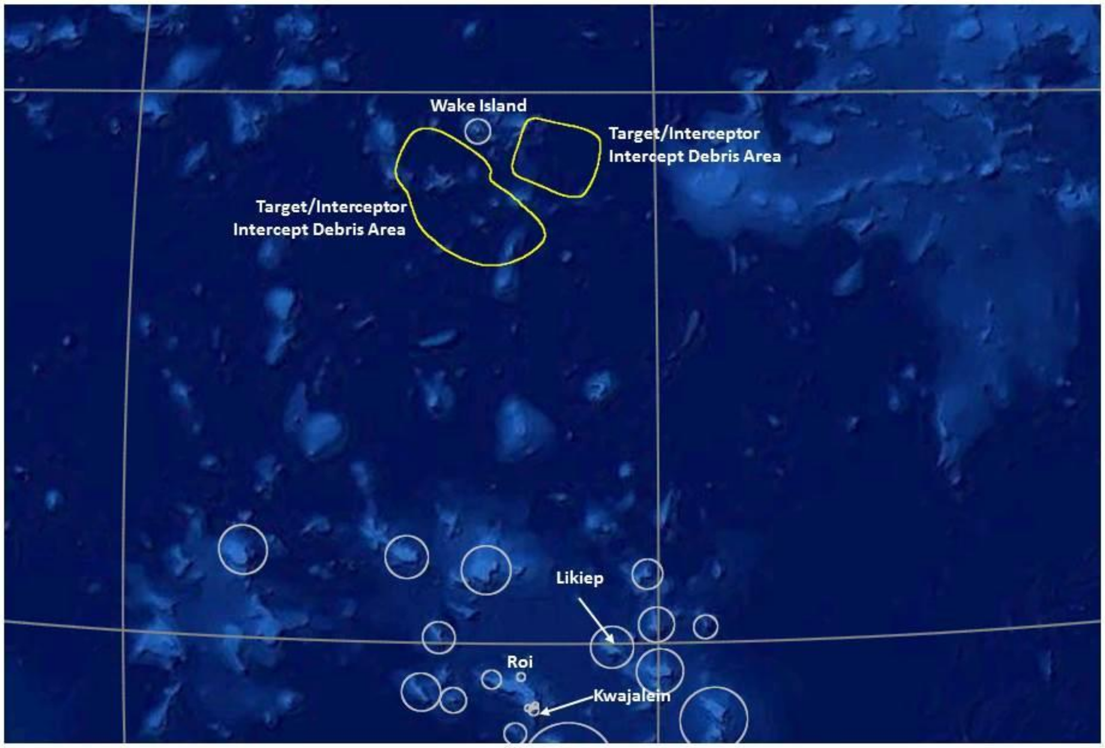

Figure 2-1 Notional Intercept/Target Debris Impact Areas in the BOA

These guidelines address flight safety hazards (including inert debris) and consequences potentially generated by range operations. All risks to aircraft generated by testing activities at RTS are within RCC standards and in coordination with the FAA. RTS requests the use of airspace during missile defense testing from the FAA. The four key RCC standards applied for missile launches are as follows:

- RCC Standard 319, Flight Termination Systems Commonality Standard
- RCC Standard 321, Common Risk Criteria Standards for National Test Ranges, Subtitle: Inert Debris
- RCC Document 323, Range Safety Criteria for Unmanned Air Vehicles
- RCC Standard 324, Global Positioning and Inertial Measurements Range Safety Tracking Systems Commonality Standard

These documents are regularly updated to reflect advances in research that improve the fidelity of risk assessment and developments to new test situations.

The RTS Range Safety Office is an active participant in the RCC Range Safety Group, and the Range mandates specific policies that follow these guidance documents, as specified in USAKA/KMR Range Safety Manual (1996) and the applicable Range Safety Operations Directive for each test.

The RTS Range Safety Office is responsible for establishing ground hazard areas, LHAs, and over water range areas that exclude the public when risks would exceed acceptable levels defined in the safety standard RCC 321, Common Risk Criteria Standards for National Test Ranges, Subtitle: Inert Debris and as adopted in USAKA/KMR Range Safety Manual (1996). The ground and LHAs for missile launches are determined by size and flight characteristics of the missile, as well as individual flight profiles of each flight test. If unauthorized personnel or craft are found within a hazard area, an evaluation is made on whether the encroaching parties are exposed to risks beyond what is acceptable according to existing standards, such as RCC 321. If not, the test may still proceed.

The range safety process is predicated on risk management, minimization of accident impacts, and protection of population centers. Risk values related to missile launch activities are categorized in two ways: (1) probability of vehicle failure, including all credible failure modes that could lead to debris impact events; and (2) the expected adverse consequences that could result from impact events. The consequence estimation is quantified by two key measures: (1) the probability of individual injury, defined as the probability of a person at a given location being injured; or (2) the expected number of injuries (collective risk), defined as the average number of persons that may be injured in a launch (typically a very small number, such as a few injuries per million operations).

Range safety is accomplished by establishing:

- Requirements and procedures for storage and handling of propellants, explosives, and hazardous materials
- Evaluation of mission plans to assess risks and methods to reduce risk
- Performance and reliability requirements for the Flight Termination System (FTS) on the missile which is employed, as required, for safety assurance
- A real-time tracking and control system at the range
- Mission rules that are sufficient to provide the necessary protection to people both in and outside the boundaries of the launch facility

Procedures and analyses to protect the public can be generally divided into five aspects:

- Ground safety procedures—handling of propellants, ordnance, noise, hazardous operations, toxics, etc.
- Pre-flight mission analysis—vehicle, trajectory, etc.
- FTS verification
- In-flight safety actions
- Emergency response

RTS uses probabilistic risk assessment criteria from RCC standards, including RCC 321, to evaluate the acceptability of each mission.

2.2.2.2.2 Range Control

Range Control is responsible for hazard area surveillance and clearance, and the control of all Range operational areas. The Range Control Officer is solely responsible for determining range status and setting RED (no firing) and GREEN (range is clear and support units are ready to begin the event) range firing conditions. The Range Control Officer coordinates the control of Wake Island airspace with the FAA and other military users, and communicates with the test directors and all participants entering and leaving the range areas. The Range Control Officer also communicates with other agencies, as required.

Ground Safety Area

Range Control officials are required by DoD policy to be able to exclude nonparticipants from hazardous areas. Ground hazard areas are established around each launch site to ensure public safety in the event of an unplanned impact of debris on land as a result of missile launch activities.

2.2.3 INTERCEPTOR MISSILE SYSTEMS

The following sections describe test participants and the activities proposed for Wake Island during the execution of FTO-02 Event 2 and other potential IFT operations in the next five years. Notional locations for the test participants are shown in Figure 2-2.

2.2.3.1 THAAD

THAAD provides the BMDS with a globally transportable, rapidly deployable capability to intercept and destroy ballistic missiles inside or outside the atmosphere during their final (or terminal) phase of flight.

THAAD Launcher

The THAAD launcher is based on the U.S. Army Model M1120 Load Handling System Heavy Expanded Mobility Tactical Truck (HEMTT) variant, a four-axle, 8X8 all-wheel drive vehicle with two axle steering with an integrated load handling system. The Missile Round Pallet (MRP) with or without Missile Rounds (MR) is mounted to the transporter. This variant includes THAAD-peculiar MRP erection cylinders, outrigger stabilization system, as well as various electrical components, an integral 3 kilowatt (kW) power generation unit, data processing, and communication equipment. There are two THAAD launch sites proposed as indicated in Figure 2-2 that have been previously analyzed. Two alternate launch sites are also being considered. One site would be approximately 30 meters (m) (100 feet [ft]) south of launch site (LS) 1. The other site would be located at the THAAD Interceptor Handling Area, also known as the 4 Points Area (Figure 2-2).

THAAD Missile

The THAAD missile is intended to intercept and destroy incoming ballistic missiles with ranges of up to 3,000 km (1,860 mi). See Figure 2-3 for an example configuration of a THAAD missile.

The THAAD missile booster is a single-stage solid rocket motor with a flare. The flare consists of overlapping petals that lock into position after deployment. The booster solid propellant is a hydroxyl-terminated polybutadiene (HTPB) composition that is rated as a Class 1.3 explosive.

THAAD Radar

The THAAD radar, AN/TPY-2 (TM), consists of four units: an antenna equipment unit (AEU), an electronic equipment unit (EEU), a cooling equipment unit (CEU), and a prime power unit (PPU). The THAAD radar layout is depicted in Figure 2-4.

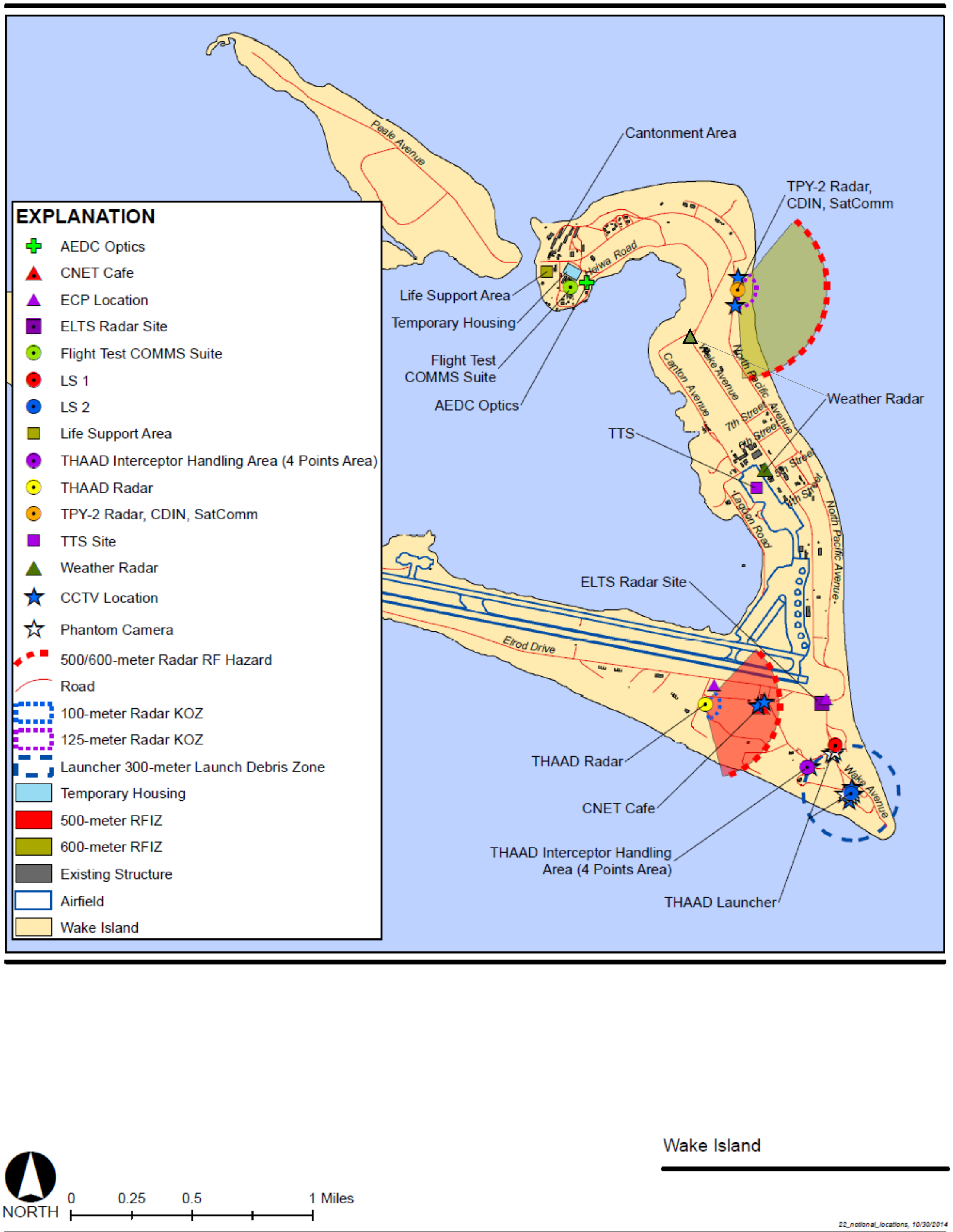

Figure 2-2 Notional Test Participant Locations

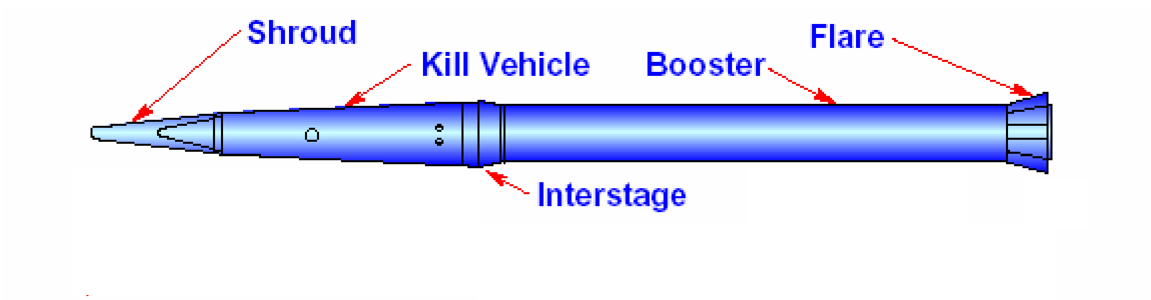

Figure 2-3 Major Components of a THAAD Missile

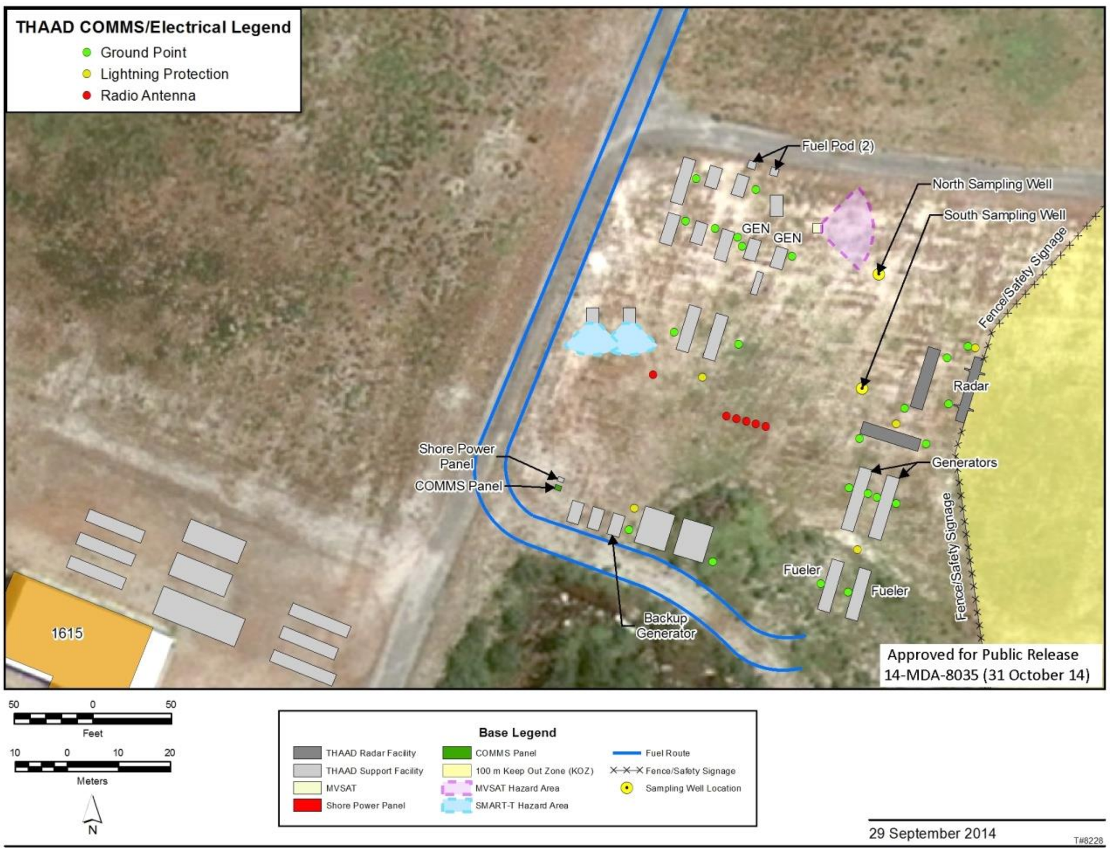

Figure 2-4 THAAD Radar Layout

The AEU transmits and receives radio frequency energy in the X-band frequency range to support search, track, and communication with the interceptor. The AEU includes all transmitter and beam steering components as well as power distribution and cooling systems. The EEU houses the signal and data processing equipment, operator workstations, and communications equipment. The CEU contains the fluid-to-air heat exchangers and pumping system to cool the AEU and EEU. The CEU fluid-to-air heat exchanger contains a reservoir with approximately 190 liters (L) (50 gallons [gal]) of a water-propylene glycol mixture. The entire radar system (PPU, EEU, AEU, and CEU) contains a total of approximately 1,325 L (350 gal) of coolant.

The PPU, used to power the THAAD radar system, is a self-contained trailer in a noise-dampening shroud that contains two diesel engine-powered generators, governor and associated controls, an internal diesel fuel tank (day-tank) sized to provide about one hour of operation, and air-cooled radiators. The PPU delivers 1.3 megawatts (MW) of electrical power at 4160 volts.

AN/TPY-2 (TM) radar operation requires 1.3 MW of electric power, which would be met using two PPUs, one primary and one back-up. This power generation configuration is expected to require approximately 3,800 L (1,000 gal) of diesel fuel per day. Daily

operations would be fueled using fuel trucks that would be contained inside a spill containment barrier. Resupply will be as necessary using a mobile fuel truck. All cabling and fuel lines would be laid directly on the ground or in protective cable trays. The AEU, CEU and the PPUs would have spill containment barriers.

AN/TPY-2 (TM) requires a relatively flat area about 33 m by 33 m (110 ft by 110 ft) to locate the AEU, EEU, and CEU. If site preparation activities were necessary for the AN/TPY-2 (TM), they would begin approximately two months before the actual test date. All efforts would be made to locate the AN/TPY-2 (TM) on an area where no site preparation is required. However, site preparation activities might include minor work to level the ground surface, mowing or removal of vegetation, and limited clearing of lines of sight. MDA would use the 611 CES assigned environmental manager to survey for nesting birds in or at the base of the trees prior to cutting of any trees. If there are any nests, to the extent practicable, consistent with mission requirements, removal of the trees would be delayed until the eggs have hatched and the chicks have fully fledged.

THAAD Fire Control and Communications (TFCC)

The role of the TFCC component is to provide capabilities to conduct THAAD mission operations. The TFCC integrates the launcher and radar components by providing the planning, control, coordination, execution, and communications necessary to fulfill the THAAD missile system Engagement Operations missions to include Force Operations planning. In addition, TFCC is interoperable with other systems and DoD agencies through data and voice communications. For FTO-02 E2 at Wake Island, the TFCC configuration would be comprised of one Tactical Operation Station (TOS), one Launch Control Station (LCS) supported by two trailer-transported 30 kW generators, and a Station Support Group (SSG).

<u>Tactical Operations Station (TOS)</u>

The TOS shelter is mounted on a M1085 Family of Medium Tactical Vehicles (FMTV) and contains two (2) work stations and servers, a dual high speed Fiber Optic System (FOS), voice communications, a printer, Uninterruptible Power Supply (UPS), and a towed generator. The workstations and servers will be interconnected to the LCS.

<u>Launch Control Station (LCS)</u>

The LCS shelter is mounted on a M1085 FMTV and contains one (1) CHS workstation and one (1) communications server, a FOS to interconnect the communications server and workstation to the TOS, voice communications, a printer, and a UPS.

Station Support Group (SSG)

The SSG is comprised of two (2) M1113 HMMWVs. They transport FOS, power cables, and radio antennas. Each M1113 vehicle tows a 30 kW generator. The generators provide primary and secondary power for the TOS and LCS.

Transportation

The THAAD components would be transported from their home base to a designated air base or port for transport to Wake Island via aircraft. Personnel and equipment would arrive at Wake Island approximately four weeks before the actual test date. Materials arriving via aircraft would be received at Wake Island. Materials arriving via ship or barge would be received at the Wake Island marine facilities. Missiles would be stored in the four corners area after arrival regardless of how they were shipped to Wake Island.

All transportation within the Continental U.S. would be performed in accordance with Department of Transportation (DOT)-approved procedures and routing as well as Occupational Safety and Health Administration (OSHA) requirements, U.S. Army safety regulations, and USAF regulations. Liquid propellants would be transported in DOT-approved containers based on the issuance of a Certificate of Equivalency. Appropriate safety measures would be followed during transportation of the propellants as required by the DOT and as described in 49 CFR 171-180, *Hazardous Materials Regulations of the Department of Transportation*. For ship or barge transportation, U.S. Coast Guard and/or applicable U.S. Army transportation safety regulations would also be followed.

For aircraft transportation, FAA and Air Force Joint Manual 24-204, Preparing Hazardous Materials for Military Shipment, would be followed. THAAD missiles would be stored in accordance with the appropriate portions of Army Regulation 385-64 *Ammunition and Explosive Safety Standards and DoD 6055.9-STD DOD Ammunition and Explosives Safety Board*.

MDA would comply with applicable Defense Transportation Regulations (DTR), the Wake Biosecurity Plan, and any other instructions provided by the USAF. Consistent with service guidelines and the DTR, all equipment and personal gear will be cleaned prior to transport. MDA has coordinated with the U.S. Department of Agriculture (USDA) for inspection of shipments traveling through the port at Guam and would use USAF provided checklists for monitoring and managing the spread of invasive species. The checklists would be placed on containers at their point of origin To prevent the introduction of invasive species, MDA would ensure compliance with the *Wake Island Biosecurity Management Plan* (USAF, 2015) for all cargo shipped by air or barge to Wake Island. Advanced copies of container packing lists and the USAF Wake Island Vessel/Aircraft Rodent Pre-departure Inspection Forms would be coordinated with Wake Island Base Operations at BaseOperations2@wakeisland.net. Visual inspections of all equipment and other materials would be completed at the point of origin prior to loading materials into containers bound for Wake Atoll. Evidence of wood boring, seeds, mud, plant materials, or actual invasive organisms would result in the shipment being set aside for decontamination using U.S. Environmental Protection Agency (USEPA) approved fumigants, power washers, and other tools to ensure the shipment is free of invasive alien species. Upon completion of a passing inspection, a Commercial "No-Pest Insect Strip" (containing the chemical compound Dichlorvos), Glue board, and baited rodent snap trap would be placed in each shipping container in order to deter rodent, insect, and reptile/amphibian incursion. Upon arrival to Wake Atoll, containers would be inspected for presence of invasive alien species prior to removing equipment from any container, barge or aircraft. In the event government contracted commercial shippers (employed directly or indirectly by the MDA) utilize Guam or Hawaii ports en-route to Wake, all cargo would be inspected for the presence of the invasive brown tree snake (*Boiga irregularis*) by USDA canines, and also for coconut rhinoceros beetle (*Oryctes rhinoceros*) and the little fire ant (*Wasmannia auropunctata*) prior to loading onto the vessel. MDA does not intend to open any containers traveling through the port at Guam. MDA would arrange for brown tree snake surveys for flat rack equipment and vehicles in Guam. The vessel operator shall also permit the USDA canine team to sweep accessible portions of the vessel prior to departure.

MDA would comply with all applicable guidelines to minimize safety concerns involved with transporting THAAD missiles, which include the transportation of hazardous materials, Class 1.3 explosives, and a small amount of hypergolic chemicals (mixed oxides of nitrogen and/or monomethylhydrazine) located in the divert and attitude control system. The canister would serve as a limited duration containment barrier for the hypergolic chemicals. The canister would be equipped with passive and active sensors to detect any leak that may occur. Should a leak occur during transportation, the aircraft would land at designated airfields where trained personnel would be standing by to handle the leaking missile.

Pre-flight Activities

THAAD equipment and approximately 100-120 soldiers and test personnel would deploy four weeks before the actual test date in order to perform pre-test operations and operate the THAAD weapon system. Temporary living facilities for the soldiers and test personnel would be sited on previously disturbed land to provide billeting space and portable sanitary facilities would be provided for these personnel during the test period. The existing dining facility would be used to provide all meals during the test period.

Final integration and preflight testing of the THAAD weapon components would occur at the THAAD emplacement site on island and could include system integration and checkout, integrated element testing, and communication/link exercises. This integration and testing would begin shortly after the weapons components are emplaced and continue until the test begins. Environmental shelters would be used to protect the launchers and personnel during testing. THAAD hardware and equipment that would be located on site include the THAAD launchers, AEU, CEU, EEU, PPU, TFCC, Battery Logistics Operations Center, Spares Transport Shelter, Deployable Rapid Assembly Shelter , THAAD Battery Command Post, and associated fiber-optic and other cabling.

If the passive and active sensors detect a leak during pre-flight activities, the missile would be moved to the Solid Waste Disposal area, between the incinerator and the ocean, where trained personnel would be able to safely destroy the leaking missile.

THAAD ground vehicles would use existing vehicle maintenance and fueling facilities to the extent practicable. Although no major maintenance is expected to occur, small quantities of used motor oil and/or coolant could be generated through normal operations.

These non-hazardous wastes and any hazardous wastes generated during vehicle maintenance would be handled by the Wake Island support contractor.

Heavy equipment would be restricted at least 4.6 m (15 ft) away from the two groundwater monitoring wells in the proposed THAAD Radar laydown area on Wake. These wells are used for recurring monitoring of contaminants. Because samples are not required often, sampling during a test would not be required. Equipment would not be placed or moved within 4.6 m (15 ft) of these wells. (See Figure 2-5.) Also, these areas would be marked with "keep out" tape before moving equipment into the area.

Figure 2-5 Ground Water Monitoring Wells in Vicinity of THAAD Radar Area

THAAD MRPs would be mounted on the launcher(s) in preparation for flight test activities. Movement and storage of other MRPs and live THAAD missiles would occur in compliance with existing policy and procedures.

Grounding rods would protect the AN/TPY-2 (TM) and associated communications and SATCOM components. THAAD grounding rods would consist of three 1-m (3-ft) sections, 1.3 centimeter (0.5 inch) diameter, Type III, Class B rods that would be hammered into the soil.

The THAAD radar would require checkout and calibration before test activities begin. Checkout and calibration activities would include observation of targets of opportunity that may occur on the range and observation of existing overhead satellites. These activities are expected to require several hours per day.

THAAD equipment may be affected by the salt environment at Wake Island. To minimize adverse impacts, fresh (non-salt) water would be used to wash down selected THAAD equipment. Personnel would use fresh water and brushes to wash down only exterior equipment surfaces. Fresh water would not contact any surfaces subject to petroleum, oil, or lubricant use. Fresh water would not be disposed directly into the ocean or lagoon environment.

Flight Test Activities

THAAD interceptors would be launched as part of the Proposed Action. The principal exhaust emission resulting from THAAD launches include aluminum oxide, carbon monoxide, hydrogen chloride, hydrogen, nitrogen, and water. Up to three THAAD interceptors could be launched as part of FTO-02 E2. Based on 8 hours of support time, the THAAD PPU, launcher generator, and TFCC generators (two each) would require approximately 3,800 L (1,000 gal) of JP-8 fuel per day of operation on tactical power.

Standard protective procedures would be followed during test activities to provide hearing protection for soldiers and other personnel. Missile impact zones would be confined to open areas at sea. 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.

A 381-m (1,250-ft) explosive safety quantity distance (ESQD) arc would be established around the THAAD launcher to comply with safety criteria. Two 1.2 m by 1.2 m (4 ft by 4 ft) steel plates would be placed side-by-side behind the launcher to provide blast protection to the ground's surface. THAAD activities would adhere to the Standard Operating Procedures (SOPs) at Wake Island to protect all persons and property A Ground Hazard Area would be established, along with road control points and clearing the area.

A hazard exclusion area for personnel would be established for the THAAD AEU. The required electromagnetic radiation (EMR) hazard keep-out area for the THAAD radar is approximately 500 m (1,640 ft) to the front and 90 degrees each side of the radar face (see Figure 2-6). The EEU, CEU, and PPU would be arrayed behind the AEU's radiating face. Before activating the radar, a visual survey of the area would be conducted to verify that all personnel are outside the hazard zone, and a warning beacon would be illuminated when the radar is operating. The radar main beam would not radiate water or ground and the energy from any side lobes would be significantly less and would be very close in to the equipment.

The MDA would notify the 611 CES assigned environmental manager of any dead or wounded birds in the project area or as a result of the proposed IFT activities. Based on previous THAAD and PATRIOT interceptor launches at PMRF and RTS, previous target launches at Wake, and previous use of sensors such as the AN/TPY sensors on PMRF, RTS and Wake, it is very unlikely that the Proposed Action would result in incidental takes. MDA, to the extent practicable, would employ active, non-lethal techniques, similar to those in the Bird Aircraft Strike Hazards (BASH) plan, to frighten birds away from the LHA prior to launch.

Post-flight Activities

At the conclusion of testing activities, soldiers would remove all mobile equipment/assets brought to the island. Support equipment provided for the test would be returned to the provider. Hazardous materials/wastes would be handled in accordance with local procedures. Transportation for removal of THAAD equipment and spent canisters would be the same as when it was brought onto the installation.

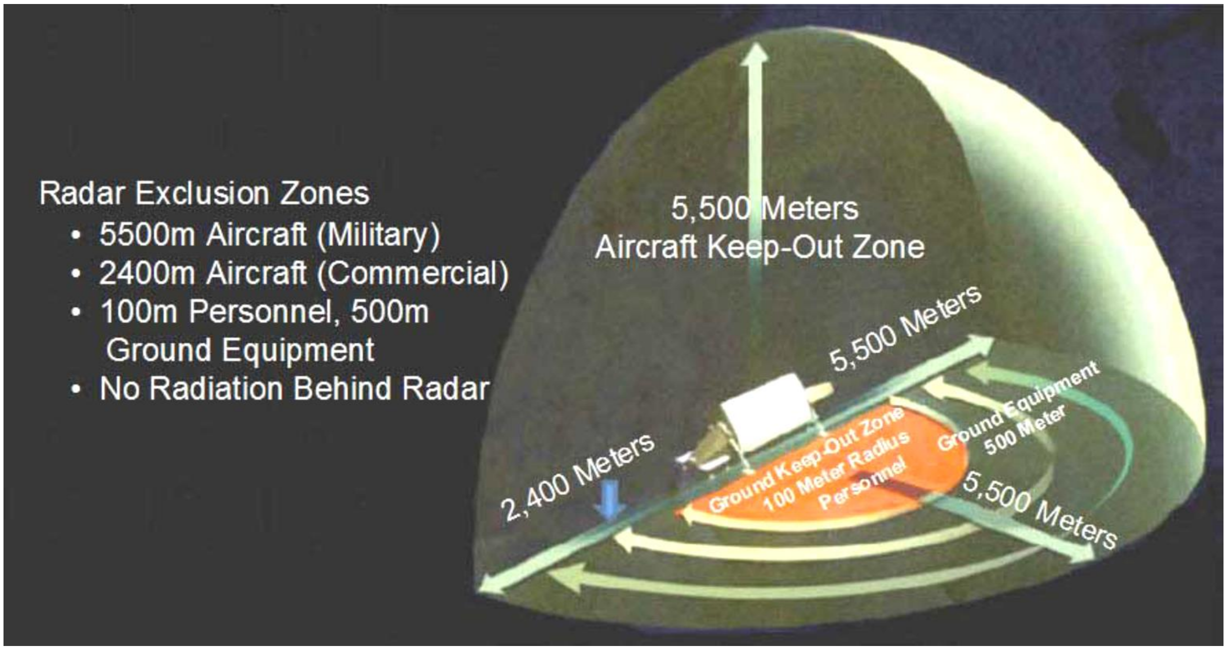

Figure 2-6 THAAD Radar Exclusion Zones

2.2.3.2 Aegis Ballistic Missile Defense (ABMD) in the BOA

The ABMD is the sea-based component of the MDA BMDS. The Aegis combat system is an integrated collection of sensors, computers, software, displays, weapon launchers, and weapons.

Standard Missile-2 (SM-2) Interceptor

SM-2 is the U.S Navy's primary surface-to-air air defense weapon. It is an integral part of the Aegis Weapon System (AWS) aboard Ticonderoga-class cruisers and Arleigh Burke-class destroyers, and is launched from the MK 41 Vertical Launcher System. The SM-2 uses tail controls and a solid fuel rocket motor for propulsion and maneuverability. Major exhaust components resulting from ignition of the SM-2 solid propellant motors include aluminum oxide, carbon dioxide, carbon monoxide, hydrogen, hydrogen chloride, nitrogen, and water.

Standard Missile-3 (SM-3) Interceptor

The SM-3 is a four-stage, solid-propellant, vertically launched interceptor missile capable of engaging targets in the exo-atmosphere using hit-to-kill technology (kinetic warheads without explosives) at long ranges (see Figure 2-7).

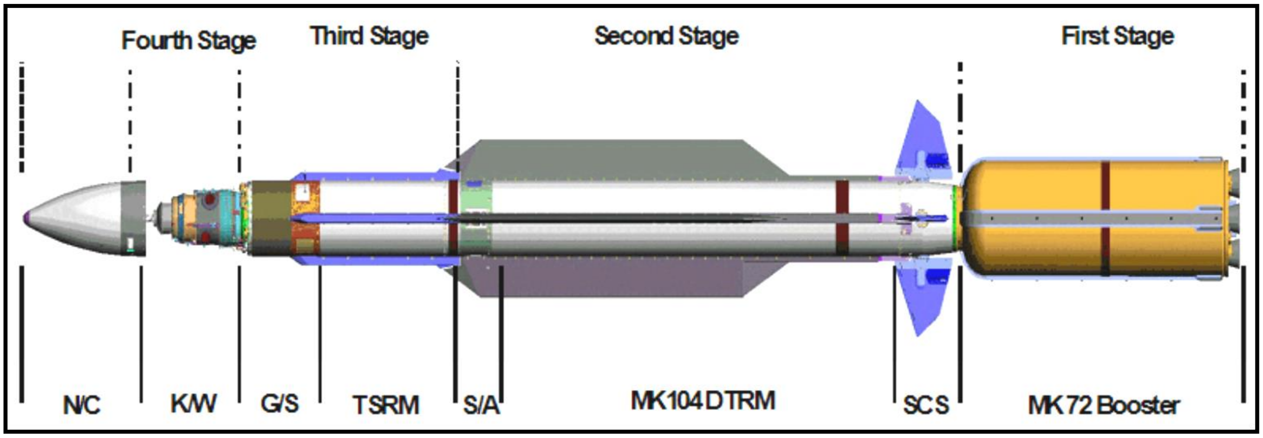

Figure 2-7 SM-3 Blk IA Missile

The SM-3 interceptor's four stages contain approximately 1,090 kilograms (kg) [2,400 pounds (lb)] of solid propellant. Major components of the propellants include aluminum, ammonium perchlorate, and HMX, a powerful and relatively insensitive high explosive. Major exhaust components resulting from ignition of the SM-3 solid rocket motors (SRMs) include aluminum chloride, aluminum oxide, ammonia, carbon dioxide, carbon monoxide, ferric chloride, ferric oxide, hydrogen, hydrogen chloride, nitric oxide, nitrogen, and water.

AN/SPY-1 Radar

The AN/SPY-1 is an S-band multi-function phased array radar with four fixed arrays and is the primary sensor for the ABMD system. The AN/SPY-1 radar is capable of search; detection; and tracking of ballistic missiles, air and surface targets; and missile engagement support. The fixed arrays of the radar transmit beams omni-directionally, continuously providing a search and tracking capability for multiple targets at the same time. All targets tracked by the AN/SPY-1 radar are monitored by the ship's Command and Decision system.

AEGIS BMD Ship

The ABMD ship participating in FTO-02 E2 and other IFTs would be a guided missile destroyer (DDG) or cruiser homeported in the Pacific Fleet. An example is shown in Figure 2-8.

Several weeks before the test date and while still in home port, the ABMD ship would begin conducting waterfront integration tests to ensure the ABMD system and personnel operating the system were fully prepared for the test mission. Preventive and corrective maintenance would be performed, as necessary, and training for system operators would be conducted.

Approximately 10 days before the test date, the ABMD ship would leave home port and begin steaming toward the test area. While underway, the crew would participate in tests and drills to verify that the ship's various communications and weapons systems were functioning properly and were integrated with the appropriate Wake Island test and safety systems.

Approximately 3-5 days before the test date, the ABMD ship would arrive at the test support position located in the BOA between Wake Island and Kwajalein Atoll. The ship and crew would respond to IFT messages received by assuming higher readiness conditions and preparing for simulated combat operations. At some time after the test scenario begins, the ABMD ship's radar would detect the target missile(s) and/or the air-breathing drone and would begin tracking them. If the target's flight path was determined to be a threat, the Aegis weapon system would calculate appropriate firing solutions for the SM-2 and SM-3 interceptors. Based on the target's path and knowing the interceptor missiles' flight characteristics, the AWS would determine the correct time and direction in which to launch the interceptor missiles so they would intercept the targets. At the appropriate time, the crew aboard the Aegis ship would launch the SM-2 and/or SM-3 missiles. After launch, the crew would continue to monitor and update the status of the targets and the interceptors to determine if the engagements were successful and the targets were destroyed. The ship's crew would remain at heightened alert status through the end of the exercise.

After FTO-02 E2 concludes, the ABMD ship would resume activities associated with typical steaming. Under normal circumstances, the ship would return to homeport or continue on its mission.

Figure 2-8 USS Hopper (DDG-70) Fires a SM-3 Blk IA Missile

2.2.3.3 PATRIOT

The only combat-proven hit-to-kill weapon system of the BMDS is the PAC-3 unit, which is operational and fielded by the U.S. Army. The PATRIOT system could be employed in future MDA flight tests at Wake Island as a single weapon system or it could be employed with THAAD and/or ABMD as part of an integrated BMDS. If a PATRIOT system were employed in a future flight test at Wake, it would most likely be sited at Peacock Point or at Heel Point.

PATRIOT Missiles

PATRIOT Advanced Capability-2

The PAC-2 missile is equipped with four clipped-delta movable control surfaces mounted on the tail. The missile propulsion is furnished by a single-grain, SRM. A high explosive warhead provides target-kill. The PAC-2 missile consists of the radome, guidance section, warhead section, propulsion section, and the control actuator section.

The radome provides an aerodynamic shape for the missile and microwave window and thermal protection for electronic components. The guidance section contains an antenna mounted on an inertial platform, navigational electronics, a computer that provides steering commands, a transmitter, and a receiver.

The propulsion section is composed of the rocket motor, external heat shield, and two external conduits and contains a conventional solid propellant. The control actuator section is located at the aft end of the missile. It receives commands via the missile autopilot and positions the fins to steer and stabilize the missile in flight.

PATRIOT Advanced Capability-3

The PAC-3 interceptor missile uses an SRM, aerodynamic controls, and a guidance system to navigate to an intercept point specified by its ground-based Fire Solution Computer before launch. The PAC-3 missile consists of the seeker assembly, Attitude Control Section, mid-section assembly, SRM section, and the aft section assembly.

The PAC-3 missile seeker assembly is mounted at the forward end of the PAC-3 missile. It consists of a protective ceramic cover called a radome, an active Ka Band Radar, an aluminum and graphite composite assembly and housing, and associated electronics.

The Attitude Control Section contains a number of small, short duration, solid propellant (aluminum and ammonium perchlorate and HTPB) rocket motors (side thrusters) that enable the PAC-3 missile to maneuver to achieve an intercept of a target in response to the instructions provided by the onboard guidance processor. It also contains one lithium thermal battery.

PAC-3 Launching Station

The PAC-3 Launching Station (LS) is a remotely operated, fully self-contained unit that has integral power. Each LS can carry up to 4 PAC-2 missiles or up to 16 PAC-3 missiles; however, there can be no mixing of PAC-2 and PAC-3 missiles on a single LS. The LS is mounted on an M-860 semi-trailer towed by an M983 HEMTT.

The generator for the LS is located on the yoke assembly of the trailer and includes an integral 15-gallon fuel tank (auxiliary capable). The unit is a diesel engine-driven generator, providing 15-kW, four-wire, 400-Hertz (Hz), 120/208-volt power.

PATRIOT Engagement Control Station

The PATRIOT Engagement Control Station (ECS) is mounted on either a 5-ton truck or Light Medium Tactical Vehicle (LMTV) and contains the computers, man-machine interfaces, and various data and communication terminals used to accomplish Fire Unit operations. The Radar Station (RS), Antenna Mast Group (AMG), and LS are remotely controlled through this shelter. All tactical decisions are executed by the operators in the shelter.

Electric Power Plant

The Electric Power Plant (EPP) is the prime power source for the PATRIOT ECS, AMG, and RS. Each EPP consists of two 150-kW, 400-Hz diesel engine generators that are interconnected through the power distribution unit and are mounted on a 10-ton M977 HEMTT. Each generator has a 380 L (100 gal) fuel tank.

PATRIOT Information Coordination Center

The PATRIOT Information Coordination Center (ICC) is mounted on either a 5-ton truck or LMTV and contains the computers, man-machine interfaces, and various data and communications terminals used to accomplish management of the Fire Unit's engagement operations functions.

PATRIOT Tactical Control Station

The Tactical Control Station (TCS) accommodates the battalion commander and up to 10 staff personnel, and provides automated equipment to support field operations. The TCS is housed in a modified M934 expandable van, which is co-located with the battalion ICC. It provides mobility in concert with the ICC.

PATRIOT Communications Relay Group

The Communications Relay Group (CRG) consists of a weather tight, Chemical, Biological, Radiological, and Nuclear proof shelter attached to a 5-ton cargo truck, similar to the ECS. It provides a secure data relay capability, as well as voice communications between the ICC, its assigned fire units, and between adjacent units. The CRG can also operate as an LCS, which is critical for remote launch operations.

AN/MPQ-65 Station

The PATRIOT RS consists of an AN/MPQ-65 multifunction phased array radar mounted on an M860 semi-trailer towed by a HEMTT and is powered by the EPP. The RS has a personnel exclusion area established 120 m (395 ft) to the front and extending 60 degrees to each side of the center of the radar during radar operations. The radar main beam would not radiate water or ground and the energy from any side lobes would be significantly less and would be very close in to the equipment.

PATRIOT Transportation

Transportation of PATRIOT unit personnel and equipment from a U.S. military installation in the continental United States to Wake Atoll using ground, air, and marine transportation means would be virtually identical to that described for the THAAD unit in Section 2.2.2.1.

PATRIOT Pre-Flight Activities

PATRIOT equipment and approximately 50 individuals would be transported to Wake Island about four weeks before the actual test date in order to perform PATRIOT pre-test operations and operate the AN/MPQ-65 and ICC equipment. Though specific emplacement site locations for PATRIOT are not determined, the system would most likely be sited at Heel Point or Peacock Point.

According to PATRIOT Technical Manuals, all PATRIOT systems must be grounded with grounding rods provided as part of the tactical equipment. Grounds must achieve a 25-ohm resistance rating. The most common method of PATRIOT grounding is emplacing three grounding rods a minimum of 2.4 m (8 ft) into the ground per major end item. Each major end item must have its own grounding cable running directly to a single ground rod. Each grounding cable may be no longer than 4.6 m (15 ft) long. Alternative grounding may consist of five 1 m (3 ft) grounding rods emplaced in a star configuration. No special provisions are provided for lightning protection.

Use of existing Wake Island grounding and lightning protection would be considered. PATRIOT ground vehicles would use existing vehicle maintenance and fueling facilities to the extent practicable. Although no major maintenance is expected to occur, small quantities of used motor oil and/or coolant could be generated through normal operations. These non- hazardous wastes and any hazardous wastes generated during vehicle maintenance would be handled by Wake Island in accordance with existing regulations.

Fiber-optic cables would be laid on the ground or along existing road rights of way. If fiber-optic cables require additional protection from vehicle and foot traffic, they would be placed in cable raceways. Trenching would occur at roadway intersections to bury the cables for protection. If, during the course of program activities, cultural and/or historic materials (particularly human remains) are discovered, activities in the immediate vicinity of the cultural materials would be halted and the Wake Island environmental office notified. Coordination/consultation required by the *Wake Island Integrated Cultural Resources Management Plan* would occur.

PATRIOT unit integration activities would be conducted before the actual test date to ensure the radar set, ICC, and launchers communicate properly. After unit integration is completed and verified, the PATRIOT unit would conduct range integration activities to verify that the unit can communicate with range safety and other required communications and control networks.

Fuel and lubricants would be required for PATRIOT LS generators, EPPs, prime movers, and organic vehicles. Specialized support requirements would not be anticipated. PATRIOT tactical generators would require JP-5 fuel on a daily basis. A reserve fuel pod would be positioned on- site to handle any emergency fuel requirements. The average daily usage for a PATRIOT Fire Unit during a test environment is approximately 1150 L (300 gal) of JP-5 per day. PATRIOT refuel operations are normally accomplished with a HEMTT fueler that is used to refuel equipment in the morning and evening during 24-hour operations. The PATRIOT generators would be used on average, less than 10 hours per day for 60 days.

Based on past deployments, PATRIOT equipment may be affected by the salt environment at Wake Atoll. To minimize adverse impacts, up to 3,800 L (1,000 gal) of fresh (non-salt) water would be used every 2 days to wash down selected PATRIOT equipment. PATRIOT personnel would use fresh water and brushes to wash down only exterior equipment surfaces. Fresh water would not contact any surfaces subject to petroleum, oil, or lubricant use. Any remaining rinse water would be disposed of in accordance with appropriate installation plans and directives. No fresh water would be disposed directly into the ocean or lagoon environment.

PATRIOT Flight Test Activities

PATRIOT interceptors could be launched as part of the Proposed Action. Aluminum oxide, carbon monoxide, hydrogen chloride, nitrogen, and water are the main emission constituents for each PATRIOT interceptor launch. Up to two PATRIOT interceptors could be launched at each target the PATRIOT system engages and the launchers would be remotely controlled from the ECS. No personnel would be in the launch area hazard zone during launch.

A 381-m (1,250-ft) ESQD arc would be established around the PATRIOT launcher to comply with safety criteria. Two 1.2 m by 1.2 m (4 ft by 4 ft) steel plates would be placed side-by-side behind the launcher to provide blast protection to the ground's surface. PATRIOT activities would adhere to the SOPs at Wake Island to protect all persons and property A Ground Hazard Area would be established, along with road control points and clearing the area. The radar main beam would not radiate water or ground and the energy from any side lobes would be significantly less and would be very close in to the equipment.

PATRIOT Post-Flight Activities

At the conclusion of testing activities, personnel would remove all PATRIOT equipment/assets brought to the island. Facilities and support equipment provided for the test would be returned to Wake Island in accordance with established procedure. Hazardous materials/wastes would be handled in accordance with the appropriate installation plans and directives. Transportation for removal of PATRIOT equipment would be the same as when it was brought into the installation.

2.2.4 SENSOR AND COMMUNICATION SYSTEMS

A variety of fixed and mobile test infrastructure assets would be used in the execution of FTO-02 E2 and future IFT activities. These assets may include fixed or mobile radars, communications assets, telemetry systems, range safety aircraft, and mobile launch and safety platforms. Potential environmental impacts resulting from the use of these assets were considered in a variety of documents including the *Mobile Sensors Environmental Assessment* and the *Wake Island Environmental Assessment*.

2.2.4.1 Army-Navy Transportable Radar Surveillance-2 (Forward Based Mode)

The AN/TPY-2 (FBM) is a transportable X-band, high resolution, phased-array radar designed specifically for ballistic missile defense. It is based on the AN/TPY-2 (TM) THAAD radar hardware and software design. The operational and support characteristics for the AN/TPY-2 (FBM) are the same as described above for the THAAD radar, AN/TPY-2 (TM).

The AN/TPY-2 (FBM) would be powered by two PPUs as described above for the AN/TPY-2 (TM) radar. A low-voltage shore power connection would be utilized during non-test periods to protect sensitive electronic equipment and provide lighting. Because the Proposed Action is an operational test and because the test scenarios are representative of the threat, the actual test could occur at any time (day or night). The mission areas would be lit at night for safety and security but those safety/security lights would be the minimum necessary. To the extent practicable, consistent with mission requirements, MDA will incorporate USFWS lighting recommendations into project planning. There would not be any increase in the use of night-time lighting except for security measures. Any new lighting would be positioned low to the ground and be shielded, so that light from the shielded source cannot be seen from the beach.

A CDIN would be co-located with the AN/TPY-2 (FBM) radar. C2BMC is a network of computer hardware, software, and communications capabilities that provide the rules, tools, and connectivity that enable the BMDS to engage threat missiles. C2BMC receives, processes, and displays tracking and status data from multiple elements, components, and sensors so that local commanders at various locations have the same integrated operating picture and can make coordinated decisions about deploying weapons.

The CDIN would consist of four shelters: the Tactical Operations Center (TOC), C2BMC Equipment Shelter, Mission Support Shelter (MSS), and Storage CONEX. The TOC contains workstations, printers, and safes to be utilized by operations personnel during preparation for and participation in exercises. The C2BMC Equipment Shelter contains the C2BMC High Availability Communications Nodal Equipment (HA CNE), Intrusion Detection System (IDS), Communications Network Interface Processors (CNIPs), network security, routing, switching and cryptologic equipment in transit cases. The MSS contains additional spares and tables for hardware assembly, test, and maintenance. The Storage CONEX contains additional spare equipment and admin support materials. There are no generators specific to the CDIN. The CDIN would be powered through a connection to an electrical patch panel shared with the AN/TPY-2; the panel would be tied into shore power with backup by a 200-kW portable diesel generator.

The SATCOM capability would be provided by two AN/USC-60A units. Each unit contains a tripod-mounted 2.4 meter diameter antenna that can operate in the C, X, or Ku band. The SATCOM would be powered by connection to the electrical patch panel shared with CDIN and AN/TPY-2. The SATCOMs would be protected from weather conditions by use of portable environmental enclosures.

Approximately 30 individuals would be required to set up and breakdown, operate, and provide security for the AN/TPY-2 (FBM) radar, C2BMC, and SATCOM units. Upon completion of FTO-02 E2, all personnel and equipment would depart via aircraft to a designated location and the area would be returned to its pre-test condition.

The MDA considered two potential sites on Wake Island for locating the AN/TPY-2 (FBM), CDIN, and SATCOM equipment. Based on integrated flight test objectives, the AN/TPY-2 could be place in the same location previously analyzed in the *Integrated Flight Tests at USAKA/RTS Environmental Assessment* (MDA, 2012). Studies indicate that locating these assets between Wake Avenue and North Pacific Avenue near Heel Point is preferable because it better supports the accomplishment of flight test objectives. The sites for the Proposed Action were chosen in conjunction with the USAF as the locations that best meet flight test objectives and minimize environmental impacts (specifically clearing). The habitat type found in the Proposed Action site is also found adjacent to the project area and is common throughout the Atoll. The proposed layout for the AN/TPY-2 radar and communications layout is shown in Figure 2-9. The AN/TPY-2 (TM) could also be located near the runway southeast of building 5050, as shown in Figure 2-10. Figures 2-9 and 2-10 show notional layouts of the AN/TPY-2 (TM) and communications equipment. The AN/TPY-2 (TM) and associated equipment would be sited on existing paved surface to the extent practicable. Soldier safety and tactical realism considerations may require an equipment configuration where certain items would be located off the existing paved surfaces. If this were to occur, sensitive resources, such as migratory bird habitat and nesting areas, would be avoided to the extent practicable, consistent with mission requirement. While there is no documented evidence of sea turtle nesting on Wake Atoll, sea turtle nesting and haul-out habitat would be avoided to the maximum extent practicable. In the unlikely event that sea turtles are present in the project area, the 611 CES assigned environmental manager will be notified and any necessary coordination with the USFWS (e.g., if a turtle nest were discovered) would occur prior to placement of test assets.

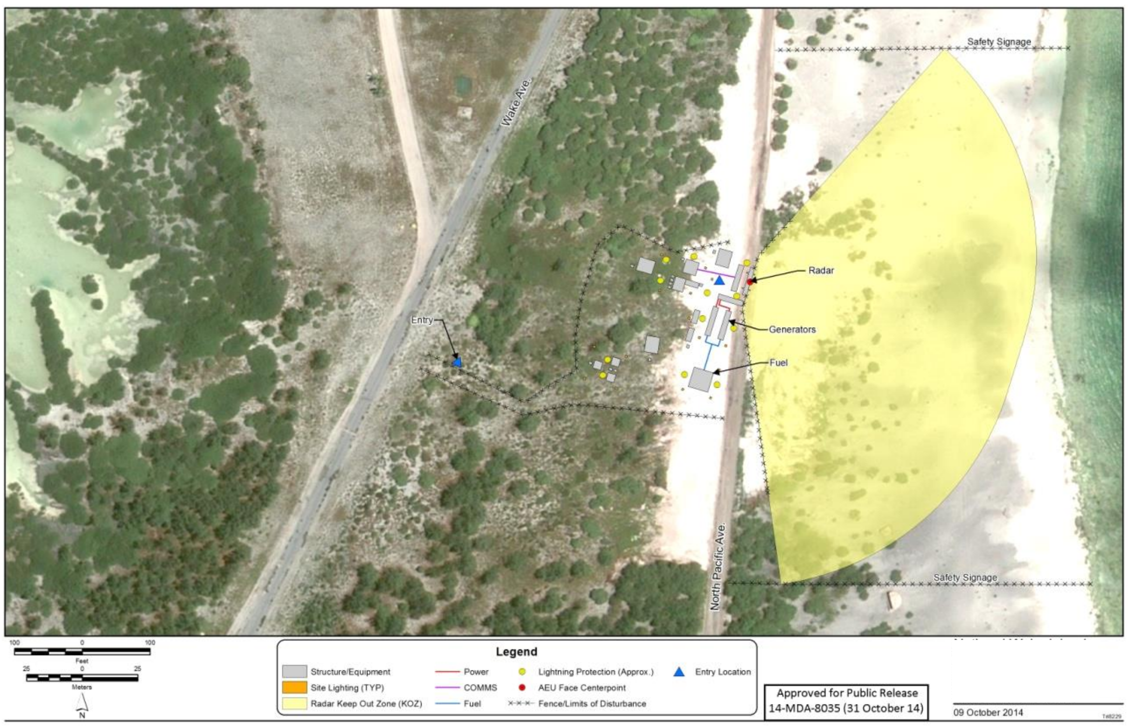

Figure 2-9 AN/TPY-2 Radar and Communications Site Layout

Source: MDA, 2012

Figure 2-10 Alternate AN/TPY-2 Radar, Communications Site Layout

In a notional configuration, the AN/TPY-2 radar and system components typically require approximately 0.8 hectares (2 acres) of graded compacted hardstand surface (shown as tan area in Figure 2-11) and approximately 4.9 hectares (12 acres) of "clear zone" (green shaded area) to allow unobstructed, low-elevation radiation. Contained with the clear zone would be a "hazard clear zone" of approximately 2.4 hectares (6 acres); for safety reasons people are not allowed to enter the hazard clear zone, or "keep out zone." MDA would prevent authorized entry into the ground portion of the keep out zone using temporary metal or rope barriers, approximately 1.12 m (44 inches) tall. The radar main beam would not radiate water or ground and the energy from any side lobes would be significantly less and would be very close in to the equipment.

Sections 2.2.1 and 2.4 discuss further the environmental requirements for vegetation maintenance.

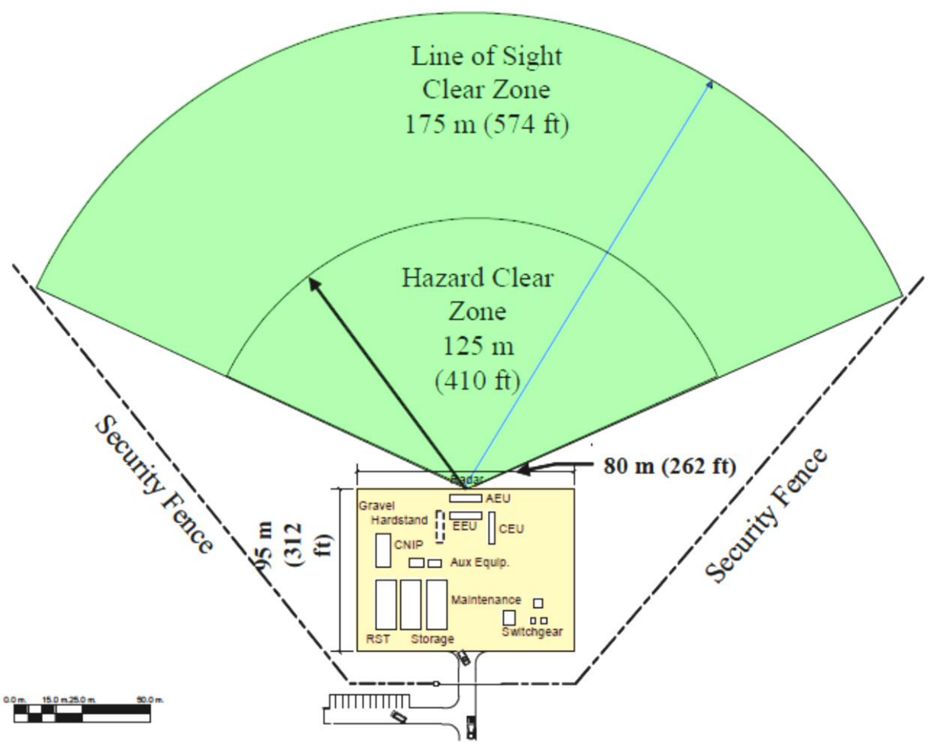

Figure 2-11 AN/TPY-2 Radar Hazard Area (Notional)

2.2.4.2 High Altitude Observatory (HALO) and Other Aircraft

The HALOs collect calibrated radiometric imagery and serve as a test bed for user programs. The HALOs consist of different sensors suites housed in modified Gulfstream IIB aircraft that would operate at altitudes up to 13,716 m (45,000 ft). They are capable of data collection in the visible through long wavelength infrared (LWIR) spectral regions. The HALOs have an acquisition range greater than 1,000 km (540 nm). The HALO aircraft could refuel at Wake Island.

Other aircraft, such as two P-3 Cast Glance aircraft would be participating in FTO-02 E2. These aircraft would collect optical data on both target extractions. Both aircraft are staging from Joint Base Pearl Harbor-Hickam, and Wake Island could be used as a divert landing location.

Two Gulfstream I aircraft would also participate in FTO-02 E2. They would be staged from RTS and would be transporting/releasing the BQM targets during the mission. These aircraft could also refuel at Wake Island.

2.2.4.3 Pacific Collector

Pacific Collector is an ocean going vessel currently hosting the Transportable Telemetry System (TTS)-1, a mobile, self-contained telemetry system designed to support the conduct of MDA test missions at remote sites. Pacific Collector is owned, operated, and maintained by the DOT Maritime Administration in support of MDA missions.

2.2.4.4 Pacific Tracker

Pacific Tracker is an ocean going vessel currently hosting the XTR-1 radar and TTS-2. Pacific Tracker is owned, operated, and maintained by the U.S. DOT's Maritime Administration in support of MDA missions. The vessel is designed to:

- Collect X- and S-band radar data and S- and L-band telemetry
- Send and receive real time data via satellite communications capability, and
- Operate in remote locations

2.2.4.5 High Frequency (HF) Radar

The HF Radar could be used to observe and collect target and intercept data. The HF radar system considered for future flight tests operates in the high frequency range (approximately 32 megahertz [MHz]) and consists of a transmit array, a separate receive array, and Container Express (CONEX)-type box (military shipping container) to house equipment and operators. The transmit array consists of 10 small antennas, electronic equipment contained in a 6 m (20 ft) CONEX shelter, and a 100- kW 50-Hz generator to power the transmitter. The receive array consists of several antenna elements, receiver equipment, and a 30-kW 50-kilohertz (kHz) generator to power the receiver. The receive array would be placed in a rectangular formation, approximately 180 m (590 ft) long by 25 m (82 ft) wide. The transmitter array would be placed in a rectangular formation, 50 m (164 ft) long by 35 m (115 ft) wide. A separate 9 m (30-ft) CONEX shelter, collocated with one of the arrays, would house two radar operators. Grounding rods would be required for both the transmitter and receiver. Placement of the radar arrays, equipment, and shelters would be on previously disturbed ground to the extent practicable and would require no trenching.

2.2.4.6 Transportable Telemetry System (TTS)

Four TTS units, designated TTS #3, TTS #4, and two TTS #5, would be located on Wake Island to collect operational flight test data (Figure 2-12).

TTS #3 and #4 would each consist of a 7.3 m (24 ft) telemetry antenna, a telemetry shelter, spares shelter, and a power shelter. The shelters are 2.4 m (8 ft) wide and 6 to 12 m (20 to 40 ft) in length. Each has a 175 kW diesel-powered generator associated with it and a bank of batteries that serves as an uninterruptable power source. Each TTS #5 is similar except that it would have as many as two 4.3 m (14 ft) telemetry antennas. The

TTSs would operate from an existing asphalt site that would be enhanced with the addition of equipment grounding, shore power, and portable lighting. The Proposed Action is an operational test and because the test scenarios are representative of the threat, the actual test could occur at any time (day or night). The mission areas would be lit at night for safety and security but those safety/security lights would be the minimum necessary. To the extent practicable, consistent with mission requirements, MDA will incorporate USFWS lighting recommendations into project planning. There would not be any increase in the use of night-time lighting except for security measures. Any new lighting would be positioned low to the ground and be shielded, so that light from the shielded source cannot be seen from the beach.

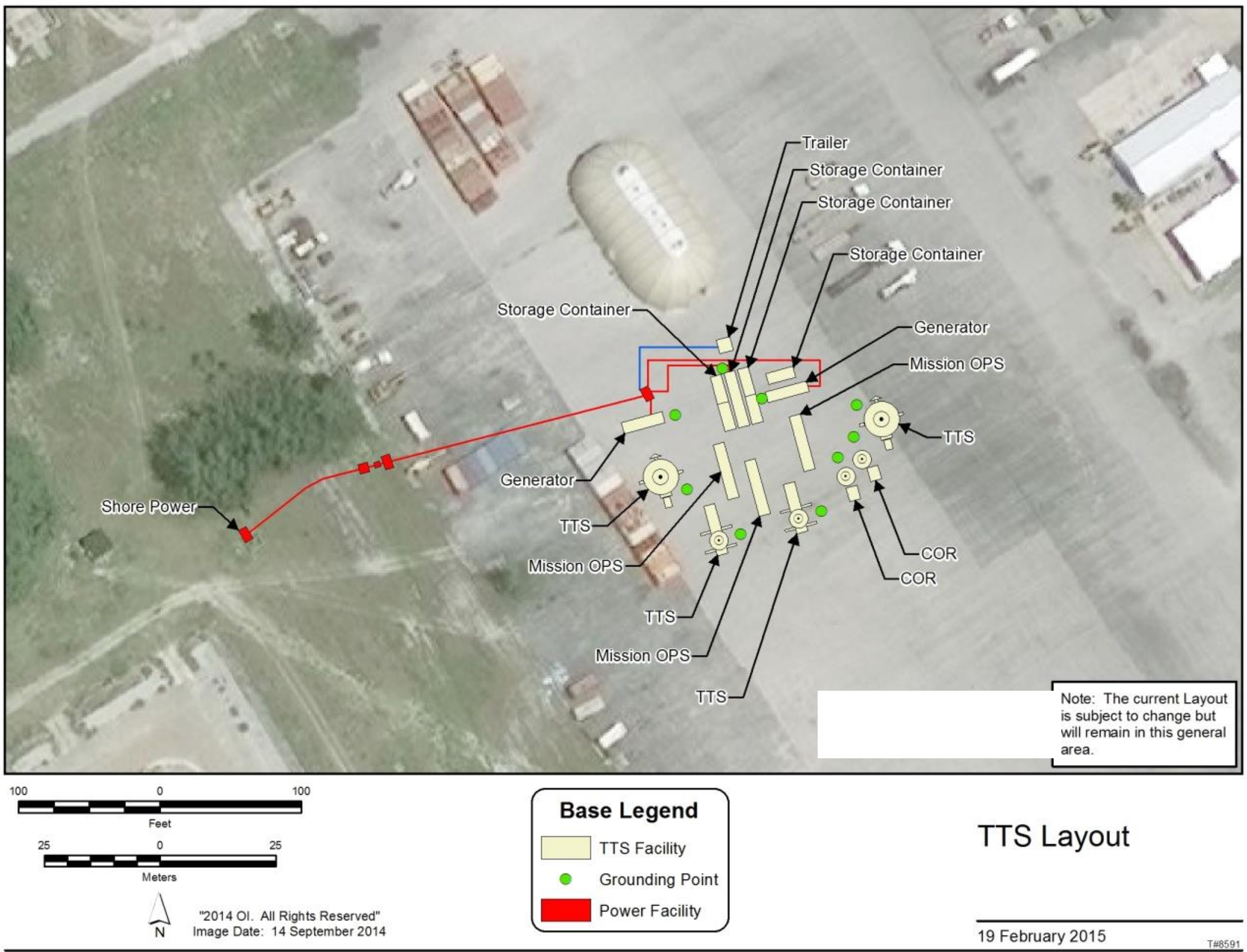

Figure 2-12 TTS Location Options

Two additional telemetry antennas, designated COR-1 and COR-2 in Figure 2-12, would also be deployed to Wake Island. This would bring the total to six telemetry antennas. COR-1 and COR-2 would be similar in size to the TTS #5 antenna.

MDA would operate the TTSs on shore power for FTO-02 E2 with a generator backup. Running continuously, the generator would consume about 1,420 L (375 gal) of JP-8 fuel per 24 hours of operation. The battery-powered uninterruptable power supply provides power while the system is switched from shore power to generator power if shore power is lost.

The units would be transported from the U.S. by air or surface craft and would arrive at their respective support areas approximately four to eight weeks before the test event. Preflight activities would include transportation from their point of arrival to their final support locations, setting up the antenna, connecting power, communications, and data lines to the shelters, and conducting pre-flight tests to confirm proper operations.

During FTO-02 E2, the TTS units would collect telemetry data from selected flight vehicles. The collected data would be transmitted via fiber optic cable or satellite communications to a data center for processing.

The TTSs would be powered down and disassembled at the conclusion of FTO-02 E2. The units would be prepared for transport from Wake Island to the United States using air or surface craft. The TTS #3 has been operated previously on Wake Island as part of FTI-01.

2.2.4.7 Communication 01 Suite

Two Satellite Antenna Communication Systems would be located on Wake Island to receive and transmit voice and data: a 4.9 m (16 ft) dish and a back-up SeaTel and associated electronics racks.

The communication suite would operate on shore power for FTO-02 E2 with a generator backup. Running continuously, the generator would consume about 1,420 L (375 gal) of JP-8 fuel per 24 hours of operation. The battery-powered uninterruptable power supplies provide power while the system is switched from shore power to generator power if shore power is lost.

These units would be transported from the United States by air or surface craft and would arrive at their respective support areas approximately eight to twelve weeks before the test event. Preflight activities would include transportation from their point of arrival to their final support locations, setting up the antennas and mounts, connecting power, communications, and running data lines from the proposed Communication 01 buildings to the various shelters and existing buildings, and conducting pre-flight tests to confirm proper operations.

During FTO-02 E2, the Communication 01 Suite would transmit and receive voice and data and distribute it to the various sites via fiber optic cable and other means. The collected data would be transmitted via fiber optic cable and satellite communications to a data center for processing.

The Communication 01 suite would be powered down at the conclusion of FTO-02 E2 and FTT-18 which closely follows. There was a similar 4.9 m (16 ft) Satellite system and smaller back-up system operated previously on Wake Island as part of FTO-01. The proposed Communication 01 Suite planned for FTO-02 E2 would also support the follow-on FTT-18 mission and future MDA missions on Wake.

2.2.4.8 MDA Operations Center

This facility would replace office space, conference space, operations areas, toilets, and support areas now in Building 1601. The facility would be an insulated, pre-engineered metal building. The building would be approximately 660 m^2 (7,100 ft^2). The proposed location is near housing and dining facilities, as shown in Figure 2-2, to reduce transportation support requirements. This new building would be located near the Communication 01 suite, at the site of former Building 1172. Site preparation for this facility would require the disturbance of approximately 0.07 hectare (0.16 acre) of vegetation.

2.2.4.9 Peacock Point Communications Terminal Building

This facility would replace the function of the communications room currently in Building 1601. The facility would be approximately 3 by 4.3 m (10 by 14 ft) and would be reinforced concrete block construction. This new building would be built adjacent to Building 1610. All communications wiring for MDA facilities located in the Peacock Point area would be removed from Building 1601 and terminated in this facility. The proposed location is near existing communications and backup power infrastructure.

2.2.4.10 Permanent Weather Radar Tower

The weather radar could be installed on a permanent tower near the intersection of Wake Avenue and Canton Avenue to replace the temporary location on top of Building 1519. This permanent tower would be installed on a concrete pad would be approximately 12 m (40 ft) tall. The tower would be supported using a system of guy wires, extending out to approximately 15 m (50 ft).

2.2.4.11 Arnold Engineering Development Center (AEDC) Optics

Two AEDC Optics mounts would be located on Wake Island to collect imagery of the THAAD launches.

AEDC would operate the optics on shore power for FTO-02 E2 with a generator backup. Running continuously, the generator would consume about 1,420 L (375 gal) of JP-8 fuel per 24 hours of operation. The battery-powered uninterruptable power supply provides power while the system is switched from shore power to generator power if shore power is lost.

These units would be transported from the United States by air or surface craft and would arrive at their respective support areas approximately four to eight weeks before the test event. Preflight activities would include transportation from their point of arrival to their final support locations, setting up the optics mounts, connecting power, communications, and data lines to the shelters, and conducting pre-flight tests to confirm proper operations.

During FTO-02 E2, the AEDC Optics mounts would collect imagery data from THAAD flight vehicles. The collected data would be transmitted via fiber optic cable or satellite communications to a data center for processing.

The units would be powered down and disassembled at the conclusion of FTO-02 E2. These units would be prepared for transport from Wake Island to the United States using air or surface craft. The AEDC Optics mounts have been operated previously on Wake Island as part of FTO-01.

2.2.4.12 Early Launch Tracking System (ELTS)

The ELTS is a mobile, X-band, Doppler radar system originally designed to support Aegis Ashore (AA) testing at the PMRF. Major system components include:

- Multi Frequency Doppler Radar antenna
- Cooling Unit for antenna transmitter (cooling built into trailer)
- Antenna Power Supply (2 pieces)
- Antenna Pedestal with Self-Positioning
- Mobile Trailer with self-leveling and built in equipment enclosure

Designated MFTR-2100/39-640, the ELTS radar is based on a Weibel MFDR-2100/39-640 X-band continuous wave multiple frequency Doppler radar mounted on the high performance AP-2100/40 antenna pedestal (Figure 2-13). The MFTR transmits 640W of continuous power in the X-band.

Figure 2-13 Early Launch Tracking System

2.2.4.13 DRX-41320M Radar

This radar, shown in Figure 2-14, is a highly mobile system with rugged weatherproof enclosures and withstands shock, dust, sand, humidity, rain, and salty air. The micro-strip antenna is ruggedized and weatherproof. This radar provides real-time tracking of multiple objects.

Figure 2-14 DRX-41320M Radar

2.2.5 TARGET SYSTEMS

The IFTs at Wake Island could involve up to five threat-representative targets per test. The following sections describe representative targets that could be used to support IFTs. The use of Wake Atoll and the Wake Island Launch Complex to support the launch of target missiles has been previously analyzed in the *Wake Island EA* (USASSDC, 1994b), the *Wake Island Launch Center (WILC) Supplement Environmental Assessment* (U.S. Army Space and Missile Defense Command, 1999), and the *MDA Wake Island Supplemental EA* (MDA, 2007).

2.2.5.1 Medium Range Ballistic Missile (MRBM) Target

The MRBM target vehicles can be provided in several different configurations with various options depending on mission requirements. Configurations being considered for integrated flight tests include the Extended Long Range Air Launched Target (E-LRALT) and the eMRBM; both configurations would be launched from a C-17 aircraft. Figure 2-15 illustrates these MRBM targets.

The E-LRALT and eMRBM targets are similar in that both employ a SR-19 SRM 1st stage and a SR-19 SRM second stage. In addition, the E-LRALT contains a third stage Orbus SRM. The main combustion products produced by these SRMs include aluminum oxide, hydrogen chloride, carbon monoxide, nitrogen, and water.

Each MRBM is supported with a Carriage Extraction System (CES), Command Control and Communication (C3) Pallet, Air Launch Equipment (ALE) and Air Launch Support

Equipment (ALSE) for operation and support onboard a government C-17 aircraft, and Common Test Set (CTS) and Mechanical Ground Support Equipment (MGSE) for ground operations.

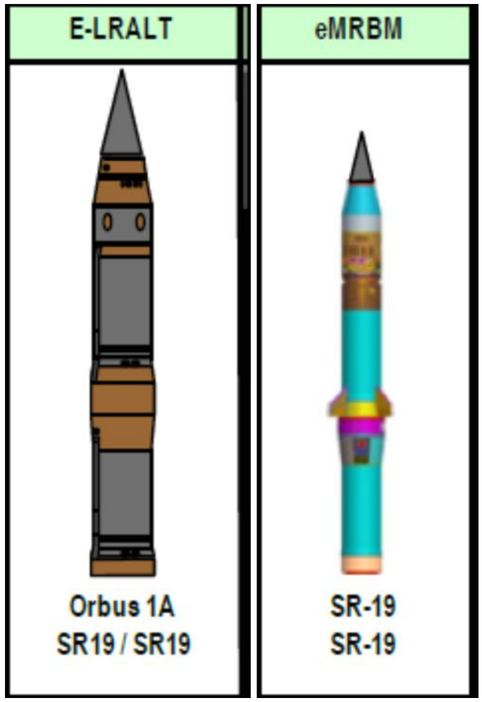

Figure 2-15 Representative MRBM Targets

The CES provides the capability for transport, aircraft loading, pre-launch testing, and deployment of the fully assembled aerial vehicle. The CES supports extraction of the target vehicle from the C-17A aircraft and descent prior to vehicle ignition.

The C3 Pallet provides mission situational awareness and communications support for the air launch operators.

The ALE consists of the necessary hardware and software to provide target vehicle communication, control, and power during system integration, test, and launch. The ALE also has the capability to record and monitor the status of the target vehicle during system integration, test, and launch operations.

The MRBM vehicle is equipped with a Flight Termination System (FTS). The FTS may be initiated by command of flight safety personnel or it can be initiated by the missile itself if an anomaly is detected during flight.

Figure 2-16 shows how the palletized MRBM target vehicle and other support equipment would be configured on the aircraft while in transport and before launch.

Transportation

Each MRBM would be assembled, tested, and shipped as a single piece from the Lockheed Martin Single Integration Center (SIC) in Courtland, Alabama. The payload and experiment packages would be assembled, tested, and shipped from the providing contractor facilities as separate modules and integrated with the flight vehicle at the SIC.

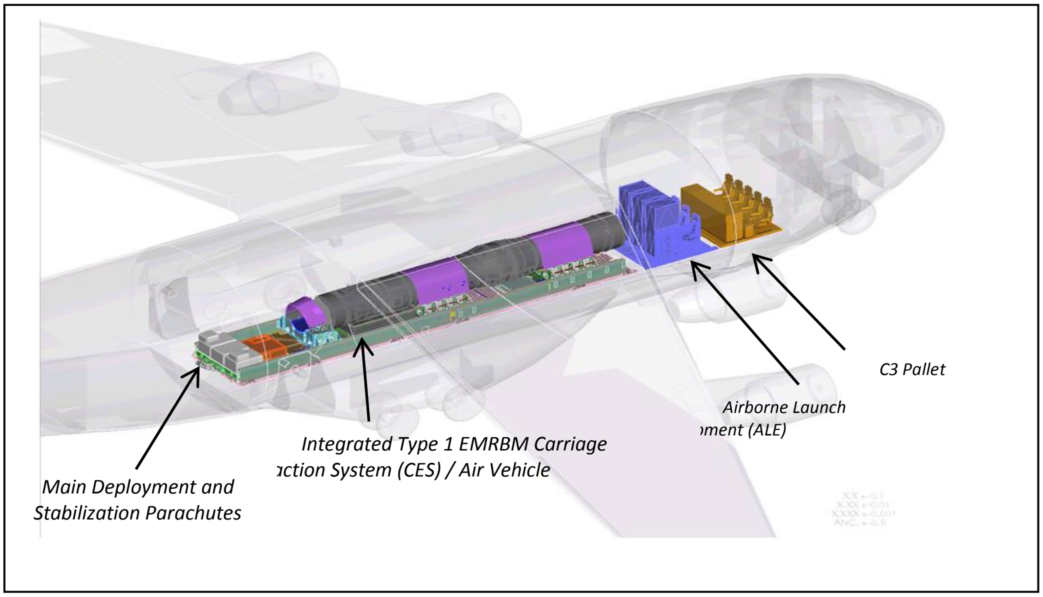

Figure 2-16 Target Vehicle and Support Equipment

The completed vehicles on the CESs would be shipped overland by truck from the Courtland facility to Redstone Arsenal, Alabama, where they would be loaded on a government C-17 aircraft for air transport to the forward staging area (FSA). Existing roads and air routes would be used. All transportation within the U.S. would be performed in accordance with appropriate DOT approved procedures and routing, as well as OSHA requirements and appropriate DoD safety regulations.

Preflight Activities

Pre-drop range integration and launch operations consist of those integration activities utilizing the fully assembled CES/MRBM aboard the aircraft including aircraft/target compatibility checks, target/range integration checks, mission dress rehearsals/dry runs, mission planning and support, and the actual conduct of the airdrop missions. Tests with the target vehicle on the CES in the C-17, prior to countdown operations for air launch would include broadcasts of S-Band and L-Band downlinks, range acquisition of downlinks, and processing of same to verify RV and LV functional integrity.

Flight Test Activities

The FSA for aircraft launching the MRBM targets would be an existing military installation such as Joint Base Hickam/Pearl Harbor, USAKA/RTS, or Andersen Air Base, Guam, which routinely handle the types of aircraft necessary for deploying the air launched targets.

During MRBM launch, as shown in Figure 2-17, the CES would be pulled from the aircraft by parachute and dropped. A total of up to ten parachutes would be used to deploy the MRBM target vehicle from the aircraft in preparation for actual launch. The parachutes may use a ring-slot design with multiple panel openings or a ribbon parachute

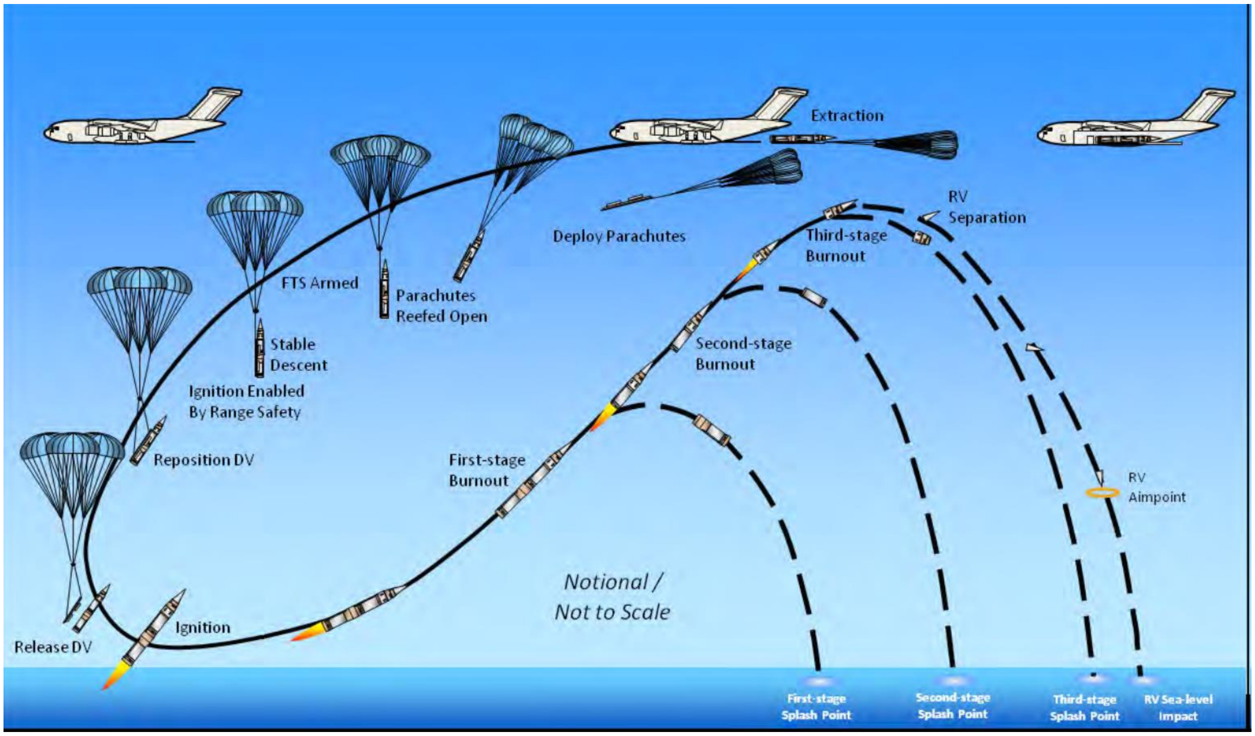

Figure 2-17 Notional Air-Launched Target Flight Profile

made of a nylon/Kevlar composition. They would range from 4.5 to 29 meters (15 to 94 feet) in diameter.

The MRBM target vehicle contains ordnance in the form of solid-rocket motor propellant, parachute reefing cutters, flight termination system, and detonation cord. The target vehicle is secured to the CES with “blankets” made of nylon or similar material or with steel straps. The blankets are stitched together with detonation cord. When the detonation cord is exploded, the blankets release the target missile from the pallet. The pallet and parachutes, which are weighted, would then fall to the ocean surface, outside the boundaries of the expanded PRIMNM, and sink relatively quickly.

All proposed activities conducted in the PRIMNM would be performed in a manner that avoids, to the extent practicable and consistent with training requirements, adverse impacts on Monument resources and qualities in accordance with Presidential Proclamations 9173 and 8336.

If the parachutes were to fall in the PRIMNM, it would be the result of an unplanned event. If any protected resources were harmed, MDA would promptly coordinate with the Secretary of the Interior or Commerce, as appropriate, for the purpose of taking appropriate actions to respond to and mitigate any actual harm and, if possible, restore or replace the monument resource or quality as called for in the PRIMNM Proclamation.

The target missile would separate from the pallet, fall free toward the earth, and first stage ignition would occur. When the first stage’s propellant is expended, that booster would be dropped to fall to the ocean in a predetermined booster drop area and the second stage booster motor would ignite. If a two-stage eMRBM target is used, near the end of the second stage’s burn, the RV would separate from the booster and would follow its flight path to interception or to splash down within a designated ocean impact area. The second stage, meanwhile, would fall to the ocean in a second predetermined booster drop zone. If a three-stage E-LRALT target is used, the RV would separate from the third stage booster and follow its flight path to interception or splash down within a designated ocean impact area as illustrated in Figure 2-17. The booster impact areas could be in the BOA or within the PRNMN.

Post Flight Activities

After launching the MRBM target missile, the C-17 aircraft would return to the FSA for crew rest and refueling before returning to home base. Depending on the final test execution schedule, the C-17 aircraft could return to USAKA/RTS for crew rest and refueling before returning to home base.

2.2.5.2 Intermediate Range Ballistic Missile (IRBM) Targets

The IRBM target (Figure 2-18) is similar to the eMRBM target in that it is a two-stage solid propellant target missile. The first stage motor is an Orion 50S XLT and the second stage is an Orion 50 XLT with a combined propellant weight of about 42,000 lbs (19,000 kg.). The IRBM target would be transported and employed using processes and procedures similar to those described for the MRBM target.

Transportation, pre-flight activities, flight test activities, and post flight activities would be virtually the same as discussed above for MRBM target vehicles.

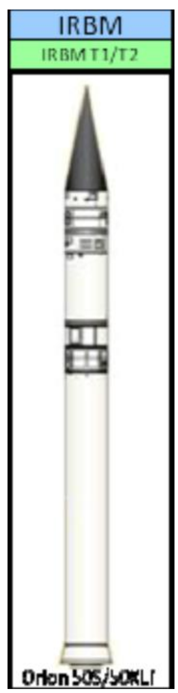

Figure 2-18 Intermediate Range Ballistic Missile Target

2.2.5.3 Short Range Ballistic Missile (SRBM) Targets

The SRBM target vehicle proposed for use in FTO-02 E2 is the Short Range Air Launched Target or SRALT (Figure 2-19). Like the MRBM target vehicles discussed above, the SRALT employs a SR-19 SRM for its only powered stage. The main combustion products produced by this SRM include aluminum oxide, hydrogen chloride, carbon monoxide, nitrogen, and water.

The SRALT is supported with a CES, C3 Pallet, ALE and ALSE for operation and support onboard a government C-17 aircraft, and Common Test Set (CTS) and Mechanical Ground Support Equipment (MGSE) for ground operations.

The CES provides the capability for transport, aircraft loading, pre-launch testing, and deployment of the fully assembled aerial vehicle. The CES supports extraction of the target vehicle from the C-17A aircraft and descent prior to vehicle ignition.

The C3 Pallet provides mission situational awareness and communications support for the air launch operators.

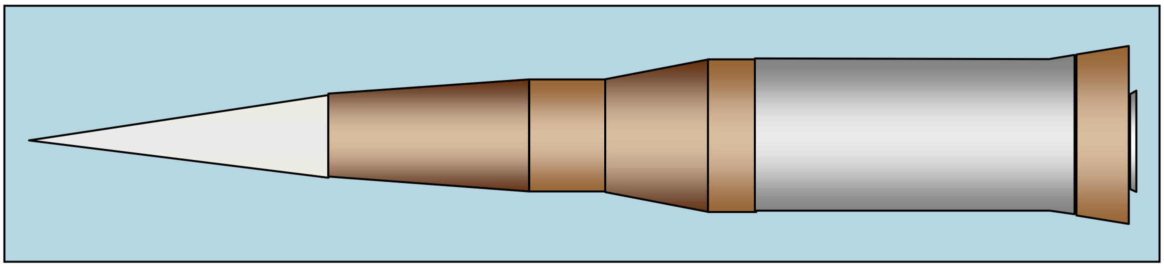

Figure 2-19 Short Range Air Launched Target

The ALE consists of the necessary hardware and software to provide target vehicle communication, control, and power during system integration, test, and launch. The ALE also has the capability to record and monitor the status of the target vehicle during system integration, test, and launch operations.

The SRALT is equipped with a FTS. The FTS may be initiated by command of flight safety personnel or it can be initiated by the missile itself if an anomaly is detected during flight.

Transportation, pre-flight activities, flight test activities, and post flight activities would be virtually the same as discussed above for MRBM target vehicles.

2.2.5.4 Air-breathing Targets

Integrated flight testing may include the use of air breathing targets to simulate the cruise missile threat. These targets would be launched from an airborne platform over the Pacific BOA. They are remotely piloted from a control station near the launch site. The air-breathing targets considered for use in IFTs contain turbojet engines that burn JP-8 or similar fuel. These targets carry no explosives. If they are not destroyed during the flight test, the air-breathing targets can deploy a parachute that allows them to descend and be recovered from water or land locations. Following recovery, air-breathing targets can be disassembled, cleaned, and reused.

BQM-74

The BQM-74E (Figure 2-20) is a turbojet-powered aerial target with high performance capabilities. Emulation of enemy anti-ship cruise missiles is the primary mission. Others include simulation of aircraft for training naval aviators in air-to-air combat and support of the test and evaluation of new weapon systems. The BQM-74E and its ground support system are highly portable.

The BQM-74E can be used with multiple command and control systems, including the Integrated Target Control System, Multiple Aircraft GPS Integrated Command Control, Vega, and System for Naval Target Control. It can be employed in either a manual mode or a pre-programmed (hands off) mode.

Figure 2-20 BQM-74 Air-Breathing Target

Transportation

To support IFTs, up to four BQM-74 drones (1 primary target, 1 back-up target, and two spares) would be packed into shipping containers in the United States and transported by government aircraft or surface shipping to Wake Island. After arriving at Wake, the shipping containers would be moved using existing material handling equipment to a storage and build up facility.

Pre-flight Activities

In the buildup facility, the primary and back-up target vehicles would be unpacked and checked for damage. The primary and back-up target vehicles would then be prepared for flight. Ground checks of communication and control systems would be completed before fueling the targets and loading them onto the Gulfstream aircraft.

Flight Test Activities

The BQM-74 drone would be launched from a Gulfstream aircraft over the Pacific BOA. Once airborne and under its own power, the drone would be controlled from Wake Island. The BQM drone would fly toward the ABMD ship in a profile that emulates a cruise missile. The ABMD ship would detect the BQM target and determine if it posed a threat. If the BQM target was determined to pose a threat to the ABMD ship, the ship would engage the BQM and launch a SM-2 interceptor missile. No collision between the BQM target and the SM-2 is planned. If there is no contact, the SM-2 would be detonated by command and the resulting debris would fall into the BOA, outside 370 km (200 nm) from Wake Atoll. The BQM target would fly into a stall attitude, deploy a parachute, and descend to the ocean surface where it would be recovered. If the SM-2 did contact the BQM target, the resulting debris would fall into the BOA, outside 370 km (200 nm) from Wake Atoll.

Post-flight Activities

At the conclusion of flight activities, the recovered BQM target would be flushed with fresh water, cleaned, and prepared for transportation to the United States. The drone components would be repacked in their shipping containers and returned to the U.S.

2.2.5.5 MQM-107E

The MQM-107E (Figure 2-21) is a medium to high performance remotely controlled target. Current plans anticipate this target only being used for one IFT in the next five years. The target is a semi-monocoque fuselage, swept-wing monoplane with conventional aircraft style tail assembly. Its mission is to provide a realistic and economical aerial target, capable of simulating the performance of enemy aircraft, to aid in research, development, test, and evaluation of surface-to-air and air-to-air weapons systems. Flight control is accomplished by telemetry up linked from a remote control station.

Figure 2-21 MQM-107E Target

MQM-107E Transportation

The MQM-107E target is shipped from the U.S. to the test location in a sealed container that includes the fuselage, wing and stabilizer, nose section, gyro, and turbojet engine (Figure 2-22). No more than five MQM-107E targets would be used to support the IFT. The containers would be shipped to Wake Island by C-17 aircraft. After arrival at Wake Island Airfield (WIA), the containers would be transferred to an assembly and launch area on Wake Island.

MQM-107E Pre-Flight Activities

The MQM-107 target would be unpacked from its shipping container near the launch site and assembled. Once assembled, pre-flight checks would be conducted to ensure communications and control systems function properly. An antenna and remote relay would be used to extend the range over which the MQM could be controlled. The antenna would be temporarily installed on an existing tower on Wake Island. Power to the relay would be provided by a small portable generator.

MQM-107E Flight Test Activities

The MQM-107E target would be launched from a trailer that is staked to the ground. Staking would require augering four holes about 1.2 m (4 ft) deep and about 0.15 to 0.2 m (6 to 8 inches) in diameter in a previously disturbed area. A small SRM would propel the target off the launch trailer and into the air until the turbojet engine generates enough thrust to sustain flight. The expended rocket motor would drop off the target approximately 670 m (2,200 ft) away from the launch trailer and would not be recovered. Once airborne, the target is flown by a controller situated in a transportable control shelter located near the launch site. In a typical flight, the MQM-107E would quickly gain altitude and fly to a designated engagement area where it would commence flying in a "racetrack" pattern that would provide an opportunity to be detected and engaged by one of the weapon systems being tested. Engagements would be planned to occur over the BOA, possibly within the PRIMNM, and any debris resulting from a successful intercept would fall to the ocean surface. If no intercept occurs, the target would fly to a planned area, deploy a parachute, and descend to the ocean's surface where it would be recovered. Flight planners would tailor the flight profile so that all fuel would be expended before the target descends to the ocean's surface. In the event that the rocket motor descends into the lagoon, this would be an unplanned event and recovery actions, where practicable, would be coordinated with the USAF.

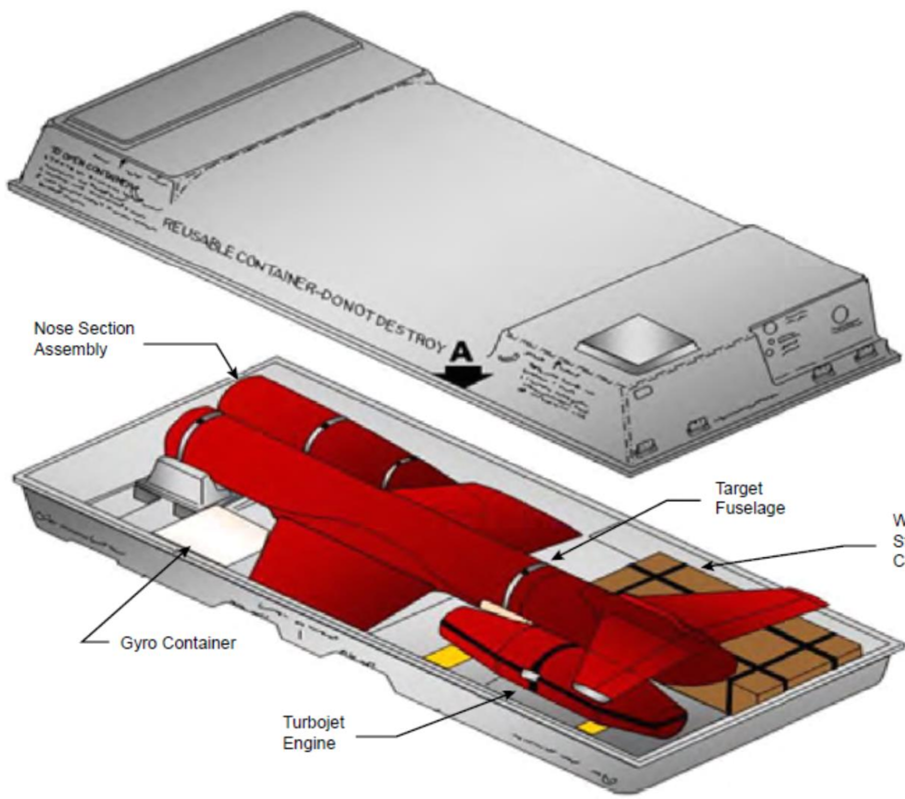

Figure 2-22 MQM-107E Shipping Container

MQM-107E Post-Flight Activities

After integrated flight tests conclude, unused and recovered targets would be disassembled, flushed with fresh water if needed, and cleaned. The target components would be repacked in their shipping containers and returned to the U.S. in the reverse process of their shipment to Wake Atoll.

2.2.6 OTHER FUTURE POTENTIAL ACTIVITIES AT WAKE ISLAND

Future MDA flight tests at Wake Atoll could involve the use of different BMDS elements and test assets than those described for FTO-02 E2 and FTT-18. Future MDA flight tests could involve launching Short and/or Medium Range Ballistic Missiles from Wake Island. The *Integrated Flight Tests at USAKA/RTS Environmental Assessment* (MDA, 2012) described the launch from Wake Island of SRBM targets. The following sections are representative of the activities associated with launching a solid propellant SRBM target missile, the Aegis Readiness Assessment Vehicle-B (ARAV-B), from Wake Island in support of future integrated flight tests. If MDA decides to launch target missiles from Wake in support of IFTs, interceptor missiles would be launched from some other location.

Aegis Readiness Assessment Vehicle-B (ARAV-B)

The ARAV-B target configuration is composed of a Terrier MK 70 as the kick stage and an Oriole motor as the booster stage, spin motors for dispersion reduction, and a separating conical nose tip. Once the nose tip is separated, four retro motors would be ignited to allow the nose tip to move away from the spent Oriole booster.

ARAV-B Transportation

Up to two ARAV-B SRBM targets would be shipped to Wake for integrated flight tests, a primary test vehicle and a back-up. The back-up vehicle would be used if there is a problem or malfunction of the primary vehicle or if a second launch is needed. All hardware would be shipped together on a Special Assignment Airlift Mission from Holloman Air Force Base, New Mexico, approximately five weeks before the test date. Upon arrival at the WIA, the hardware would be moved into a missile assembly building, for integration and testing prior to launch.

ARAV-B Pre-Flight Activities

The ARAV-B vehicle payload would be built up and integrated onto the booster on its handling cart. The vehicle would then be loaded onto the launch rail in two pieces, kick stage and upper stage, and the pieces would be mated on the rail.

All pre-flight assembly and integration activities would be conducted in accordance with applicable ground safety and ordnance handling procedures.

ARAV-B Flight Test Activities

At a pre-planned time on the day of the integrated flight test, the ARAV-B would be launched from the rail on an existing concrete pad on Wake. The LHA established around the launch rail would represent the footprint of maximum hazard associated with debris impact and explosive overpressure. No clearing of vegetation would be required. It would be engaged by the weapon system being tested. The weapon system’s warhead would intercept and destroy the ARAV-B with debris resulting from the intercept being deposited in the BOA, possibly within the PRIMNM. All debris would conform to the risk guidelines in RCC 321. No debris hazardous to human health would be deposited on inhabited land.

ARAV-B Post-Flight Activities

After the integrated flight test concludes, the unused back-up vehicle would be de-integrated in a missile assembly building on Wake. It would then be loaded onto a government aircraft and returned to White Sands Missile Range via Holloman Air Force Base in the reverse of the process used to ship it to Wake.

2.3 ALTERNATIVES TO THE PROPOSED ACTION

2.3.1 NO-ACTION ALTERNATIVE

The No-action Alternative would be not to conduct interceptor launches described in the Proposed Action. The MDA would not be able to demonstrate integrated BMDS effectiveness against SRBM, IRBM, MRBM, and cruise missile threats in an operationally realistic flight test. Previously planned and on-going activities at the alternative sites would continue.

2.3.2 ALTERNATIVES CONSIDERED BUT NOT CARRIED FORWARD

Depending on mission requirements and operation realism, MDA intends to use PMRF and USAKA/RTS, as analyzed in previous environmental documents, or Wake Atoll for the placement of BMDS components for the execution of IFTs.

2.4 OTHER CONCURRENT PROGRAMS TO BE EVALUATED FOR CUMULATIVE IMPACTS

MDA identified a number of projects intended to repair or improve the existing infrastructure at Wake Island to better support IFTs. Many of these projects involve minor repairs or renovations with a scope of work that can be completed under the existing Base Operation Support contract with on-hand personnel. These projects were documented in AF Form 813, *Request for Environmental Impact Analysis* citing appropriate categorical exclusions, as provided for in 32 CFR 989.13, (*Environmental Impact Analysis Process – Categorical Exclusion*) for repair and maintenance activities.

The USAF has approved the following projects as categorical exclusions that have been completed prior to the activities of the Proposed Action. These projects include:

- Assemble and remove temporary lodging modules for test events. Up to 60 temporary modular shelters, currently stored at Wake Island, would be assembled by the on-site contractor and placed on the existing concrete floor slabs of Building 1173 and 1177.
- Install satellite communication (SATCOM) and SeaTel equipment installation for test events. The SATCOM antenna would be installed in a previously disturbed, maintained grassy area on the south side of Heiwa Road to the southeast of Building 1176. The SeaTel antenna would be installed on the north side of Heiwa Road.
- Install flight test communication equipment for voice and data transfer during activities related to test missions and operations. The equipment would be operated from a new 9 m by 12 m (30 ft by 40 ft) metal pre-engineered building to support MDA operations. This new building is east of and parallel to Building 1176 and close to the island power plant.
- Install temporary weather radar for test missions and operations. The weather radar and equipment would be temporarily installed on Building 1519 and is

similar to other small Doppler weather radars used throughout the U.S. providing accurate weather monitoring and prediction information. The weather radar would be mounted on existing scaffolding approximately 5 m (16 ft) above the existing building height. The electronic equipment would be located inside Building 1519. The radar and support scaffolding would be securely fastened to the building using a system of guy wires.

- Prepare a limited number of sites to support future MDA military readiness activities, including flight tests and associated operations at Wake Atoll. Existing areas on Wake Island support the majority of MDA requirements. However, MDA requires additional vegetation cutting and site preparation in limited areas to fully prepare for the placement, testing, and operation of mobile assets, such as weapon systems, military equipment, vehicles and sensors, to support flight test missions. The various areas of the island were reviewed during a site survey visit in August 2014. First, existing hardstand areas with clear line of sight were selected to minimize the requirement for vegetation cutting and site preparation. Then, the locations were adjusted further to minimize disruption of existing surface area and existing vegetation based on site-specific conditions. One site was relocated, resulting in the total avoidance of vegetation removal and two other sites were adjusted to minimize disruption to vegetation and site surfaces. The final sites and areas were selected based on being least disruptive to existing resources, while still meeting mission requirements.
- In general the trenching is limited to 1) road crossings (previously disturbed) for power and communications lines and 2) high voltage underground power lines from power connections on the main power grid to step-down transformers. The transformers would then feed lower voltage power to the equipment via above-ground power cables. About 10-12 road crossings are required for power or comm. About 4 high-power electrical runs (trenching) from the power grid to a transformer. Trenching and permanent utility connections would begin in early 2015.
    - Communications. The vast majority of communication cables would be temporary above-ground cables. When a road crossing required, the crossing would be trenched, conduit installed and cabling run through the conduit. Once at the equipment site, cabling at a given site would be protected from damage from on-site light vehicle movement (ATVs and light trucks) as necessary using temporary protection measures. (cable traffic trays, wood crossing, etc.) Communication lines would be installed all the way from the new Communications building to the Peacock Point area and connected to any existing cables. Cabling would be run adjacent to existing cleared roadways.
    - Power. Power lines would be run underground for four connections to the main power grid. One connection in the area of the AN/TPY-2 (forward-based mode) radar near Peacock Point, one in the area of the THAAD Radar (near building 1615) and one at the TTS site. The underground utility runs would be required from the station power grid connection (4160 volt) to a new permanent step-down transformer. From the transformer to the equipment we would run temporary above-ground

electrical cabling to equipment The AN/TPY-2 radar site connection would go from a connection point on the west side of Wake Ave to a new transformer on the east side of Wake Ave. The connection point at the TTS site is in the grassy area on the lagoon side of the TTS site. Power would run up to a transformer located near the edge of the pavement. At the THAAD Radar site, the power connection is on the south side of Elrod Road (road parallel to the runway on the south) between Building 1615 and Elrod Road. It would run to a new transformer on the west edge of the THAAD site. The high voltage power crossing would be permanent to the transformer. From the transformer to the equipment would be temporary, and would be protected from on-site movement of vehicles with temporary protective trays or other measures. At the conclusion of the test, temporary cabling (both power and communications lines) would be rolled up and either shipped to another location or stored in an MDA storage facility at Wake Atoll for use during future military readiness activities.

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3.0 AFFECTED ENVIRONMENT

This chapter describes the environmental resources that may be affected by the Proposed Action and the No-action Alternative. The information provided serves as a baseline point of reference for understanding potential impacts. The affected environment is concisely described, with components of concern described in greater detail. This Environmental Assessment (EA) evaluates the potential impacts of performing IFTs on the Wake Atoll and relevant BOA environments.

Available reference materials, including EAs and EISs were reviewed. To fill data gaps and to verify and update information, questions were directed to program and facility personnel.

Environmental Resources

Thirteen broad resources of environmental consideration were originally considered to provide a context for understanding the potential effects of the Proposed Action and to provide a basis for assessing the severity of potential impacts. These areas included air quality, airspace, biological resources, cultural resources, geology and soils, hazardous materials and waste, health and safety/electromagnetic radiation, infrastructure and transportation, land use, noise, socioeconomics, visual aesthetics, and water resources. These areas were analyzed as applicable for the proposed locations or activity. Each proposed alternative is discussed for each resource unless the proposed activities at that location would not result in a foreseeable impact. Explanations are given under each resource for the elimination of a resource of environmental consideration.

Environmental Setting

Wake Island

Wake Island is a part of Wake Atoll, a coral atoll in the North Pacific Ocean. The Atoll consists of three islands: Wake, Wilkes, and Peale. Wake is less than 7.8 km^2 (3 mi^2) in area and lies in the middle of the North Pacific Ocean, about 3,950 km (2,460 mi) west of Hawaii and 2,560 km (1,590 mi) east of Guam. The "V" shaped atoll has approximately 739 hectares (1,826 acres) of dry land mass and 40 km (25 mi) of coast line, and is surrounded by a barrier reef. Wake Island is an unorganized, unincorporated territory of the United States, part of the United States Minor Outlying Islands, administered by the DOI Office of Insular Affairs. Access to the island is restricted and all current activities on the island are managed by the USAF and a civilian base operations and maintenance services company. Wake Island was designated as a National Historic Landmark because of events that occurred during World War II and the Cold War and a National Wildlife Refuge because of the valuable wildlife resources present out to 12 nm from shore**.** Wake Atoll may be the oldest living atoll in the world, and it was made part of the PRIMNM, which sustains many endemic species including corals, fish, shellfish, marine mammals, seabirds, water birds, land birds, insects, and vegetation not found elsewhere. The deeper, offshore PRIMNM waters of Wake Atoll may contain significant objects of scientific interest that are part of a highly pristine deep sea and open ocean ecosystem with unique biodiversity, including a number of undersea mountains ("seamounts") that may provide habitat for colonies of deepwater corals many thousands of years old.

Wake was developed as a stopover and refueling site for military and commercial aircraft transiting the Pacific during and after the 1940s. The island's airstrip has been used by the U.S. military and some commercial cargo planes, as well as for emergency landings. It is primarily an emergency divert airfield or planned stopover location on cross-Pacific military flights.

Broad Ocean Area

The BOA includes offshore waters generally surrounding the Wake Atoll. U.S. Government activities within the BOA are subject to EO 12114.

3.1 AIR QUALITY

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

3.1.1 WAKE ATOLL

3.1.1.1 Region of Influence

The region of influence for the Proposed Action is Wake Atoll and its adjacent offshore areas.

3.1.1.2 Affected Environment

No ambient air quality monitoring data are known to be available for Wake Island; however, it is believed that there are no air pollution problems at Wake Island due to the strong trade winds quickly dispersing local emissions. Additionally, there are no other islands within several hundred miles of Wake Atoll that could be affected by air pollutants generated on Wake Island.

3.1.2 BROAD OCEAN AREA

3.1.2.1 Region of Influence

During its flight path, the emissions from the targets and interceptors have the potential to affect air quality in the global upper atmosphere, which includes the Stratospheric Ozone Layer.

3.1.2.2 Affected Environment

Stratospheric Ozone Layer

The stratosphere, which extends from approximately 10 km (6 mi) to approximately 50 km (30 mi) in altitude, contains the earth's ozone (O_3) layer (National Oceanic and Atmospheric Administration, 2008). The ozone layer plays a vital role in absorbing harmful ultraviolet radiation from the sun. Over the last 20 years, anthropogenic (human-made) gases released into the atmosphere—primarily chlorine related substances—have threatened ozone concentrations in the stratosphere. Such materials include chlorofluorocarbons (CFCs), which have been widely used in electronics and refrigeration systems, and the lesser-used halons, which are extremely effective fire extinguishing agents. Once released, the motions of the atmosphere mix the gases worldwide until they reach the stratosphere, where ultraviolet radiation releases their chlorine and bromine components, which destroy ozone.

Through global compliance with the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer and amendments, the worldwide production of CFCs and other ozone-depleting substances has been drastically reduced and banned in many countries. A continuation of these compliance efforts is expected to allow for a slow recovery of the ozone layer (World Meteorological Organization, 2006).

Greenhouse Gases and Global Warming

Greenhouse gases (GHG) are components of the atmosphere that contribute to the greenhouse effect and global warming. Several forms of GHG occur naturally in the atmosphere, while others result from human activities, such as the burning of fossil fuels. Federal agencies, states, and local communities address global warming by preparing GHG inventories and adopting policies that will result in a decrease of GHG emissions.

According to the Kyoto Protocol and Hawaii's Global Warning Solution Act 234, there are six GHG:

- Carbon dioxide (CO_2)
- Nitrous oxide (N_2O)
- Methane (CH_4)
- Hydrofluorocarbons
- Perfluorocarbons
- Sulfur hexafluoride

(United Nations Framework Convention on Climate Change, 2008).

3.2 AIRSPACE

Airspace, while generally considered to be unlimited, is a finite resource that is defined in space (height, depth, and width) and period of use (time) when describing its use for aviation purposes. In general, airspace is categorized into controlled, uncontrolled and special use airspace based on the activities, hazards to aircraft, and volume of air traffic in an area. The FAA is charged with the overall management of airspace and has established criteria and limits for use of various sections in accordance with procedures of the International Civil Aviation Organization (ICAO). Aircraft are not permitted to fly within controlled airspace without the knowledge and permission of the appropriate aircraft control authority.

3.2.1 WAKE ATOLL

3.2.1.1 Region of Influence

The region of influence for airspace at Wake Atoll includes the airspace over and surrounding Wake Island.

3.2.1.2 Affected Environment

Wake Island is located in the Oakland Oceanic Control-6 Sector of international airspace (Figure 3-1). The airspace at Wake Island is controlled by the FAA Air Route Traffic Control Center (ARTCC) at Oakland and prior permission is required to land. Wake has an active BASH plan. The purpose of the BASH plan is to minimize aircraft and pilot exposure to potentially dangerous bird/animal strikes. The plan is based on hazards encountered at Wake Island Air Field from resident and seasonal bird populations, and other animals. The plan allows Wake Island Air Field management to properly identify existing hazards, as they occur, based on operational need, to assess associated risks, identify “best practices” to minimize/control those risks and coordinate/advise local decision authorities and/or transient aircrews of current, real time bird/wildlife threats to aircraft operations, as well as any recommended actions (advisories/restrictions) to enhance overall flight safety and mission support. (USAF, 2008; USAF 2012)

3.2.2 BROAD OCEAN AREA

The affected airspace in the BOA region of influence is described below in terms of its principal attributes, namely controlled and uncontrolled airspace, special use airspace, en route airways and jet routes, and air traffic control. There are no military training routes in the region of influence.

3.2.2.1 Region of Influence

The region of influence is defined as those portions of the international airspace over the open Pacific Ocean that would potentially be affected by the Proposed Action.

3.2.2.2 Affected Environment

Controlled and Uncontrolled Airspace

Because the majority of the airspace over the BOA is beyond the territorial limits of the U.S. and is in international airspace, the procedures of the ICAO are followed. The FAA acts as the U.S. agent for aeronautical information to the ICAO, and air traffic in the region of influence is primarily managed by the Honolulu Control Facility. The Honolulu Control Facility includes the ARTCC, the Honolulu Control Tower, and the Combined Radar Approach Control collocated in a single facility. Airspace outside that managed by the Honolulu Control Facility is managed by the Oakland ARTCC.

Special Use Airspace

There is no special use airspace in the BOA region of influence.

En Route Airways and Jet Routes

The BOA airspace use region of influence has several en route high altitude commercial jet routes (A331, A332, A450, R463, R464, R465, R 584, Corridor V 506, and Corridor G 10), which pass through the region of influence. However, most of the BOA airspace use region of influence is well removed from current jet routes that crisscross the North Pacific Ocean (Figure 3-2).

As an alternative to following the published, preferred instrument flight rules routes for aircraft that are flying above 8.8 km (29,000 ft), the FAA is gradually permitting aircraft to select their own routes. This Free Flight program is an innovative concept designed to

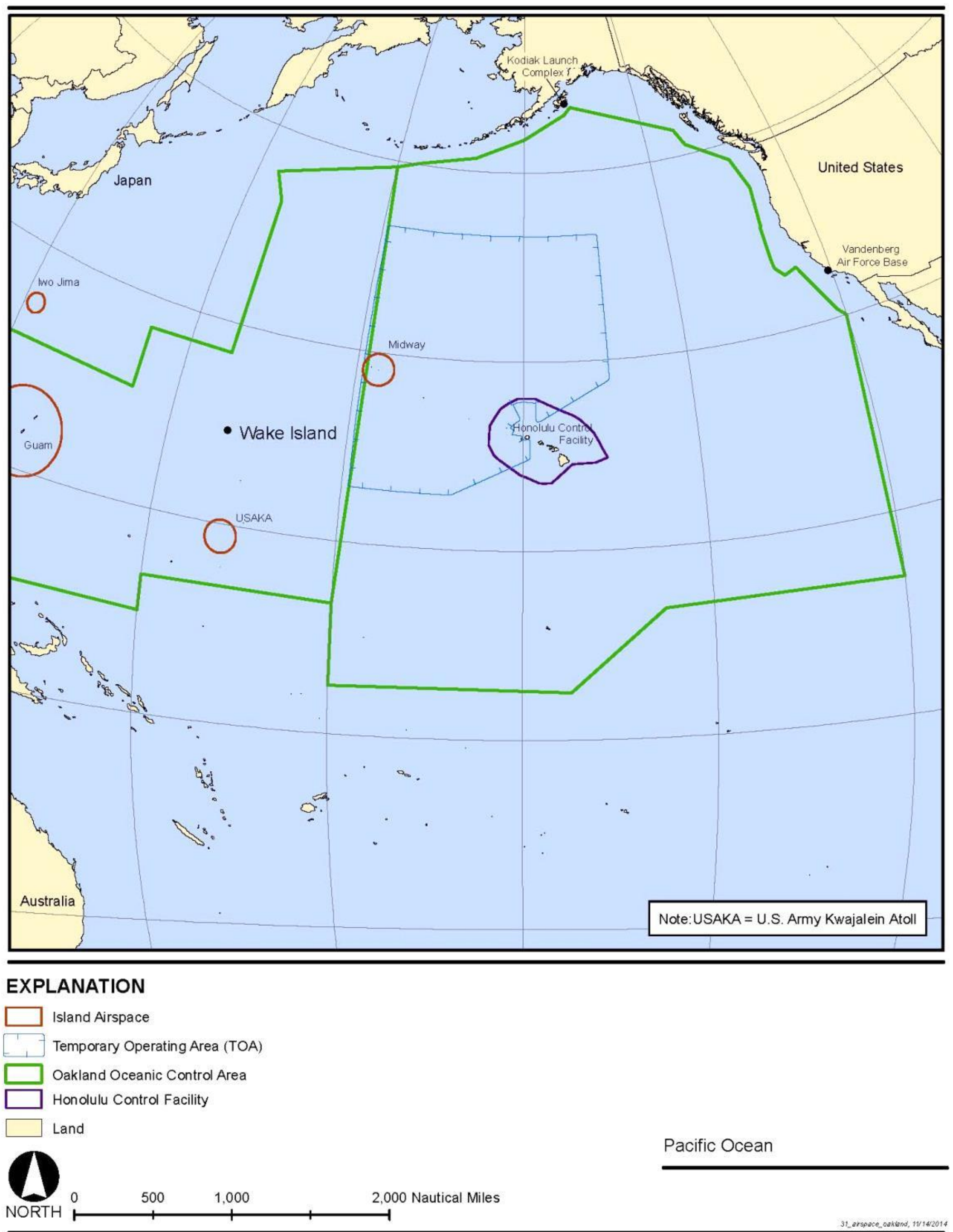

Figure 3-1 Airspace Managed by the Oakland Oceanic Control Area Administrative Boundaries

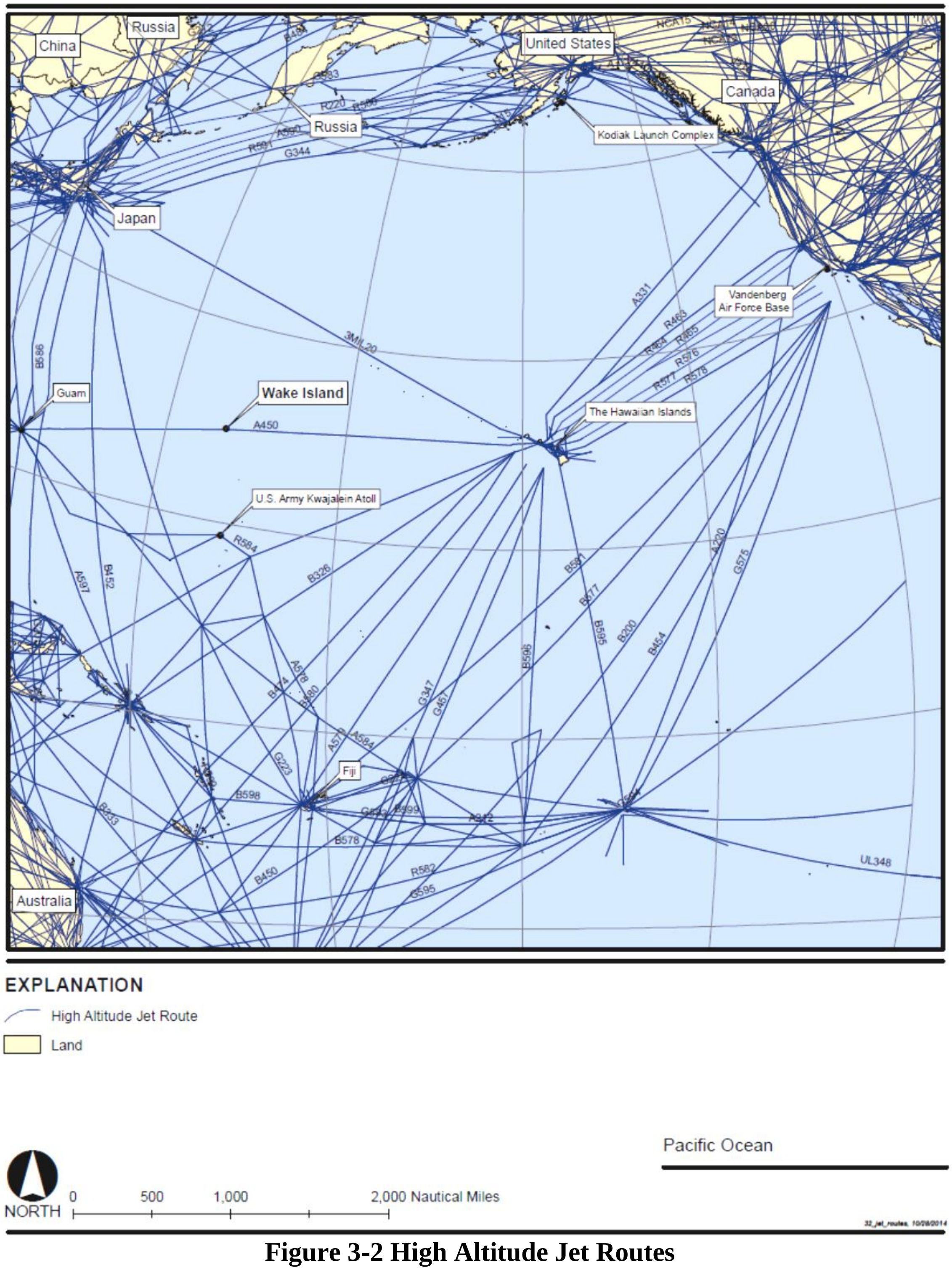

Figure 3-2 High Altitude Jet Routes

enhance the safety and efficiency of the National Airspace System. The concept moves the National Airspace System from a centralized command-and-control system between pilots and air traffic controllers to a distributed system that allows pilots, whenever practical, to choose their own route and file a flight plan that follows the most efficient and economical route. (Federal Aviation Administration, 1996)

Free Flight is already underway, and the plan for full implementation will occur as procedures are modified, and technologies become available and are acquired by users and service providers. This incremental approach balances the needs of the aviation community and the expected resources of both the FAA and the users. Advanced satellite voice and data communications are being used to provide faster and more reliable transmission to enable reductions in vertical, lateral, and longitudinal separation, more direct flights and tracks, and faster altitude clearances (Federal Aviation Administration, 1996). With full implementation of this program, the amount of airspace in the region of influence that is likely to be clear of traffic will decrease as pilots, whenever practical, choose their own route and file a flight plan that follows the most efficient and economical route, rather than following the published jet routes.

All en route airways and jet routes that are predicted to pass through the missile intercept debris areas are identified before a test to allow sufficient coordination with the FAA to determine if the aircraft on those routes could be affected, and if so, if they would need to be re-routed or rescheduled. Routing around the intercept debris areas is handled in a manner similar to severe weather. The additional time for commercial aircraft to avoid the area is generally less than 10 minutes at cruising altitudes and speeds.

The numerous airways and jet routes that crisscross the BOA airspace use region of influence have the potential to be affected by missile testing. However, missile launches and missile intercepts are conducted in compliance with DoD Directive 4540.01 that specifies procedures for conducting missile and projectile firing; namely, “Firing areas shall be selected so that trajectories are clear of established oceanic air routes or areas of known surface or air activity. An exception to this operating procedure may be made when it can be ascertained that aircraft are operating above the maximum ordinate of the trajectory.” (DoD Directive 4540.01, 2007). Before conducting a missile launch and/or intercept test, Notices to Airmen (NOTAMs) are sent in accordance with the conditions of the directive specified in the primary responsible test range requirements.

Air Traffic Control

Control of oceanic air traffic from/to the United States is carried out from oceanic centers in Anchorage, Oakland, and New York. Air traffic in the region of influence is managed by the Honolulu Control Facility and Oakland ARTCC. The Oakland Oceanic Flight Information Region is the world’s largest, covering approximately 48 km^2 (18.7 million mi^2) and handling over 560 flights per day. (Federal Aviation Administration, 2000)

3.3 BIOLOGICAL RESOURCES

Native or naturalized vegetation, wildlife, and the habitats in which they occur are collectively referred to as biological resources. Existing information on plant and animal species and habitat types in the vicinity of the proposed project sites was reviewed in the current Integrated Natural Resources Management Plan (INRMP) for Wake Atoll, (USAF, 2015), with special emphasis on the presence of any species listed as threatened or endangered by federal agencies, to assess their sensitivity to the potential for effects as a result of the Proposed Action and the No-action Alternative. For the purpose of discussion, biological resources have been divided into the areas of Wake Atoll and the BOA surrounding the atoll. For each of these areas, accounts are provided for the significant vegetation (plants), wildlife (animals), and marine biological resources, including protected resources, typically encountered.

3.3.1 WAKE ATOLL

3.3.1.1 Region of Influence

The region of influence encompasses the terrestrial environment of Wake Atoll (Wake, Wilkes, and Peale Islands) and the marine environment of the adjacent shallow lagoon and coral reefs.

3.3.1.2 Affected Environment

Wake Atoll supports a diverse assemblage of biological resources. The islands and shallow reefs shallow reefs of the lagoon and surrounding ocean sustain habitats that support vegetation and wildlife of many species. Several of these species have been given protected status through various means such as the Endangered Species Act (ESA), Marine Mammal Protection Act (MMPA), Migratory Bird Treaty Act (MBTA), and the International Union for the Conservation of Nature (IUCN).

For a discussion of hearing ability in wildlife organisms present at Wake Atoll, see section 3.3.2.2 (Biological Acoustic Thresholds) below.

Terrestrial

Vegetation

Native vegetation communities on Wake Atoll were significantly disturbed during World War II and subsequent developments. In addition to widespread human disturbance, Wake Atoll is subject to periodic natural disturbances which impact vegetation and due to harsh ambient environmental conditions (high temperatures and limited rainfall) natural vegetation is limited to pioneer species with broad ecological tolerance (USAF, 2015). Native vegetation has been displaced in large tracts of the atoll by the introduction of alien plants and noxious weeds, most notably *Casuarina equisetifolia* (ironwood). (USAF, 2015)

The 1998 compilations of terrestrial vegetation at Wake Atoll describe 204 species of 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 persisted without cultivation), 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, and the degree of human disturbance and intervention. Generally, the terrestrial plant communities on Wilkes and Peale have been relatively less disturbed by contemporary human activities and exhibit more indigenous and mature vegetation than the cultivated and operational areas of Wake

(U.S. Fish and Wildlife Service [USFWS] and National Marine Fisheries Service [NMFS], 1999). The vegetation of each island is discussed in detail in the following paragraphs.

Wake Island

Vegetation surveys of Wake Island were conducted in October 2013 to update vegetation maps by dividing the island into habitat management units (HMU) (USAF, 2015). The HMUs which comprise the THAAD launch site and the THAAD Radar site on the Southeast point of Wake Island includes a mosaic of *Casuarina* forest, scrub, and disturbed or maintained areas (USAF, 2015). The Peacock Point site extends from the control tower eastward along Elrod Road to the ocean and from the tower south to the ocean (Figure 3-3). The vegetation of this area is a changing mosaic of *Heliotropium foertherianum* scrub, *Casuarina* forest, and *Cordia subcordata* trees interspersed with dense stands of naupaka (*Scaevola gaudichaudiana*) and cotton (*Abutilon albescens*).

Eastward from Peacock Point Road, the species *Heliotropium has a* scattered distribution, growing in coral rubble. West of Peacock Point Road, *Tournefortia* is interspersed with dense stands of naupaka and *Casuarina* 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 *Cordia* trees, 6 to 8 m (20 to 26 ft) in height, can be found.

Based on observation during August 2011, the area around Launch Pad #2 was clear of overgrowth and had low plant cover around the concrete pads. The abandoned Pad #3 (southwest of Launch Pad #2) was also observed in August 2011 to have an overgrowth of trees and bushes. (MDA, 2012) During a site visit in August 2014, observations indicated there was little change from the site survey in 2011 (Spiegelberg, 2014).

Wilkes Island

The western third of Wilkes has been set aside as a large seabird colony. The most conspicuous vegetation at the western end of the island is a scant fringe of *Tournefortia* trees, 4 to 6 m (13 to 20 ft) tall, and the broad mats formed by nohu vines (*Tribulus cistoides*) which dominate the flat 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 *Tournefortia* trees from 1 to 8 m (3 to 26 ft) tall. The ground layer is mixed grasses, predominantly two species of bunchgrass with intermittent patches of scurvy grass (*Lepidium bidentatum*) and arena *(Boerhavia repens*). One of the bunch grass species (*Lepturus gasparricensis*) that occurs in the bird sanctuary is considered to be rare.

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

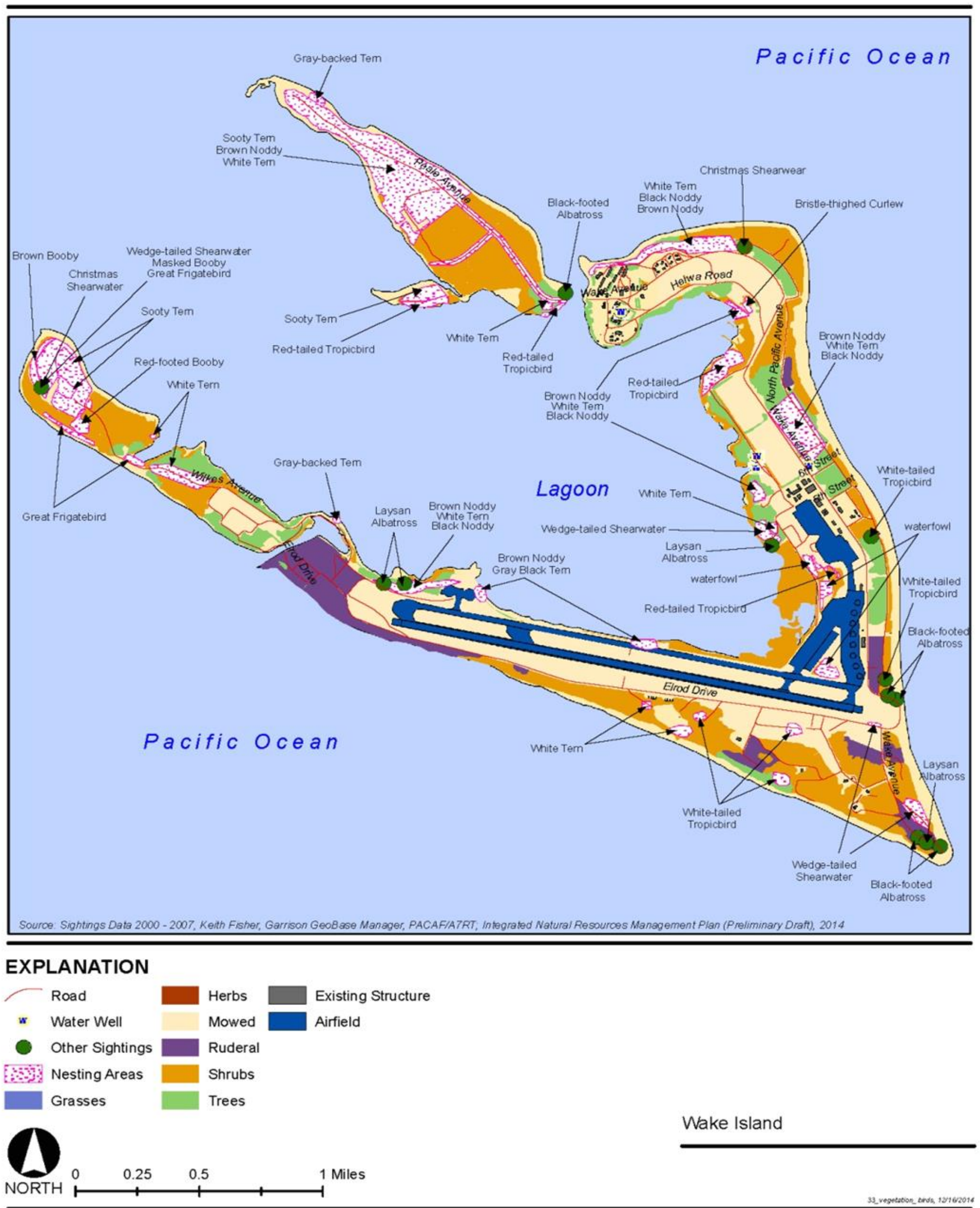

Figure 3-3 Vegetation and Bird Sightings and Nesting Areas

Along the lagoon shore of Wilkes the coastal vegetation is *Pemphis acidula* with mats of sea purslane (*Sesubium portulacatrum*) and a dense planting of *Tournefortia* trees near the point just north of the storage tanks. A scant scrub of tree heliotrope, (also known as naupaka), sour bush (*Pluchea carolinensis*), cotton, and various weeds and grasses cover about 50 percent of the ground surface. The remainder is coral rubble and metal and wood scrap. (MDA, 2012)

Peale Island

The dominant vegetation of Peale is *Tournefortia*, approximately 2 to 8 m (7 to 26 ft) tall. The ground cover is mixed bunchgrass (*Lepturus repens*) and open coral rubble. Along the shore near the burned out 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 purslane. Upland from and intermingled with the *Pemphis* is a burgeoning community of *Casuarina* trees. A scattering of *Pisonia grandis* and *Cordia* trees is located about 150 m (492 ft) from the burned out Peale Island Bridge on the ocean side of Peale Island Road, almost all that is left of what Fosberg (Fosberg, 1959 and USAF 2008) referred to as a *Pisonia/Cordia* forest.

About halfway between the burned out Peale Island Bridge and the northwestern tip of Peale Island is a dirt road that leads to the old Pan American Airways Seaplane Ramp. Just at the turn, there is a dense planting of *Opuntia littoralis* and a little further along the road is a reproducing stand of sisal (*Agave sisalana*). On either side of the dirt road are open areas where there are no *Tournefortia* trees. In these open places, huge enclaves of the shrubby, wild cotton (*Gossypium hirsutum*) which is native to this Atoll can be found (MDA, 2012; USAF, 2015).

Wildlife

A significant number of migratory and nesting birds inhabit Wake Atoll. Wilkes and Peale Islands support large populations of resident and migratory seabirds and visiting winter resident shorebirds and waterfowl. The open terrain and current lack of disturbance on those two islands is conducive for nesting seabirds. Aircraft operations have the potential to disturb or inadvertently strike birds during aircraft landings and takeoffs. A bird sanctuary northwest of the WIA is maintained to present suitable habitat to attract both resident and migratory birds away from the WIA (USAF, 2015). Disturbance to birds may also occur with other human activities and base operations including runway maintenance, grounds maintenance, cutting or trimming of trees, and unauthorized access to the Wilkes Island. Incidental bird deaths may also occur in collisions with motor vehicles. The BASH plan exists at WIA and the surrounding area because of the resident and migratory birds. The plan establishes procedures to minimize these hazards. (USAF, 2015)

Native bird populations are large, but have been significantly impacted by human disturbance and introduced predators (cats and rats). The Wake Island Rail (*Gallirallus wakensis*) was the only known endemic landbird to exist on the atoll, and it went extinct during the Japanese occupation of the atoll. (USAF, 2008)

Wake supports 13 species of resident nesting seabirds and several species of migratory shorebirds, all of which are populations of regional significance.

Approximately 57 species of birds have been encountered on Wake Atoll (USAF, 2015). These encounters include resident species, migrants, visitors, vagrants, accidentals, and exotics. Included among these bird species are seabirds, shorebirds, land birds, and wetland/water birds. A population of albatrosses, either nascent or remnant, returns to Wake each year in November for the courtship and nesting season. Bird nesting areas are shown in Figure 3-3.By mid to late summer most of the 44 migrating birds have departed.

Six black-footed albatrosses were observed during 2010/2011 surveys at Wake and one more bird was observed near the island in 2014 (USAF, 2015). The black-footed albatross has been known to nest on the atoll in the past, however, no nesting activity was observed in the most recent survey (USAF, 2015). Black-footed albatrosses and Laysan albatrosses recently recolonized Wake, one of few northern albatross colonies outside the Hawaiian archipelago (USFWS, 2010). During the 1997-1998 winter season, five individual black-footed albatross (*Phoebastria nigripes*) and three individual Laysan albatross (*Phoebastria immutabilis*)**,**) over-wintered at Wake, nesting and displaying courtship behavior. Atoll residents reported observing several Laysan albatross nests on Wake (USAF, 2015). During 2010/2011 monitoring surveys, seven Laysan albatrosses were observed at Wake (USAF 2015). During this breeding season and the previous breeding season, there was one active Laysan albatross nest on Wake and it was located in the MDA area (USAF, 2015). Laysan albatrosses have also been observed near the bird sanctuary on Wilkes Island, including some evidence of nesting activity (USAF, 2015).

Other than birds, the native terrestrial fauna at Wake Atoll is relatively limited and includes insects, several species of land crabs, and at least one species of snail. Geckos can be found on all three islands. There has been no recent account of snake species on Wake Atoll; however, the potential for such an introduction at the Atoll has been recognized, specifically as it pertains to the invasive brown tree snake (*Boiga irregularis*) on Guam.

There are no indigenous terrestrial mammals on Wake Atoll. Historically, domestic dogs (*Canis familiaris*) and cats (*Felis catus*) were introduced onto Wake Island and became naturalized ferals (USAF, 2015). There are currently no feral dogs on Wake Atoll and an eradication program eliminated feral cats from the Atoll in 2004 (USAF, 2015). In 2010/2011 biological surveys, three feral cats were observed in addition to two domestic cats (USAF, 2015). No new pets are allowed on Wake Atoll (USAF, 2015).

Both Polynesian rats (*Rattus exulans*) and Asian house rats (*R. tanezumi*) were introduced to Wake Atoll and became extremely abundant by 2010 (USAF, 2015). Due to the rats' detrimental effects on seabirds, native plants, and invertebrates, a rat eradication program was initiated in 2012 (USAF, 2015). While the eradication program has appeared to eliminate the Asian house rat from Wake Atoll, the Polynesian rat population persisted on Wake and Wilkes Islands and appears to be rapidly rebounding (USAF, 2015). In 2014, the USAF and USDA conducted research on the efficacy of several USEPA-approved rodenticide baits and the diet preference of *R. exulans*, in support of planning efforts for a subsequent eradication attempt (USAF, 2015).

Protected Terrestrial Resources

No plant species listed by the USFWS as threatened or endangered has been encountered at Wake Atoll. One bunch grass species (Lepturus gasparricensis) that occurs in the bird colony on Wilkes is considered by the USFWS to be rare and a noteworthy species within the Wake Island National Wildlife Refuge.

The Newell's shearwater (*Puffinus auricularis newelli*) is listed as a threatened species pursuant to the ESA. The black-footed albatross was a candidate for listing as threatened under the ESA but this did not occur. On October 6, 2011, a USFWS notice stated, "After a review of the best scientific and commercial information available, the U.S. Fish and Wildlife Service has determined that listing the black-footed albatross as endangered or threatened throughout its range is not warranted. The result of the 12-month petition finding was published in the Federal Register today." (USFWS, 2011b).

Federally protected terrestrial biota at Wake Atoll includes migratory seabirds, shorebirds, and occasional vagrant waterbirds, which are protected under the MBTA of 1916 (16 U.S.C. 703-712). Birds known to occur at Wake Atoll that are protected under the MBTA are listed in Table 3-1.

Near Shore Marine

Marine habitat at Wake Atoll includes the adjacent near shore ocean, shallow lagoon, and coral reefs surrounding the islands of the Atoll (USAF, 2015). Although approximately 100 species of corals have been reported at Wake Atoll, this number is somewhat lower than found at larger and less isolated neighboring atolls to the south.

During the 1998 marine biological survey, a total of 122 species of reef fish, 41 species of corals, 39 species of other macroinvertebrates, and 19 species of macroalgae were recorded at Wake Atoll (USFWS and NMFS, 1999 and more recent surveys continued to add numerous species to these records. Twelve years later, the USFWS noted that more than 300 fish species and 100 coral species thrive on the shallow coral reefs; and seabirds, giant clams, sea turtles, and spinner dolphins are found in near shore waters at Wake (USFWS, 2011). The lagoon covers about 3.9 km^2 (1.5 mi^2) in area. The lagoon is shallow and averages 3 m (10 ft) in depth, but ranges from 0.3 to 3.7 m (1 to 12 ft) in depth depending on the tidal condition. Depths at the mouth of the lagoon are around 4.6 m (15 ft) (USAF, 2015).

Table 3-1 Migratory Birds <u>Protected</u> By the Migratory Bird Treaty Act and Documented at Wake Atoll

Scientific Name	Common Name	Scientific Name	Common Name
Actitis hypoleucos	Common sandpiper	***Tringa incana***	Wandering tattler
Anas acuta	Northern pintail	*Larus atricilla*	Laughing gull
Anas crecca	Green-winged teal	*Larus glaucescens*	Glaucous-winged gull
Anas clypeata	Northern shoveler	*Limnodromus scolopaceus*	Long-billed dowitcher
Anas penelope	Eurasian wigeon	*Milvus migrans*	Black kite
Anas querquedula	Garganey	*Numenius phaeopus*	Whimbrel
Anous minutus	Black noddy	*Numenius tahitiensis*	Bristle-thighed curlew
Anous stolidus	Brown noddy	*Oceanodroma leucorhoa*	Leach's storm-petrel
Arenaria interpres	Ruddy turnstone	*Onychoprion fuscatus*	Sooty tern
Asio flammeus	Short-eared owl	*Onychoprion lunatus*	Gray-backed tern
Aythya fuligula	Tufted duck	*Phaethon lepturus*	White-tiled tropicbird
Branta hutchinsii leucopareia	Aleutian cackling goose	*Phaethon rubricauda*	Red-tailed tropicbird
Bubulcus ibis	Cattle egret	*Philomachus pugnax*	Ruff
Bucephala clangula	Common goldeneye	*Phoebastria immutabilis*	Laysan albatross
Calidris acuminate	Sharp-tailed sandpiper	*Phoebastria nigripes*	Black-footed albatross
Calidris alba	Sanderling	*Pluvialis dominica*	Pacific golden plover
Calidris alpine	Dunlin	*Pterodroma nigripennis*	Black-winged petrel
Calidris melanotos	Pectoral sandpiper	*Puffinus auricularis newelli*	Newell's shearwater
Charadrius mongolus	Lesser sand plover	*Puffinus griseus/tenuirostris*	Sooty shearwater
Egretta sacra	Pacific reef heron	*Puffinus nativitatis*	Christmas shearwater
Eudynamys taitensis	Long-tailed cuckoo	*Puffinus pacificus*	Wedge-tailed shearwater
Gygis alba	White tern	*Sula dactylatra*	Masked booby
Fregata ariel	Lesser frigatebird	*Sula leucogaster*	Brown booby
Fregata minor	Great frigatebird	*Sula sula*	Red-footed booby
Gallinago gallinago	Common snipe	*Tringa melanoleuca*	Greater yellowlegs
Haliaeetus spp.	Sea Eagle		
***Tringa** brevipes*	Gray-tailed tattler		

Source: IUCN, 2015. USAF, 2015

The lagoon supports a large population of fish, and the surrounding reefs host a diverse assemblage of reef fish.

Most recently, at least 323 fish species have been recorded, including large populations of the Napoleon wrasse (*Cheilinus undulatus*); sharks of several species, including grey reef sharks (*Carcharhinus amblyrhynchos*) and black tipped reef sharks (*Carcharhinus melanopterus*); and large schools of the bumphead parrotfish (*Bolbometopon muricatum*), which are considered globally depleted. Recently, NOAA reported great numbers of bumphead parrotfish off of Wilkes Island (USAF, 2015). Common near shore fish include groupers, porgies, jacks, and large giant moray eels (*Gymnothorax javanicus*).

Foraging populations of green sea turtles (*Chelonia mydas*) have been found at Wake (USFWS, 2010). Green sea turtles were observed multiple times in the near shore ocean and lagoon waters at Wake Atoll during the 1998 terrestrial survey. Green sea turtles have been observed in the waters between Wake and Peale Islands (USAF, 2015). 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. It is possible, however, that green sea turtles haul out along the southern shoreline of the atoll since the slope of the shoreline is not steep and offers some limited basking opportunities. Green sea turtles may also nest along the northern beaches of Wake, Peale, and Wilkes Islands (USFWS and NMFS, 1999). No sea turtle nesting or basking activities have been seen or documented at Wake (USAF, 2015). On March 28, 2015, a sea turtle crawl was photo documented on Peale Island. There was no observed nest mound, but the crawl was distinct. Approximately 1.5 m (5 ft) to the side of the terminus, the sand was found to be only about 10 centimeters (4 inches) deep before hitting solid ground, which is not deep enough for a successful nest (Helm, 2015).

The hawksbill sea turtle (*Eretmochelys imbricata*) has been suspected to occur at Wake Atoll (*Transfer and Reuse of WIA*, Hickam AFB, HI as cited in U.S. Army Space and Missile Defense Command, 1999; USAF, 2015). However, no records or accounts of confirmed sightings could be found in the literature reviewed. No observations of hawksbill turtles were recorded at Wake Atoll during marine surveys, although a joint NMFS and USFWS Recovery Plan for U.S. Pacific populations of the green sea turtle noted that the unincorporated Pacific islands "all probably provide marine feeding grounds for green and perhaps hawksbill turtles" (USFWS and NMFS, 1999). Leatherback sea turtles (*Dermochelys coriacea*) have been suspected to occur near Wake Atoll (USAF, 2015).

Marine mammals which occur in near shore waters surrounding Wake Atoll include several species of cetaceans: blue whale (*Balaenoptera musculus*), finback whale (*B. physalus*), humpback whale (*Megaptera novaeangliae*), Cuvier's beaked whale (*Ziphius cavirostris*), sperm whale (*Physeter macrocephalus*), bottlenose dolphins (*Tursiops truncatus*), and spinner dolphins (*Stenella longirostris*). Resident populations of spinner dolphins are also found at Wake (USFWS, 2010). While the whales may be present intermittently near Wake Atoll, they are expected to spend most of their time in deeper waters in the surrounding BOA.

There is a historical record of a single observation of the Hawaiian monk seal (*Monachus schauinslandi*) near Wake Atoll (USAF, 2015; NMFS, 2015), but this species has not been observed there for decades.

Protected Near shore Marine Resources

The blue whale, finback whale, humpback whale, Cuvier's beaked whale, sperm whale, bottlenose dolphin, and spinner dolphin are listed as ESA endangered species and also protected by the MMPA. The Hawaiian monk seal is also an ESA endangered species and protected by the MMPA. Individuals of this species spend a large proportion of their time feeding on fish, cephalopods, and crustaceans at sea, however, they do use terrestrial habitats for breeding, loafing, and basking (USAF 2015). There is a historical record of a single observation on Wake Atoll (USAF, 2015; NMFS, 2015) but this species has not been seen there for decades. Wake Atoll is not designated as critical habitat for the Hawaiian monk seal.

Sea turtles including the green, hawksbill, and leatherback sea turtles are protected by the ESA. In March of 2015, NMFS published a proposed rule to revise the green sea turtle listing asking for public comment. If the rule moves forward, the green turtles would be listed as 11 Distinct Population Segments (DPS). The DPS for the green turtles that would be found at Wake is the Central North Pacific (Central South Pacific) [CNP (CSP)].). Green turtles of the CNP (CSP) DPS are listed as Threatened (Endangered). (NMFS, 2015).

NMFS recently listed 15 corals as threatened under the ESA. Three of these species occur in the Pacific Remote Islands: *Acropora globicpes*, *A. retusa*, and *A. speciosa*, although none of them have yet been reported at Wake. Coral reef ecosystems at Wake Atoll are protected by EO 13089, Coral Reef Protection, which requires federal agencies to "identify their actions that may affect U.S. coral reef ecosystems; utilize their programs and authorities to protect and enhance the conditions of such ecosystems; and to the extent permitted by law, ensure that any actions they authorize, fund, or carry out will not degrade the conditions of such ecosystems."

The humphead wrasse (*Cheilinus undulatus)* is considered an ESA species of concern by NMFS. This fish occurs in the waters surrounding Wake Atoll. Adult wrasses are found on steep coral reef slopes, channel slopes, and lagoon reefs, while juveniles are found in shallower areas with higher coral density (USAF, 2015). While the humphead wrasse is known to occur in the waters surrounding Wake, little is known about its abundance or density.

The bumphead parrotfish (*Bolbometopon muricatum*) is listed as an ESA species of concern by NMFS and is known to occur in the waters surrounding Wake islands. This reef fish species occurs in shallow waters 0-10 m (0-33 ft) such as lagoons, seagrass beds, and areas with abundant fleshy algae or patch coral formations (USAF, 2015). While no juvenile bumphead parrotfish were observed during a 2013 project, great numbers of bumphead parrotfish were observed in recent (2014) surveys at Wake Atoll (USAF, 2015).

The giant clam (*Tridacna maxima*) is listed as lower risk, conservation dependent on the IUCN Red List and is commonly found in the near shore waters surrounding Wake Atoll. This clam was observed during the summer of 2011 in the lagoon area and is currently afforded federal protection under the Convention for the International Trade of Endangered Species (CITES) (USFWS, 2011a; USAF, 2015).

Near shore marine species that are of concern to the USAF are listed in Table 3-2. This table shows USFWS data updated in 2014, as well as data from an earlier environmental document (U.S. Army Space and Strategic Defense Command, 1994b) that indicates sea turtles may be found at Wake.

Table 3-2 USAF and Near Shore Marine Species of Concern at Wake Atoll

Common Name	Scientific Name	Status
Green sea turtle*	*Chelonia mydas*	ESA Threatened
Hawksbill sea turtle	*Eretmochelys imbricate*	ESA Endangered
Hawaiian monk seal	*Monachus schauinslandi*	ESA Endangered
Newell's shearwater	*Puffinus auricularis newelli*	ESA Endangered
Black-footed albatross	*Phoebastria nigripes*	IUCN Near Threatened
Humphead wrasse	*Cheilinus undulatus*	ESA Species of Concern
Bumphead parrotfish	*Bolbometropon muricatum*	ESA Species of Concern
Giant clam	*Tridacna maxima*	IUCN Low-Risk Conservation Dependent

Source: IUCN, 2015, USAF, 2015, and Rauzon et al, 2008.
*In March of 2015, NMFS published a proposed rule to revise the green sea turtle listing asking for public comment. If the rule moves forward, the green turtles would be listed as 11 DPS. The DPS for the green turtles that would be found at Wake is CNP (CSP). Green turtles of the CNP (CSP) DPS are listed as Threatened (Endangered). (NMFS, 2015)

3.3.2 BROAD OCEAN AREA

3.3.2.1 Region of Influence

The BOA region of influence includes those open ocean and sea floor areas below the potential intercept test corridors and drop areas in the Pacific Ocean. The average depth of the BOA region of influence is 3,900 m (12,900 ft).

3.3.2.2 Affected Environment

The BOA consists of the open ocean and sea floor environments that may affected by the Proposed Action, including the salient physical and chemical properties of the ocean, the characteristics of its different ecosystems or communities, and the biological diversity of animal and plant life that live in deeper water as well as in and just above the surface waters of the sea.

<u>Physical and Chemical Properties</u>

Water quality in the BOA is excellent, with high water clarity, low concentrations of suspended matter, dissolved oxygen concentrations at or near saturation, and low concentrations of contaminants such as trace metals and hydrocarbons. The general composition of the ocean includes water, sodium chloride, dissolved gases, minerals, and nutrients. These characteristics determine and direct the interactions between the seawater and its inhabitants. The most important physical and chemical properties are salinity, density, temperature, pH, and dissolved gases. For oceanic waters, the salinity is approximately 35 parts of salt per 1,000 parts of seawater.

Surface seawater often has a pH between 8.1 and 8.3 (slightly basic), but generally is very stable with a neutral pH. The amount of oxygen present in seawater will vary with the rate of production by plants, consumption by animals and plants, bacterial decomposition, and surface interactions with the atmosphere. Most organisms require oxygen for their life processes. Carbon dioxide is a gas required by plants for photosynthetic production of new organic matter. It is 60 times more concentrated in seawater than it is in the atmosphere.

Baseline or ambient noise levels on the ocean surface—not including localized noise attributed to shipping—is a function of local and regional wind speeds. Studies of ambient noise of the ocean have found that the sea surface is the predominant source of noise, and that the source is associated with the breaking of waves. Wave breaking is further correlated to wind speed, resulting in a relationship between noise level and wind speed. (FAA, 2001)

Ambient noise in relation to underwater noise is also the existing background noise of the environment. Ambient noise strongly affects the distances to which animal and specific manmade sounds and other sounds of interest can be detected by marine mammals (Richardson et al., 1995). Common sources of background noise for large bodies of water are tidal currents and waves; wind and rain over the water surface; water turbulence and infrasonic noise; biological sources (e.g., marine mammals); and human-made sounds (e.g., ships, boats, low flying aircraft). The ambient noise levels from natural sources typically vary by as much as 20 dB or more (Richardson et al., 1995) according to numerous factors including wind and sea conditions, seasonal biological cycles, and other physical conditions. Noise levels from natural sources can be as loud as 120 dB (re: 1 micropascal [μPa] at 1 meter) in major storms. (U.S. Department of the Air Force, 1998)

Noise associated with human sources varies with the characteristics of the specific noise source. The primary human-made noise source within the region of influence is expected to be associated with ship and vessel traffic. This source may include transiting commercial tankers and container ships, commercial fishing boats, and military surface vessels and aircraft. Vessel noise is primarily associated with propeller and propulsion machinery. In general, noise levels increase with vessel size, speed, and load. Noise levels from large ships can reach levels of 180-190 dB (re 1 μPa at 1 meter), whereas smaller vessels range from approximately 100-160 dB (re 1 μPa at 1 meter) (U.S. Department of the Air Force, 1998). At distances greater than 1 meter, noise levels received diminish rapidly with increasing distance (Richardson et al., 1995).

Ecosystem Characteristics

Classification of ocean zones is based on depth and proximity to land. There are four major divisions or zones in the ocean: the littoral zone, the coastal zone, the offshore zone, and the pelagic zone. Spanning across all zones is the benthic environment, or sea floor. The pelagic zone and the benthic environment are most relevant to the BOA.

The pelagic zone is commonly referred to as the open ocean. Many of the organisms that inhabit the open ocean are not commonly found near land, continental shelves, or the seabed. Approximately 2 percent of marine species live in the open ocean. (MDA, 2012)

The sea floor is known as the benthic area. It comprises 98 percent of the species of animals and plants in the ocean. Less than 1 percent of benthic species live in the deep ocean below 2,000 m (6,600 ft).

Significant geological features of the sea floor in the BOA are undersea mountains or “seamounts.” A seamount is a mountain rising from the deep sea floor that does not reach the sea surface. Most often, seamounts occur in chains or clusters. The PRIMNM is an important part of the BOA, and it contains many seamounts. Nearly all of the seamounts in the PRIMNM are volcanoes: some are still erupting actively, and others stopped erupting long ago. The PRIMNM includes 33 seamounts in the original PRIMNM; the expansion includes approximately 132 more. The additional seamounts provide important opportunities for scientific exploration and study.

Biological Diversity

Marine life in the BOA ranges from microscopic one-celled organisms to the world’s largest animal, the blue whale. Most marine plants and plant-like organisms live in the sunlit surface waters of the ocean, the photic zone, which extends to only about 100 m (330 ft) below the surface. Beyond the photic zone, the light is insufficient to support photosynthesis in these plants and plant-like organisms. Animals, however, live throughout the ocean from the surface to the greatest depths. Most organisms have a distinct range of temperatures in which they may thrive. A greater number of species live within the moderate temperature ranges, with fewer species tolerant of extremes in temperature as depth increases.

The organisms living in pelagic communities may be drifters (plankton) or swimmers (nekton). Plankton consists of plant-like organisms (phytoplankton) and animals (zooplankton), which drift with the ocean currents, with little ability to move through the water on their own. Nekton consists of animals that can swim freely in the ocean, such as marine mammals, sea turtles, fish, squid, and many other types of marine animals. Benthic communities are made up of numerous marine invertebrate and vertebrate species that live on or near the sea floor (U.S. Army Space and Missile Defense Command, 2004a).

The most prominent species of nekton in the BOA are marine mammals. Cetaceans such as the blue whale, finback whale, humpback whale, Cuvier's beaked whale, sperm whale, bottlenose dolphin, and spinner dolphin are known to occur in the BOA. Green, hawksbill, leatherback, loggerhead (*Caretta caretta*), and olive ridley (*Lepidochelys olivacea*) sea turtles are also present in the BOA. Prominent fish in the BOA include migratory tunas, billfish, and other commercially important species. Species of shrimp and other crustaceans, squid and other mollusks, jellyfish and other medusa, as well as many other invertebrate species are found in the BOA. The pelagic environment in the BOA provides habitat and forage, including invertebrate and vertebrate larvae and adults, for cetaceans, sea turtles, tunas and other commercially valuable species; and seabirds that have evolved with a foraging technique that depends on large marine predators (U.S. Government, 2014).

In tropical and subtropical regions, seamounts with tops that are between 100 and 500 ft deep are known to support deep coral ecosystems. The dominant organisms providing the structural component to these seamount top communities are corals, sponges, and algae that can survive in low to very low light. The biological richness of seamount habitats results from the shape of these undersea mountains. Because of their steep slopes, nutrients are carried upwards from the depths of the ocean toward the sunlit surface, providing food for organisms such as corals, fish, crustaceans, and sponges.

Estimates are that 15 to 44 percent of the species on a seamount or seamount group are found nowhere else on Earth. Roughly 5 to 10 percent of invertebrates found on each survey of a seamount are new to science. Some seamounts have pools of undiscovered species. The approximately 132 seamounts in the adjacent areas provide the opportunity for identification and discovery of many species not yet known to humans, with possibilities for research, medicines, and other important uses. (U.S. Government, 2014)

The PRIMNM portion of the BOA represents the most widespread collection of marine and terrestrial-life protected areas on the planet, sustaining many endemic species including corals, fish, shellfish, marine mammals, seabirds, water birds, land birds, insects, and vegetation not found elsewhere. The PRIMNM areas adjacent to Wake Atoll contain significant objects of scientific interest, such as seamounts, which are part of this highly pristine deep sea and open ocean ecosystem with unique biodiversity.

Protected BOA Marine Resources

The most prominent protected species in the BOA that are identified as threatened or endangered pursuant to the ESA include the sei whale (*Balaenoptera borealis*), blue whale (*B. musculus*), finback whale (*B. physalus*), humpback whale (*Megaptera novaeangliae*), sperm whale (*Physeter macrocephalus*), loggerhead sea turtle (*Caretta caretta*), green sea turtle, leatherback sea turtle, hawksbill sea turtle, and olive ridley sea turtle (*Lepidochelys olivacea*). Additional protection is afforded to the whale species by the MMPA. In March of 2015, NMFS published a proposed rule to revise the green sea turtle listing asking for public comment. If the rule moves forward, the green turtles would be listed as 11 Distinct Population Segments (DPS). The DPS for the green turtles that would be found at Wake is the Central North Pacific (Central South Pacific) [CNP (CSP)]). Green turtles of the CNP (CSP) DPS are listed as Threatened (Endangered) (NMFS, 2015).

In addition, NMFS recently listed 15 corals as threatened under the ESA. Three of these species occur in the Pacific Remote Islands: *Acropora globicpes*, *A. retusa*, and *A. speciosa*, although none of them have yet been reported at Wake or on seamounts in the surrounding BOA. Coral reef ecosystems in the PRINMN portion of the BOA are protected by EO 13089, Coral Reef Protection, which requires federal agencies to "identify their actions that may affect U.S. coral reef ecosystems; utilize their programs and authorities to protect and enhance the conditions of such ecosystems; and to the extent permitted by law, ensure that any actions they authorize, fund, or carry out will not degrade the conditions of such ecosystems."

The Newell's shearwater (*Puffinus auricularis newelli*) is listed as a threatened species pursuant to the ESA. The black-footed albatross was a candidate for listing as threatened under the ESA but this did not occur. On October 6, 2011, a USFWS notice stated, "After a review of the best scientific and commercial information available, the U.S. Fish and Wildlife Service has determined that listing the black-footed albatross as endangered or threatened throughout its range is not warranted. The result of the 12-month petition finding was published in the Federal Register today." (USFWS, 2011b).

These and many other seabird species fly above waters of the BOA to access oceanic feeding areas, sometimes flying very close to or resting on the ocean surface. Several shorebird and waterfowl species also fly over waters of the BOA during seasonal migrations. All of these seabirds, shorebirds, and waterfowl are protected under the MBTA of 1916 (16 U.S.C. 703-712). The MBTA-protected birds known to occur at Wake Atoll, and which are expected to fly over the surrounding BOA at various times, are listed in Table 3-1.

Biological Acoustic Thresholds

Noise from missile launches, low-level sonic booms, and splashdown of missile components have the potential to affect the behavior and hearing sensitivity in birds, cetaceans, sea turtles, and fish in the Action Area. Loud sounds might cause these organisms to quickly react, altering their normal behavior either briefly or more long term. Responses can also include temporary alterations to foraging behavior or changes in the type or timing of an animal's vocalizations. Higher sound levels can impede a cetacean's, sea turtle's, or fish's ability to hear, even after the exposure has ended, temporarily raising the threshold at which the animal can hear. Depending on the level of exposure, this threshold shift in hearing may be temporary or permanent. Temporary threshold shift can temporarily impair an animal's ability to communicate, navigate, forage, and detect predators. Exposure to higher sound pressures can result in physical injury including permanent impairment of an animal's hearing ability. The onset of threshold shift in wildlife hearing depends on the total exposure to sound energy, a function of sound pressure level and duration of exposure. As a sound gets louder, the duration required to induce threshold shifts gets shorter.

Interpreting the effects of noise on birds, marine mammals, sea turtles, and fish depends on various parameters, including the sound exposure level and duration, the sound frequency, and the animals hearing ability. For cetaceans, current general acoustic threshold criteria used by NMFS are used here as thresholds against which the sound pressures expected for the Proposed Action can be compared. The physical injury threshold for cetacean exposure to in-water sounds is ≥ 180 dB (NMFS-PIRO, 2012). Exposure to impulsive sounds at ≥ 160 dB is the Temporary Threshold Shift for all marine mammals (NMFS-PIRO, 2012). In the absence of specific threshold criteria for sea turtles, this EA follows NMFS' approach in applying the marine mammal thresholds as a conservative approach in favor of the turtles (NMFS-PIRO, 2012).

Most fish are able to detect a wide range of sounds from below 50 Hz up to 500-1500 Hz (Popper and Hastings, 2009). While fish in the Action Area would likely be able to detect something like a sonic boom, their response to this sound disturbance is unclear. Potential responses to sound disturbance in fish include temporary behavioral changes, stress, hearing loss (temporary or permanent), tissue damage (such as damage to the swim bladder), or mortality (Popper and Hastings, 2009). The effects of elevated sound levels on fish are evaluated using the current conventional threshold levels of 187 SELcum or 206 peak dB (re 1 μPa) for the onset of physical injury in fish greater than 2 grams, 183 SELcum or 206 peak dB (re 1 μPa) for onset of physical injury in fish under 2 grams, and 150 dBRMS (re 1 μPa) for onset of behavioral disruption in fish of all sizes (Oestman and Buehler, 2009).

Birds are also able to detect a wide range of sounds and generally hear best at frequencies between about 1 and 5 kHz (Dooling and Popper, 2007). While birds in the Action Area are likely to be able to detect any sounds above ambient sound levels, most short duration sounds would cause only temporary behavioral modification in birds. Birds may exhibit shifts in hearing sensitivity in response to sufficiently long and/or intense sounds (Dooling and Popper, 2007). Birds have been shown to tolerate continuous (up to 72 hours) exposure to noises up to 110 dBA without being subject to hearing damage (Dooling and Popper, 2007). As in other organisms discussed above, highly elevated sound levels may cause physical damage to birds such as damage to hair cells in the ear. A level of 140 dBA for single impulse sounds is used as the threshold for physical injury in birds (Dooling and Popper, 2007).

3.4 CULTURAL RESOURCES

3.4.1 WAKE ATOLL

The USAF has obligations under Sections 106 and 110 of the NHPA to protect any significant cultural resources on Wake Atoll and to mitigate any adverse effects on these resources. The entire atoll is within the Wake Island National Historic Landmark (NHL). A higher standard of protection is required for elements of the landmark under Section 110(f) of the NHPA than for other resources listed on the NRHP. (ICRMP, 2014)

Federal laws of primary relevance to cultural resources management at WIA are the Historic Sites Act of 1935, which authorized the designation of national historic sites and landmarks, and NHPA of 1966, as amended, which created the legal framework for considering the effects of Federal undertakings on historic properties. The Historic Sites Act is implemented by 26 CFR 65, "National Historic Landmarks," and by 36 CFR 68, "Standards of Historic Preservation." The NHPA is implemented by 36 CFR 800, "Protection of Historic Properties." Also relevant is Executive Order 11593, "Protection and Enhancement of the Cultural Environment," which directs Federal agencies to inventory the cultural resources in the areas they control and to record to professional standards any historic properties that their undertakings would alter or destroy. (ICRMP, 2014)

The management of cultural resources at WIA presents special challenges. Wake Atoll is one of the United States Outlying Minor Islands. The atoll is remotely located, logistics are difficult, and access is restricted. Because it is an unorganized, unincorporated U.S. territory under military control, there is no local or State Historic Preservation Officer (SHPO). However, the state of Alaska SHPO, where the 611th Air Support Squadron is headquartered, has agreed to undertake cultural resources management oversight responsibilities there.

The Integrated Cultural Resources Management Plan (ICRMP) updates the 2000 Cultural Resources Management Plan for Wake Atoll and the draft ICRMP for WIA as required by AFI 32-7065 §4.10.1. It is designed to assist the PRSC and Detachment 1, PRSC (Det. 1, PRSC) in meeting their cultural resources management responsibilities while supporting the military mission of WIA. By fulfilling its cultural resources stewardship responsibilities, PRSC not only meets USAF and Federal compliance requirements, but also facilitates the commemoration and understanding of a battle that stirred the patriotism and imagination of the American public in the dark early days of American involvement in World War II. The ICRMP integrates cultural resources management with the installation environmental review and management process.

Site preparation activities, maintenance, and repair activities have the greatest likelihood of adversely affecting cultural resources at WIA; therefore, the installation operations support maintenance crew and any site preparation activities crews deployed to Wake Atoll must be informed of the nature of the cultural resources at Wake Atoll and the crew's responsibilities regarding these resources. Respect for and maintenance of Wake Island NHL features is of primary concern, but training should also include managing and maintaining historically significant structures that do not contribute to the NHL, the possibility of subsurface archaeological features, and restrictions on removing artifacts from Wake Atoll NHL, including from underwater wrecks. (ICRMP, 2014)

3.4.1.1 Region of Influence

The region of influence is the area within the boundaries of the Wake Atoll (Wake, Wilkes, and Peale Islands) where ground disturbance might occur. This includes areas where lightning rods for the radars and associated communications and SATCOM equipment would be emplaced.

3.4.1.2 Affected Environment

Prehistory

Traditional cultural resources may include prehistoric sites and artifacts, historic areas of occupation and events, historic and contemporary sacred areas, materials used to make implements, hunting and gathering areas, and other biological and geological resources of importance to contemporary cultures. Marshallese traditions reveal that the islands of Wake Atoll may have been visited by voyagers for the collection of the orange kio flower (used in a warrior initiation ceremony) and to obtain wing bones of large seabirds for use in tattooing chiefs (Heine and Anderson, 1971; Burgett and Rosendahl, 1990; Jackson, 1996). However, the remoteness of Wake Island and its lack of water (other than rainfall) discouraged permanent settlement; therefore, there is no archaeological evidence for prehistoric occupation of the islands by Polynesian peoples and little potential for prehistoric resources to be present (U.S. Army Space and Strategic Defense Command, 1994b; Jackson, 1996).

History

Early sightings of Wake Island by European and American expeditions (Spanish explorer Alvaro de Mendana in 1568; British Captain William Wake in 1796; American Lieutenant Charles Wilkes in 1841) all found the islands to be uninhabited. In 1898, the islands were claimed for the U.S. and have been used as a military facility and military and commercial aircraft transiting location periodically since that time (Jackson, 1996).

Historic resources are present on Wake Atoll, resulting from permanent occupation of the atoll that began after a 1934 EO by U.S. President Franklin D. Roosevelt assigned the atoll to the Navy. In 1935, Pan-American Airways was granted permission to begin Clipper operations on Wake Atoll and established a small compound for its personnel. Navy Seabees began construction on the atoll thereafter, constructing a causeway and other facilities. Marines and contractors constructed additional facilities in 1941. On December 8, 1941, the Japanese attacked Wake Atoll. Another attack occurred on December 11, followed by almost continuous fighting for the next 12 days. The Marines surrendered to the Japanese on December 23, 1941, and the atoll remained occupied by up to 4,000 Japanese until 1945. The Japanese then heavily fortified the Atoll. In 1942, the U.S. began a submarine blockade of the Atoll and continued both air and naval operations against the occupying Japanese. The U.S. established an air and sea blockade of the Atoll in 1944. On September 23, 1945, the Japanese surrendered Wake Atoll to the U.S. military.

From September 1945 until October 1947, the U.S. Navy had administrative control of Wake Atoll and used it as a refueling and weather station. Administrative control of the atoll was transferred to the Civil Aeronautics Administration, which later became the FAA. The FAA oversaw commercial and military flights to destinations in the Pacific from 1947 through 1972 (Thompson 1984). During this time, many of the structures that currently exist on Wake Atoll were built and the population exceeded 2,000. President John F. Kennedy, through EO 11048, assigned the civil administration of Wake Atoll to the Secretary of the Interior, including all executive, legislative, and judicial authority. With the introduction of long-range jet aircraft, Wake Atoll was no longer required as a refueling stop and the FAA relinquished its facilities to the USAF in 1972. Under the USAF administration, missile launch facilities were constructed as part of the Athena Missile Program. The Military Airlift Command had responsibility for Wake Atoll from July 1972 to June 1973, at which time responsibility was transferred back to the USAF and to PACAF.

In 1972, the Secretary of the Interior and the Secretary of the Air Force entered into an agreement that transferred the Secretary of the Interior's authority to the Secretary of the Air Force until terminated by mutual agreement. The USAF has retained jurisdiction pursuant to its agreement with the Secretary of the Interior. In 1993, the USAF terminated its operation of Wake Atoll but retained real property accountability. The USAF turned over the administration of Wake Atoll to the U.S. Army on September 30, 1994, but retained jurisdiction of the island. On October 1, 2002, the USAF officially assumed operational responsibility for Wake Atoll from the U.S. Army. The Chief of Staff of the Air Force directed the Air Staff to pursue funding to rebuild the facilities and infrastructure solely to support contingency operations. (USAF, 2010)

In 1985, all areas of Wake encompassing Japanese structures and fortifications were officially designated a NHL because of the atoll's significance in the history of World War II in the Pacific and the Cold War. The atoll was concurrently placed on the U.S. National Register of Historic Places (Thompson, 1984; Jackson, 1996). Other areas—e.g., all post-World War II developments—while situated within the boundary of the NHL, do not contribute to the significance of the island, including those areas proposed for IFT activities. (MDA, 2012)

In 1996, the USAF prepared a Historic Preservation Plan (HPP) for the Wake Island NHL, which outlined preservation and management alternatives for the property. The Air Force, the National Park Service, and the U.S. Advisory Council on Historic Preservation concurred with the findings in the HPP, which stated that adverse effects on identified historic properties would not result from anticipated land uses because they would be conducted within previously developed post-World War II areas and specific historic features would be avoided (Jackson, 1996).

The post-war development of Wake Atoll have been surveyed and evaluated by the Air Force, most recently in connection with resource conditions assessments following Super Typhoon Ioke. The postwar resources do not contribute to the NHL. The Air Force has evaluated the post war resources as not eligible for the NRHP. The Keeper of the National Register of Historic Places concurred with this determination in March 2010. (USAF, 2010)

The Keeper of the National Register determined later that buildings 1502 and 1601 are eligible for the National Register of Historic Places. The demolition of building 1644 was reviewed by the Alaska SHPO in August 2014, and agreed the undertaking would not affect historic properties. (Leeper, 2014)

3.4.2 BROAD OCEAN AREA

There are no known marine cultural resources (e.g., shipwrecks) within areas of the BOA beneath the proposed IFT paths. Average ocean depths within these areas are approximately 3,900 m (12,900 ft) and any unidentified resources at that depth would have a very low probably of being affected by impacts from missile components or debris during planned activities or abnormal flight termination.

3.5 GEOLOGY AND SOILS

Geology and soils include those aspects of the natural environment related to the earth, which may be affected by the Proposed Action. This resource is described in terms of land forms, geology, and associated soil development as they may be subject to erosion, flooding, mass wasting, mineral resource consumption, contamination, and alternative land uses resulting from proposed site preparation activities and launch activities.

3.5.1 WAKE ATOLL

3.5.1.1 Region of Influence

The region of influence is the proposed locations on Wake within the LHA that have the potential to be subject to soil contamination from launch exhaust emissions and/or unburned fuel in the event of a terminated launch.

3.5.1.2 Affected Environment

Wake 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 comparable rate 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 despite persistent and severe wave and storm attacks, the organisms that form the reefs are vulnerable to sedimentation, burial, and changes in circulation caused by natural forces and 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 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, when substantially more water world-wide becomes entrapped in glaciers and ice fields, reducing overland flow and ultimate discharge back to the oceans. The island's building process by large storm-generated waves is evidenced on the south side of Wake 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, and lack many of the nutrients required to support most plant species.

3.5.2 BROAD OCEAN AREA

The floor of the Pacific Ocean is relatively uniform, with a mean depth of about 4,270 m (14,000 ft). The major irregularities are primarily extremely steep-sided, flat-topped submarine peaks known as seamounts, extremely deep subduction trenches, or volcanic ridges. The BOA is underlain by the tectonic Pacific Plate, produced to the west of a spreading center in the central Pacific, ultimately growing to become the largest oceanic plate on the Earth. The Pacific Plate is a solid rock layer that moves above a weak ductile rock layer in the upper mantle. (Neall, 2008)

Because a relatively small land area drains into the Pacific, and because of the ocean’s immense size, most sediments are authigenic (formed at the site) or pelagic (clay and shell fragments that settle through the water column) in origin. Terrigenous sediments (formed by erosion) are confined to narrow marginal bands close to land (USAF, 2006).

3.6 HAZARDOUS MATERIALS AND WASTE

In general, hazardous materials and wastes are defined as those substances that, because of their quantity, concentration, or physical, chemical, or infectious characteristics, would present substantial danger to public health and welfare or to the environment when released into the environment.

As defined by the DOT, a hazardous material is a material that is capable of posing an unreasonable risk to health, safety, or property when transported in commerce and has been so designated. Hazardous waste is further defined by the USEPA as any solid waste not specifically excluded in 40 CFR 261.2 of the Resource Conservation and Recovery Act regulations, which meets specified concentrations of chemical constituents or has certain toxicity, ignitability, corrosivity, or reactivity characteristics.

3.6.1 WAKE ATOLL

3.6.1.1 Region of Influence

The region of influence is the area within the boundaries of the Wake Atoll (Wake, Wilkes, and Peale Islands).

3.6.1.2 Affected Environment

Hazardous Materials Management

The *Wake Island Airfield Spill Prevention Control and Countermeasures (SPCC) Plan* (USAF, 2015) was prepared in accordance with good engineering practices. It commits the leadership at Wake to use the personnel, equipment, and materials necessary to control and mitigate releases at WIA. The priorities of response team members are based on protection of human life, mitigating environmental harm, and protection of property.

Operations using hazardous materials at Wake are limited to aircraft flight and maintenance activities, base operations and infrastructure support activities, and infrequent missile launches. Jet fuel is the hazardous material used in the greatest quantity at Wake.

Jet fuel is transported to Wake via cargo ship and is transferred to the on-island storage system. It is distributed through two fuel systems to both aircraft refueling areas and to the power plant. No waste jet fuel is produced under normal conditions. The balance is consumed by aircraft flight operations and power production. In the event of a jet fuel spill, existing spill control contingency plans would be implemented to minimize the area of potential contamination and to expedite cleanup efforts.

In addition to jet fuel, small quantities of lubricants and motor fuel (gasoline) are stored in bulk for base operations and infrastructure support. These materials are delivered to Wake 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 under existing spill control prevention control and countermeasure plans.

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 stored and handled at Wake.

Hazardous Waste Management

The USEPA identified WIA as a "large quantity generator" of hazardous waste in 1994. However, the installation could qualify for "small quantity generator" status based on actual amounts of hazardous wastes generated since 1994. (Missile Defense Agency, 2007)

There are several satellite accumulation points located around the installation where waste is temporarily stored. All hazardous waste is moved from the satellite accumulation sites to a main hazardous waste accumulation site to await transportation off-site via barge. All liquid wastes are stored on spill pallets. Types of wastes generated include small quantities of used solvents, paints, cleaning fluids, asbestos-containing materials (generated during building maintenance activities) and pesticides. Waste may be placed in DOT-E-9618-approved polyethylene overpack containers for added security until shipment for treatment or disposal. Hazardous waste shipments are normally consigned to the Wake supply barge for shipment to Hawaii. (Missile Defense Agency, 2007)

3.6.2 BROAD OCEAN AREA

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

3.6.2.1 Region of Influence

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

3.6.2.2 Affected Environment

Hazardous Materials and Hazardous Constituents

Missiles

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

Aerial Targets

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

Hazardous Wastes

Environmental compliance policies and procedures applicable to shipboard operations afloat are defined in Office of the Chief of Naval Operations Instruction 5090.1C (2007). This document has a compliance orientation to ensure safe and efficient control, use, transport, and disposal of hazardous waste. Munitions containing or comprising hazardous materials expended during training exercises that are irretrievable from the ocean are not considered a hazardous waste in accordance with the Military Munitions Rule. Navy ships may not discharge overboard untreated used or excess hazardous materials generated onboard the ship within 370 km (200 nm) of shore. Hazardous wastes generated afloat are stored in approved containers. The waste is offloaded for proper disposal within five working days of arrival at a Navy port.

3.7 HEALTH AND SAFETY

Health and safety includes consideration of any activities, occurrences, or operations that have the potential to affect one or more of the following:

The well-being, safety, or health of workers: Workers are considered to be persons directly involved with the operation producing the effect or who are physically present at the operational site.

The well-being, safety, or health of members of the public: Members of the public are considered to be persons not physically present at the location of the operation, including workers at nearby locations who are not involved in the operation and the off-base population. Also included within this category are hazards to equipment and structures.

3.7.1 WAKE ATOLL

3.7.1.1 Region of Influence

The region of influence is the area within the boundaries of the Wake Atoll (Wake, Wilkes, and Peale Islands).

3.7.1.2 Affected Environment

Functioning as an Air Force installation, all operational activities at Wake Island Launch Center are subject to Air Force health and safety regulations. These governing regulations include AFMAN 91-201, Explosive Safety Standards. The primary existing hazards at Wake are associated with aircraft refueling and base infrastructure support. Typical hazards include the handling and use of hazardous materials, exposure to noise from aircraft operations, and physical safety associated with the use of heavy equipment and support operations. These hazards are managed and controlled through implementation of safety programs, procedures, and the use of safety equipment. (U.S. Army Space and Missile Defense Command, 1999)

Range Safety

The missile range extending from Wake toward USAKA/RTS is under the jurisdiction of RTS. USAKA/RTS controls all range operations, and all procedures are conducted in accordance with the USAKA Range Safety Manual (U.S. Army Space and Strategic Defense Command, 1993 Missile Defense Agency, 2004) and USAKA/RTS policies and procedures. In the event of a catastrophic event (e.g., natural disaster, hazardous materials spill, aircraft or missile mishap), Operations Plan 355-1, Wake Island Disaster Preparedness Plan, would be implemented.

To ensure the protection of all persons and property, SOPs have been established and implemented for the Ground Hazard Areas. These SOPs include establishing road control points and clearing the area using vehicles and helicopters (if necessary). Road control points are established prior to launches. This allows security forces to monitor traffic that passes through the Ground Hazard Areas. Before a launch, the Ground Hazard Area is cleared of the public to ensure that, in the unlikely event of early flight termination, no injuries or damage to persons or property would occur. After the Range Safety Officer declares the area safe, the security force gives the all-clear signal, and the public is allowed to reenter the area.

Ordnance Management and Safety

Ordnance safety includes procedures to prevent premature, unintentional, or unauthorized detonation of ordnance.

Wake still contains a substantial amount of ordnance from WWII. In the event that unexploded ordnance is accidentally discovered during operations on the island, work ceases, and explosive ordnance demolition crews from Army units stationed in Hawaii or USAKA/RTS dispose of the munitions.

Ordnance associated with missile launches is delivered to Wake by aircraft to the on-base airfield or by barge, and then over land by truck transport. The barges carrying explosives are met by trained ordnance personnel and special vehicles for transit to and delivery its point of storage or use. All ordnance is transported in accordance with U.S. DOT regulations.

If the passive and active sensors detect a leak during pre-flight activities, the missile would be moved to the Solid Waste Disposal area, between the incinerator and the ocean, where trained personnel would be able to safely destroy the leaking missile.

Wake has defined ESQD arcs. The arcs are generated by launch pads, ordnance storage area, ordnance handling pad, and the Missile Assembly/Test Buildings.

Broad Ocean Area Clearance

Range Safety officials manage operational safety for projectiles, targets, missiles, and other hazardous activities on Wake. Prior to a hazardous operation proceeding, the range is determined to be cleared using inputs from sensors, visual surveillance of the range, and radar data.

Transportation Safety

Wake transports ordnance by truck from the marine harbor or on-base airfield to the designated area. All ordnance is transported in accordance with U.S. DOT regulations.

3.7.2 BROAD OCEAN AREA

3.7.2.1 Region of Influence

The BOA region of influence consists of all areas beneath the proposed flight track where there is the potential for impact of missile components during planned activities or abnormal flight termination and the BOA where the missile's first stage and other missile debris would impact.

3.7.2.2 Affected Environment

The affected health and safety environment for the BOA is described below in terms of its principal attributes, namely range control procedures and verification of BOA clearance procedures.

PRSC, 11th Air Force is the Wake Island range safety authority. Test events including the launching of target missiles, radar operations and other events that require the preparation and approval of event specific safety plans are outside the normal Base Operations Support at Wake Island. Range Safety at USAKA/RTS, located 1,100 km (683 mi) south of Wake in the Kwajalein Atoll, includes missile flight control, laser safety, ionizing radiation safety, toxic and thermal hazards safety, directed energy safety, and explosive and ordnance safety. USAKA/RTS Range Safety has the specific skills and expertise to provide flight and ground safety plans for coordination by the PRSC and address any concerns that are raised. RTS Range Safety will include the PRSC in mission planning events to develop insight and awareness of the planned tests.

Range Control is charged with surveillance, clearance, and real-time range safety. The Range Control Officer using USAKA/RTS assets is solely responsible for determining range status and setting "RED" (no firing) and "GREEN" (range is clear and support units are ready to begin the event) range firing conditions. USAKA/RTS uses RCC 321-02, Common Risk Criteria for National Test Ranges. RCC 321-02 sets requirements for minimally-acceptable risk criteria to occupational and non-occupational personnel, test facilities, and nonmilitary assets during range operations. Under RCC 321-02, individuals of the general public shall not be exposed to a probability of fatality greater than 1 in 10 million for any single mission and 1 in 1 million on an annual basis.

Flight Safety provides protection to Wake personnel and ships and aircraft operating in areas potentially affected by mission activities. Specific procedures, including regulations, directives, and flight safety plans, are required for the preparation and execution of missions involving aircraft, missile launches, and reentry payloads. USAKA/RTS controls all flight corridor operations as part of USAKA/RTS. All operations are thus conducted in accordance with safety procedures, which are consistent with those implemented for USAKA/RTS. There is no special use airspace over Wake Atoll.

3.8 INFRASTRUCTURE

Infrastructure addresses transportation and utilities. Transportation addresses the modes of transportation (road, air, and marine) that provide circulation within and access to the installation. Utilities include the facilities and systems that provide drinking water, reclaimed water, wastewater treatment, collection/disposal of solid waste, and electricity.

3.8.1 WAKE ATOLL

3.8.1.1 Region of Influence

The region of influence for infrastructure includes the on-island utility system or structures, as well as any modes of transportation on Wake.

3.8.1.2 Affected Environment

Transportation

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 operation, 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-17 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 WIA. Based on an August 2011 observation, the overall condition of the runway is good, with subsidence, raveling, and minor cracking over the entire length, and the parking apron is in good condition.

Ground Transportation

Transportation on Wake Island is provided by bus or by contractor or government-owned vehicles. The primary road is a two-lane paved road extending the length of Wake Island to the causeway between Wake Island and Wilkes Island. The causeway was rehabilitated in 2003 and is capable of supporting heavy equipment. A bridge connecting Wake and Peale Islands burned down in December 2002.

A combination of paved and coral gravel roads serves the marina area. Paved access to Wilkes Island ends at the petroleum, oil, and lubricants tank farm, where a road constructed of crushed coral 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 walking, bicycles, light utility carts, standard automobiles, vans, trucks, and larger trucks and equipment.

Marine Transportation

Wake is supplied by sea-going barges and ships. The Base Operations Support (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.

Utilities

Water

Potable water is supplied by a reverse osmosis (RO) system on Wake. A groundwater well is used to obtain water for the RO process.

Fire protection is provided by fire suppression systems in most operations buildings and by a continuously staffed fire station. Wake 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. (MDA, 2012)

Wastewater

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. Although their full design capacity is not known, the sewer system and treatment plant adequately served the 1960s' peak base population.

Solid Waste

There is one primary solid waste disposal area and several closed satellite dumps or landfills at Wake Atoll. The primary solid waste disposal area is located on the south side of Wake Island, and a closed asbestos landfill is located on the south side of Wilkes Island. Wake Atoll does not really have a solid waste landfill, but instead operates a solid waste dump for accumulating burn residue and ash from open burning and incineration. Open burning at Wake Atoll, as a means of solid waste disposal, although prohibited in the U.S. states, territories, and commonwealths, continues under interim agreement with the USEPA. Currently, there are nine open pit areas where wastes are dumped, for municipal solid waste and burnable operations solid waste. Whenever there is an open burn, Air Operations is notified and open burns are not allowed if any air traffic is expected. Environmental personnel are notified and are on site for the initial burn operation. The Fire Department is also notified and they ignite the waste in full fire protective gear. They monitor the fire until it is at a point where it is deemed safe to leave. Wastes are periodically bulldozed into a pile within a pit, burned as necessary, and the unburned residue is put through a sifter where glass and metal are separated out and put into their respective recycling areas. The ash is then pushed in a pile beside one of the pits for storage. No air monitoring is performed. There are concrete block walls, locked gates, and posted signs restricting access. (Chugach Federal Solutions Inc., 2013)

The Wake Atoll solid waste incinerator is an Inciner8, Model A2600 incinerator, which has a design capacity of 270 kg (600 lbs) per 4-hour burn cycle. It can be operated 8 hours a day, 5-6 days a week, providing a nominal capacity of some 544 kg (1,200 lbs) per day (but seldom handles half this amount). The incinerator is fired by diesel or oil. The incinerator has a maximum feed rate of 270 kg (600 lbs) per burn cycle. The incinerator is manually fed. Ash is manually removed from the burn chamber, allowed to cool, and is added to the stockpile of ash currently stored in the burn pits. (Chugach Federal Solutions Inc., 2013)

Electricity

The current Power Plant was brought online on 17 May 2008. This facility is located in the north quadrant of the island. This facility has the capability of producing 1,755 kilowatts (kW) (1.755 megawatts [MW]) of power. The Power Plant consists of three 585-kW capacity engines that also have the capability of producing 650 kW of power if connected to a 1,000-watt switch. The Installation added a fourth engine in 2013, which increased the capacity output by an additional 585 kW. There are three MEP-12 (Mobile Electric Power) backup engines with a capacity of 750 kW each. Five MEP-10 generators have also been added to the inventory. A maximum peak load of 1,432 kW was recorded on 19 October 2010, at which time there were approximately 300 individuals (contractors and active duty) on island. An Installation Electrical Study was completed on 28 December 2010.

3.8.2 BROAD OCEAN AREA

Infrastructure is not applicable to the BOA.

3.9 LAND USE

This section describes current land-based uses which are typically regulated by management plans, policies, ordinances, and encroachment of one land use on another.

3.9.1 WAKE ATOLL

3.9.1.1 Region of Influence

The region of influence for land use is the area within the boundaries of the Wake Atoll (Wake, Wilkes, and Peale Islands).

3.9.1.2 Affected Environment

Wake is the main island and contains the majority of the operations and facilities associated with the military. 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 storage and reverse osmosis system, power plant). The airfield and missile launch facilities are situated on the southern part of the island. Figure 3-4 shows land classification at Wake Atoll.

3.9.2 BROAD OCEAN AREA

The typical definition of land use does not apply to the BOA.

3.10 NOISE

3.10.1 WAKE ATOLL

3.10.1.1 Region of Influence

The region of influence is primarily those areas closest to the activities of the Proposed Action.

3.10.1.2 Affected Environment

Natural background sound levels on Wake 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. (MDA, 2012)

Anthropogenic sources of noise at Wake are from airfield operations and base maintenance activities. The majority of non-military aircraft are unscheduled. The majority of military aircraft are C-130s. During flight operations, the noisiest aircraft that typically operates at Wake, an Air Force C-5, is estimated to generate A-weighted sound pressure levels of approximately 84 dB at the base dispensary, 69 dB at base family housing, 74 dB at the base dormitories, 69 dB at the midpoint of Peale, and 95 dB at the midpoint of Wilkes. 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. (MDA, 2012)

Missile launches are another noise source on Wake. Maximum A-weighted sound pressure level contours during flight vehicle launches vary from approximately 115 dB near Launch Pad #2, to less than 95 dB on the western ends of Peale and Wilkes. The 95-dB contour covers almost all of the Wake Island Launch Center (U.S. Army Space and

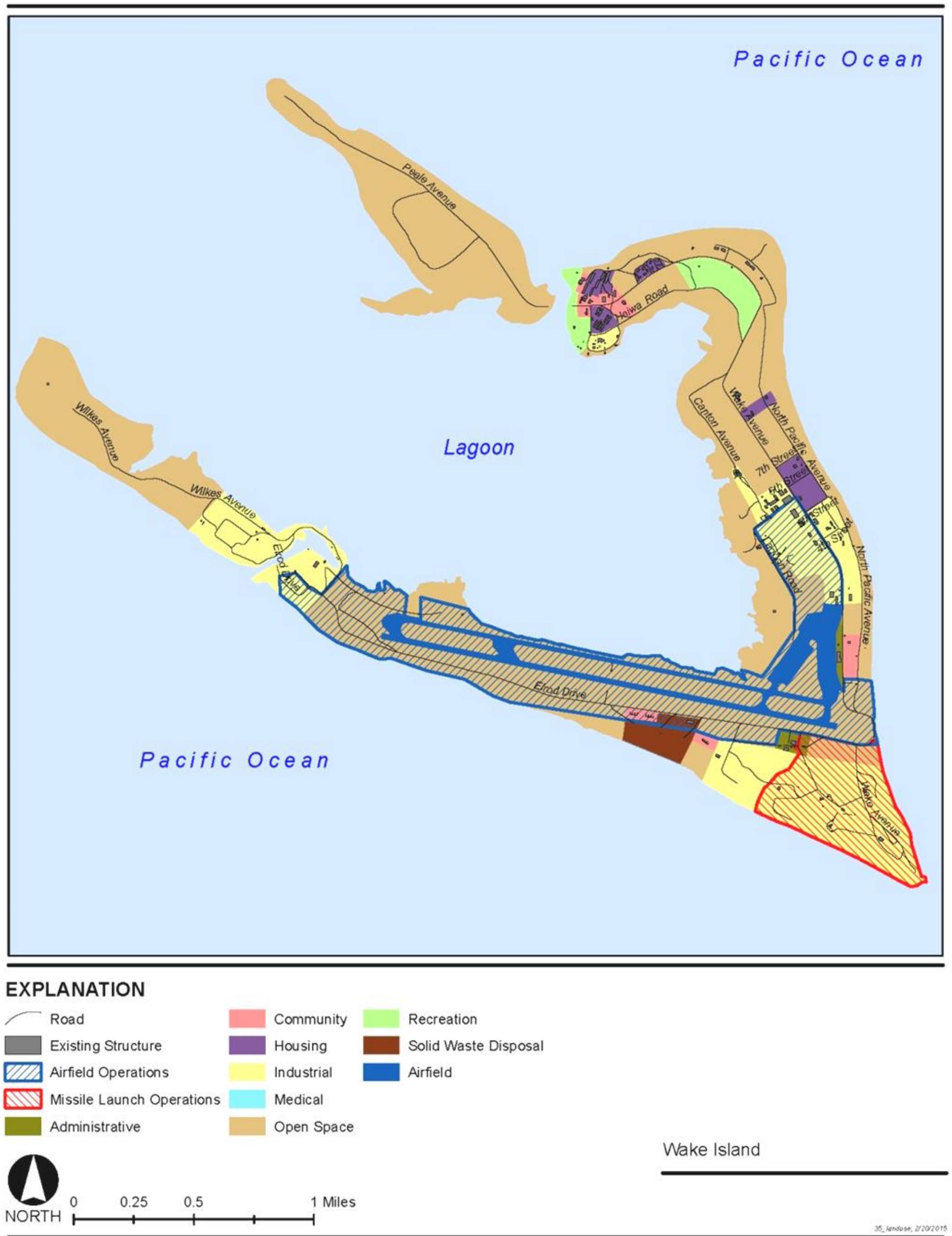

Figure 3-4 Land Classification

Strategic Defense Command, 1994a). 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.

3.10.2 BROAD OCEAN AREA

Wildlife receptors and their acoustic characteristic and sensitivities are described in Biological Resources.

3.10.2.1 Region of Influence

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

3.10.2.2 Affected Environment

Airborne noise sources include civilian and military aircraft (both types of which fly at altitudes ranging from hundreds of m (ft) to tens of thousands of m (ft) above the surface), bombs, gunfire, missiles, rockets, and small arms. Noise levels may be significant in the vicinity of these activities, but the noise intensity decreases rapidly with increasing distance from the source, especially for impulsive noise from the discrete noise events characteristic of military training, aircraft landings and takeoffs, and missile launch tests. Additionally, these activities take place miles from land within the BOA, where few or no human receptors are exposed to the noise. BOA noise events are widely dispersed, temporally and geographically, with little or no overlap or additive effects.

3.11 SOCIOECONOMICS

Socioeconomic impact regions typically include: current and projected population and relevant demographic characteristics; local government revenues, expenditures, and revenue-sharing arrangements; current and projected housing capacity; current and planned public service capacity (water, sewer, transportation, police, fire, health, education, and welfare); economic structure and labor force characteristics; local government characteristics; local organizations and interest groups; social structure and life styles; and local support or opposition to the proposed project.

3.11.1 WAKE ATOLL

3.11.1.1 Region of Influence

The region of influence for Wake is limited to the Atoll itself. Since the Atoll is an isolated military installation, actions taken have little effect on outside employment, population immigration, or local area expenditures.

3.11.1.2 Affected Environment

Less than 100 personnel currently reside on Wake Atoll. Island population temporarily surges during time of MDA test missions on average less than one time per year. The military or contractor personnel who work at Wake, live in billets previous constructed on the island. These billets are military controlled. There are no schools, private homes, motels/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.

3.11.2 BROAD OCEAN AREA

3.11.2.1 Region of Influence

The region of influence for the BOA would be all areas outside of 22 km (12 nm) from the land of Wake Atoll.

3.11.2.2 Affected Environment

Socioeconomic attributes of the BOA would include commercial fishing and commercial shipping routes.

3.12 VISUAL AESTHETICS

3.12.1 WAKE ATOLL

3.12.1.1 Region of Influence

The region of influence includes the potential locations (radar site and land launched target rail/missile) on Wake that would support the Proposed Action.

3.12.1.2 Affected Environment

Since the Atoll is an isolated military installation, actions taken there have little effect to the views of government and contracted employees.

3.12.2 BROAD OCEAN AREA

3.12.2.1 Region of Influence

The region of influence and the affected environment would include the area outside of 22 km (12 nm) from land along the test corridor.

3.12.2.2 Affected Environment

The affected environment would include views from islands and ships in the region of influence.

3.13 WATER RESOURCES

3.13.1 WAKE ATOLL

3.13.1.1 Region of Influence

The region of influence for potable water resources includes the entire Wake Atoll where potable water would be obtained to supply program requirements. The lands and waters of Wake Atoll out to the 322 km (200 mi) boundary of the U.S. Exclusive Economic Zone are part of the PRIMNM and the waters out to 22 km (12 nm) from mean low water constitute the Wake Atoll National Wildlife Refuge.

3.13.1.2 Affected Environment

The average annual precipitation on Wake is 89 cm (35 in). Due to the relatively small area of the island and the high permeability of the soil, all precipitation either rapidly runs off from the land into the ocean and lagoon or filters into the soil. Other than the potable water supplied by the capture of rainwater in two 7-hectare (17-acre) catchment basins in the central portion of the island, there is virtually no fresh surface water on the island.

The island does have some fresh groundwater. Rainwater that filters into the soil is less dense than the underlying saline or brackish groundwater and generally remains in a segregated floating lens. 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.

3.13.2 BROAD OCEAN AREA

3.13.2.1 Region of Influence

The BOA region of influence includes those areas below the potential flight corridors areas in the central North Pacific Ocean. The average depth of the BOA region of influence is 3,900 m (12,900 ft).

3.13.2.2 Affected Environment

The general composition of the ocean includes water, sodium chloride, dissolved gases, minerals, and nutrients. These characteristics determine and direct the interactions between the seawater and its inhabitants. The most important physical and chemical properties are salinity, density, temperature, pH, and dissolved gases. For oceanic waters, the salinity is approximately 35 parts of salt per 1,000 parts of seawater. Most organisms have a distinct range of temperatures in which they may thrive. A greater number of species live within the moderate temperature zones, with fewer species tolerant of extremes in temperature.

Surface seawater often has a pH between 8.1 and 8.3 (slightly basic), but generally is very stable with a neutral pH. The amount of oxygen present in seawater will vary with the rate of production by plants, consumption by animals and plants, bacterial decomposition, and surface interactions with the atmosphere. Most organisms require oxygen for their life processes. Carbon dioxide is a gas required by plants for photosynthetic production of new organic matter. Carbon dioxide is 60 times more concentrated in seawater than it is in the atmosphere.

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4.0 ENVIRONMENTAL CONSEQUENCES

This chapter describes the potential environmental consequences of the No-action and Proposed Action Alternatives by comparing these activities with the potentially affected environmental components described in Chapter 3.0. The amount of detail presented in each section is proportional to the potential for impacts.

To assess the potential for and significance of environmental impacts, a list of activities was developed (Chapter 2.0) and the environmental setting was described, with emphasis on any special environmental sensitivities (Chapter 3.0). Program activities were then assessed with the potentially affected environmental components to determine the environmental impacts of these activities.

4.1 AIR QUALITY

Although the Proposed Action would allow various pollutants to be released into the atmosphere, the levels are not expected to violate any federal ambient air quality standards (AAQS) that may apply to Wake. Activities from the Proposed Action are normal activities at Wake and are not expected to cause additional impacts to air quality. No ambient air quality monitoring data are known to be available for Wake; however, it is believed that there are no air pollution problems at Wake due to the strong trade winds quickly dispersing any local emissions from relatively few emission sources. Additionally, there are no other islands within several hundred miles of Wake Atoll that could be affected by pollutants generated on Wake. Based on this information, air quality on Wake would not be affected.

4.1.1 WAKE ATOLL

4.1.1.1 Proposed Action

THAAD Interceptor System (Radar and Launcher)

The evaluation of potential air quality impacts from the Proposed Action includes the effects of air pollutant emissions from the operations of the two THAAD radars and missile/interceptor launches.

Radar

Potential effects from the radar use on air quality would be from the operation of the four generators associated with the two PPUs. The PPUs, used to power the radar systems, are in a self-contained trailer in a noise-dampening shroud that contains two diesel engine-powered generators. As analyzed in the USAKA Final Supplemental EIS (U.S. Army Space and Strategic Defense Command, 1993), modeling analysis determined that the maximum concentrations of pollutants emitted during operation were not expected to degrade U.S. AAQS, and therefore, would not affect the stratospheric ozone layer, GHG, or global warming.

Launcher

Missile launch activities at Wake Island have been analyzed in previous environmental documents, such as the *Wake Island Environmental Assessment* (U.S. Army Space and Strategic Defense Command, 1994b) and the *Theater High Altitude Area Defense (THAAD) Pacific Test Flights Environmental Assessment* (U.S. Army Space and Missile Defense Command, 2002). Flight test activities at other sites have previously been analyzed in the *USAKA Final Supplemental EIS* (U.S. Army Space and Strategic Defense Command, 1993) and the *Theater Missile Defense Hera Target Systems Environmental Assessment* (U.S. Army Space and Strategic Defense Command, 1994a), including the launching of THAAD and PATRIOT interceptors and impacts to the environment were not significant. Table 4-1 shows the amount of main constituents emitted from the THAAD Interceptor over the entire time of flight. Only during a small portion of time is the launch vehicle in the vicinity of Wake Atoll.

Table 4-1: Interceptor Emission Constituents

Constituent	Amounts	
	Kilograms	Pounds
Aluminum Oxide (Al_2O_3)	<159	<350.0
Carbon Monoxide (CO)	<113	<250.0
Hydrogen Chloride (HCl)	<90.7	<200.0
Nitrogen (N_2)	<45.3	<100.0
Water (H_2O)	<22.6	<50.00
Hydrogen (H_2)	<22.6	<50.00
Carbon Dioxide (CO_2)	<6.80	<15.00
Chlorine (Cl*)	<2.26	<5.00
Calcium Chloride (CaCl* (1))	<2.26	<5.01
Sodium Chloride (NaCl)	<2.26	<5.00
Aluminum Chloride (AlCl* (2))	<0.45	<1.00

Source: U.S. Army Space and Missile Defense Command, 2002a
Note: * = radicals, (#) = valence

Generators

Impacts to air quality on Wake would occur as a result of the implementation of the Proposed Action (e.g., AN/TPY-2 Radar, C2BMC, and MQM-107E target). Two PPUs would be used for the THAAD radar. Two PPUs would be used for the AN/TPY-2 (FBM); however, the MEP 810 diesel generators or another commercial mobile power source could be used as a substitute for the PPUs for the operation of the radars. These generators would operate 10 hours per day for 60 days. During testing and preparation activities, the generators would operate longer, up to 24 hours per day, 7 days a week. A reserve generator would be deployed for use with the C2BMC to substitute in the absence of other power. Two operational and one reserve diesel generators would be used for the MQM-107E target. The generators supporting the MQM-107E target would operate 12 hours per day. A gasoline generator would also be used to support the MQM-107E target.

Table 4-2 lists all generators that are scheduled to be deployed to Wake and Table 4-3 shows the calculated emissions from those generators.

Although the Proposed Action would allow various pollutants to be released into the atmosphere, the emissions and quantities are not expected to violate any federal AAQS

Table 4-2: Generators Scheduled to be Deployed to Wake

THAAD	
THAAD Launcher	2 X 3 kW
THAAD Fire Control and Communications	2 X 30 kW
THAAD Radar	2 X 1.3 MW
THAAD Battery CP	10 kW
DRASH	28 kW
BLOC/STS	28 kW
Communications Shelter	30 kW
SOLD	2 X 60 kW
Bld1615	200 kW (backup for THAAD support trailers)
AN/TPY-2 (FBM), C2BMC, and SATCOM	
AN/TPY-2 Radar	2 X 1.3 MW
AN/TPY-2 site	200 kW (backup power)
TTS	
TTS-3	175 kW
TTS-4	175 kW
TTS-5	2 X 100 kW
AEDC Optics	
Optics Shelter	45 kW
Flight Test Communications	
Flight Test Communications Wake Facility	200 kW

Table 4-3 FTO-02 Calculated Emissions

Type	Size hp	No. of units	Fuel gal/hr/unit	Operating Hours/ Unit	Emission Factor					Emissions Tons per year				
					NOx lb/hp-hr	SO_2 lb/gal	CO lb/hp-hr	PM_{10} lb/hp-hr	VOC lb/hp-hr	NO_x	SO_2	CO	$PM_{2.5}$ PM_{10}	VOC
Generator set	*210*	*1*	*13.2*	*8760*	*0.031*	*0.143*	*0.00668*	*0.0022*	*0.00247*	*28.51*	*8.27*	*6.14*	*2.02*	*2.27*
Generator set	*35.5*	*2*	*1.1*	*8760*	*0.031*	*0.143*	*0.00668*	*0.0022*	*0.00247*	*9.64*	*1.38*	*2.08*	*0.68*	*0.77*
Generator set	*130*	*2*	*5.2*	*8760*	*0.031*	*0.143*	*0.00668*	*0.0022*	*0.00247*	*35.30*	*6.51*	*7.61*	*2.51*	*2.81*
Generator set	*50*	*2*	*2.5*	*8760*	*0.031*	*0.143*	*0.00668*	*0.0022*	*0.00247*	*13.58*	*3.13*	*2.93*	*0.96*	*1.08*
A/C Cart	*18*	*1*	*1.2*	*8760*	*0.031*	*0.143*	*0.00668*	*0.0022*	*0.00247*	*2.44*	*0.75*	*0.53*	*0.17*	*0.19*
GPU	*117*	*1*	*5*	*8760*	*0.031*	*0.143*	*0.00668*	*0.0022*	*0.00247*	*15.89*	*3.13*	*3.42*	*1.13*	*1.27*
Generator set	*16*	*2*	*0.7*	*8760*	*0.031*	*0.143*	*0.00668*	*0.0022*	*0.00247*	*4.34*	*0.88*	*0.94*	*0.31*	*0.35*

Source: USAKA, 2013

that may apply to Wake, as determined in the *Wake Island EA* (U.S. Army Space and Strategic Defense Command, 1994b) and the *Integrated Flight Tests at U.S. Army Kwajalein Atoll/Ronald Reagan Ballistic Missile Defense Test Site (USAKA/RTS)* (MDA, 2012). Activities from the Proposed Action are normal activities at Wake and are not expected to impact air quality.

No ambient air quality monitoring data are known to be available for Wake; however, air quality exceedances are unlikely because of the low levels of emissions at Wake and due to the strong trade winds quickly dispersing any local emissions. Additionally, there are no other islands within several hundred miles of Wake Atoll that could contribute to or be affected by pollutants generated on Wake. Based on this information, the Proposed Action would not have a significant impact on air quality on Wake Island.

PATRIOT

Results of air quality modeling for a normal launch at Wake Island showed that neither the National Ambient Air Quality Standards nor the hydrogen chloride guidelines would be exceeded for distances greater than 1 km (0.6 mi) from the launch site. The potential exists for minor impacts from hydrochloric acid formed from the hydration of the hydrogen chloride gas during rainy or very high-humidity conditions. Normally the hydrogen chloride gas remains dry and is quickly and easily dispersed by winds. Emissions from diesel generators that would run intermittently for a few hours per test would be quickly dispersed by wind. (PAC-3 EA, 1997)

Global Warming

Greenhouse gas emissions are of concern as they contribute to global warming by trapping reradiated energy in the atmosphere. The main GHG in the Earth's atmosphere are water vapor, CO_2, CH_4, N_2O, hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, and other fluorinated gases including nitrogen trifluoride and hydrofluorinated ethers. The 2010 draft NEPA guidance on consideration of the effects of climate change and greenhouse gas emission deems projected direct annual CO_2 equivalent GHG emissions from a proposed action of 25,000 metric tons or more as an indicator that a quantitative or qualitative assessment may be meaningful to decision makers and the public. However, the 25,000 metric tons figure is not a firm standard, and currently there are no standards to determine the significance of the cumulative impacts from these emissions. Based on the emission constituents listed on Table 4-1, it is not anticipated that the emission activities associated with the execution of the Proposed Action would reach or exceed 25,000 metric tons threshold.

Ozone Depletion

Burning diesel fuel is of concern to air quality because it can lead to emission of ozone-depleting substances such as hydrochloric acid, aluminum oxide, and nitrogen. Under the Clean Air Act, USEPA has set protective health-based standards for ozone in the air we breathe. USEPA, state, and cities have instituted a variety of multi-faceted programs to reduce ozone-depleting substances. Due to the chemical reactions of propellants and diesel fuel burning, the Proposed Action would have an impact on ozone depletion. However, based on air pollutant thresholds for major stationary sources, emissions from the generators and other sources do not reach a potential for significant impacts for ozone depletion during execution of the Proposed Action.

With the remote location of Wake Atoll, the constant winds, and the infrequent testing schedule, impacts to air quality as a result of the Proposed Action would be not significant.

4.1.1.2 No-action Alternative

No IFTs would take place under the No-action Alternative. There would be no additional potential for degradation to the existing air quality at Wake Atoll and impacts would be not significant.

4.1.1.3 Cumulative Impacts

The combination of the standard practices, emission reductions, and controls for the Proposed Action would not result in significant cumulative impacts from activities associated with the Proposed Action. If any future IFTs would also include the launch of a missile from the 50-k rail or the launch stool, no additional impacts would be expected. Computer modeling was used to determine whether emissions from a HERA missile would exceed regulatory thresholds in the *Theater Missile Defense Hera Target Systems Environmental Assessment* (U.S. Army Space and Strategic Defense Command, 1994a). The results of the modeling show that for a normal launch neither the relevant National Ambient Air Quality Standards (NAAQS) nor the HCl guidelines are exceeded for distances greater than 1.0 km (0.6 mi) from the launch site. Results from the air quality modeling for the missile failure accident scenario also show, with one exception, that neither the relevant NAAQS nor guideline values are exceeded for distances greater than 1.0 km (0.6 mi) from the launch site. Any new future sources that may subsequently be sited at Wake Island would be scheduled to avoid any future flight intercept activities and impacts would be not significant.

4.1.2 BROAD OCEAN AREA

4.1.2.1 Proposed Action

Flights (interceptors or targets) occur within a large open area of the ocean. Missile intercepts in this area would result in only temporary, minor, and localized emissions. There is no indication of emissions from the Proposed Action affecting the air quality in the BOA area and impacts would be not significant.

4.1.2.2 No-action Alternative

No interceptor launches would take place under the No-action Alternative. Target launchers and sensors as analyzed in previous envious environmental documentation would continue. There would be no additional potential for degradation to the existing air quality in the BOA and impacts would be not significant.

4.1.2.3 Cumulative Impacts

No additional actions are known that would contribute to cumulative impacts that could significantly affect air quality in the global upper atmosphere of the BOA and impacts would be not significant.

4.2 AIRSPACE

4.2.1 WAKE ATOLL

4.2.1.1 Proposed Action

The airspace at Wake Island is controlled by the FAA ARTCC at Oakland and prior permission is required to land. Since the number of aircraft (one jet route) flying over or near to the island is small and only a small number of IFTs is anticipated, no major impacts are expected to airspace use. Aircraft within the region of radar operating on Wake would be subject to a NOTAM to advise avoidance of the radar and the launch of interceptors during testing. The impacts on airspace management or air traffic control by the Proposed Action would be not significant.

4.2.1.2 No-action Alternative

The No-action Alternative would not require additional airspace closures at Wake Island because there would be no IFT activities. Existing closures and restrictions would remain in place.

Implementation of the No-action Alternative would not cause additional airspace closures and, therefore, impacts to airspace would be not significant.

4.2.1.3 Cumulative Impacts

The Proposed Action would increase the controlled airspace for incoming and departing aircraft through the implementation of NOTAMs and special use airspace areas which are standard practices with the existing radars on Wake. No other future projects in the airspace region of influence have been identified that would have the potential for incremental, additive cumulative impacts to controlled or uncontrolled airspace, special use airspace, en route airways and jet routes, airfields and airports. Cumulative impacts to airspace are expected to be not significant.

4.2.2 BROAD OCEAN AREA

4.2.2.1 Proposed Action

Typically, a missile would be at very high altitude passing through FL 600 (approximately 18,300 m (60,000 ft)) in just a matter of minutes after launch, and thus well above the airspace subject to the rules and regulations of the ICAO Convention. However, the designation and activation of booster drop areas in the launch corridor could have airspace use impacts.

The airspace outside territorial limits lies in international airspace and, consequently, is not part of the National Airspace System. Because the area is in international airspace, the procedures of ICAO, outlined in ICAO Document 444, *Rules of the Air and Air Traffic Services*, are followed. The FAA acts as the U.S. agent for aeronautical information to the ICAO, and air traffic in the over-water region of influence is managed by the Honolulu Control Facility and Oakland ARTCC.

After launch, typically the target missiles would be above FL 600 within minutes of the rocket motor firing. As such, all other local flight activities would occur at sufficient distance and altitude so that the target missile and interceptor missiles would be little noticed. However, activation of the proposed stationary Altitude Reservation procedures, where the FAA provides separation between non-participating aircraft and the missile flight test activities in the Temporary Operating Area, would impact the controlled airspace available for use by nonparticipating aircraft for the duration of the Altitude Reservation—usually for a matter of a few hours, with backup days reserved for the same hours. Because the airspace above the impact areas is not heavily used by commercial aircraft, and is far removed from the en route airways and jet routes crossing the North Pacific, the impacts to controlled/uncontrolled airspace would be minimal. Missile intercepts and intercept debris would generally occur outside special use airspace areas.

For sea-launch target launches, it may be necessary to establish a 3.7 km (2-nm) radius temporary Warning Area, extending from the surface up to 18,300 m (60,000 ft) mean sea level above the mobile launch platform. Such a restricted area would marginally reduce the amount of navigable airspace in the BOA, but because the airspace is not heavily used by commercial aircraft, and is far removed from the en route airways and jet routes crossing the North Pacific, the impacts to controlled and uncontrolled airspace would be not significant.

4.2.2.2 No-action Alternative

The No-action Alternative would not require additional airspace closures in the BOA because there would be no interceptor launches. Existing closures and restrictions would remain in place and impacts would be not significant.

Implementation of the No-action Alternative would not cause additional airspace closures and, therefore, would not impact air space.

4.2.2.3 Cumulative Impacts

All missile launches, missile intercepts, and debris impacts 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. However, missile launches are short-term, discrete events. The use of the required scheduling and coordination process for international airspace, and adherence to applicable DoD directives and USAF regulations concerning issuance of NOTAMs and selection of missile firing areas and trajectories, the potential for incremental, additive, cumulative impacts would be not significant.

4.3 BIOLOGICAL RESOURCES

4.3.1 WAKE ATOLL

4.3.1.1 Proposed Action

Site Preparation Activities

Procedures are in place, which require cargo handling personnel to inspect arriving aircraft/crafts for pest species of plants and animals. Program personnel would be briefed on methods of pest detection. MDA would comply with applicable DTR, the Wake Biosecurity Plan, and any other instructions provided by the USAF. MDA has coordinated with the USDA for inspection of shipments traveling through the port at Guam and would use USAF provided checklists for monitoring and managing the spread of invasive species. The checklists would be placed on containers at their point of origin To prevent the introduction of invasive species, MDA would ensure compliance with the Wake Island Biosecurity Management Plan (USAF, 2015) for all cargo shipped by air or barge to Wake Island. MDA would arrange for brown tree snake surveys for flat rack equipment and vehicles in Guam. Therefore, any short-term potential increase in sea and air traffic associated with the Proposed Action is not expected to increase the transportation of non-native pest species to the atoll.

To prevent the introduction of invasive species, MDA would ensure compliance with the Wake Island Biosecurity Management Plan for all cargo shipped by air or barge to Wake Island. Consistent with service guidelines and the Defense Transportation Regulations (DTR), all equipment and personal gear will be cleaned prior to transport. Advanced copies of container packing lists and the USAF Wake Island Vessel/Aircraft Rodent Pre-departure Inspection Forms would be coordinated with Wake Island Base Operations at BaseOperations2@wakeisland.net.

Visual inspections of all equipment and other materials would be completed at the point of origin prior to loading materials into containers bound for Wake Atoll. Evidence of wood boring, seeds, mud, plant materials, or actual invasive organisms would result in the shipment being set aside for decontamination using USEPA approved fumigants, power washers, and other tools to ensure the shipment is free of invasive alien species. Upon completion of a passing inspection, a Commercial "No-Pest Insect Strip" (containing the chemical compound Dichlorvos), Glue board, and baited rodent snap trap would be placed in each shipping container in order to deter rodent, insect, and reptile/amphibian incursion.

Upon arrival at Wake Atoll, containers would be inspected for presence of invasive alien species prior to removing equipment from any container, barge or aircraft. In the event government contracted commercial shippers (employed directly or indirectly by the MDA) utilize Guam or Hawaii ports en-route to Wake, all cargo would be inspected for the presence of the invasive brown tree snake (*Boiga irregularis*) by USDA canines, and also for coconut rhinoceros beetle (*Oryctes rhinoceros*) and the little fire ant (*Wasmannia auropunctata*) prior to loading onto the vessel. The vessel operator shall also permit the USDA canine team to sweep accessible portions of the vessel prior to departure. No containers are planned to be opened on Guam.

Vegetation

No exclusively terrestrial threatened and endangered vegetation species are known or reported to exist on Wake. Thus, there will be no impacts to such species as a result of site preparation activities associated with the Proposed Action.

Although the site(s) for the launch activities are previously cleared, improved locations, there are components of the Proposed Action that would require some ground disturbance and vegetation removal. Through a collaborative effort with the 611 CES Natural Resources Environmental Element, the areas identified for the placement and operation of test assets were chosen because they minimize MDAs tactical footprint and minimize vegetation clearing and ground disturbance requirements while still satisfying mission objectives. MDAs tactical footprint totals approximately 6 acres, which is less than 1 per cent of the total Wake Atoll land mass of approximately 739 hectares (1,826 acres).

There is a minor amount of vegetation clearing and site leveling associated with the placement of the AN/TPY-2 radar (see Figure 4-1). As shown in Figure 4-2, only *Casuarina equisetifolia* (ironwood) trees that obstruct satellite communication would be removed in the area east of Building 1176. For the area near Building 1177, two *Casuarina equisetifolia* (ironwood) trees would be cut (see Figure 4-3) for communications conduit. A site walk of the area to be disturbed or cleared would be conducted by the 611 CES assigned environmental manager. MDA would use the 611 CES assigned environmental manager to survey for rare bunch grasses (i.e., *Lepturus gasparricensis*) and nesting birds in or at the base of the trees prior to cutting of any trees. If there are any nests, to the extent practicable, and consistent with mission requirements, removal of the trees would be delayed until the eggs have hatched and the chicks have fully fledged.

The BOS contractor would comply with the Wake Atoll Land Management Plan. No substantial impacts to vegetation are anticipated. Any spill or release of hazardous material would likely be restricted to a small localized area near the source. Standard operating procedures and spill plans would reduce any potential impact to vegetation. As determined in the AF 813 for clearing activities, the ground disturbing activities associated with the Proposed Action are part of a single National Pollutant Discharge Elimination System permit application for MDA and other USAF activities.

Wildlife

There will be no significant impact to ESA threatened or endangered terrestrial wildlife species on Wake, i.e., the Newell's shearwater, as a result of site preparation activities associated with the Proposed Action. Disturbance to migratory birds, from launch noise and increased personnel would be short-term and is not expected to have a lasting impact nor a measurable negative effect, since migratory birds predominantly nest at the end of Peale and Wilkes well outside the typical 70 to 98 dBA noise levels isopleths at 15 m (50 ft) from site preparation equipment. Any spill or release would likely be restricted to a small localized area near the source. Standard operating procedures and spill plans would reduce any potential impact to wildlife in the vicinity of the spill.

Specifically, the Proposed Action test assets (THAAD, PATRIOT, AN-TPY2, targets, etc.) would be placed in previously disturbed areas and on existing launch pads where applicable. Site locations were identified in conjunction with the USAF to minimize environmental impacts while still satisfying mission requirements. The amount of clearing/trimming would be minimal. During the site visit with the USAF in August, 2014 no birds, nests or eggs were seen in the project area. To the extent practicable and consistent with mission requirements, follow-on pre-vegetation clearing surveys would be conducted in order to document any bird nesting activity with the MDA project areas, consistent with the migratory bird monitoring protocols set out in the 2015 INRMP (USAF, 2015).

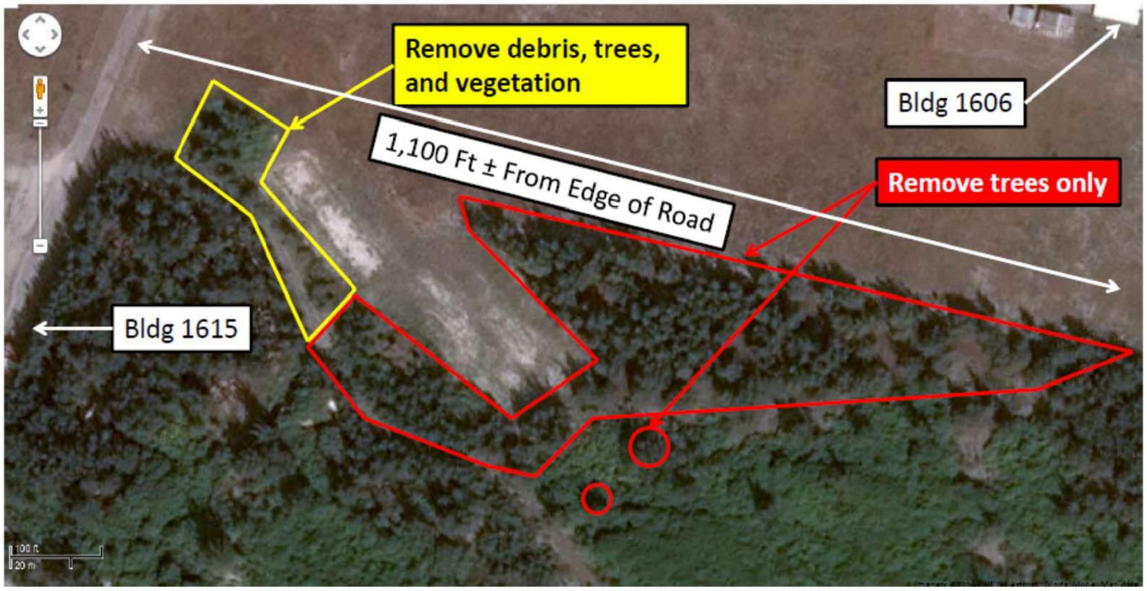

Figure 4-1 Area of THAAD Radar Site Preparation

Figure 4-2 Trees to be Removed for SATCOM Line of Sight

Figure 4-3 Trees to be Removed for Communications Conduit

Table 4-4 presents the vegetation type and area disturbed as part of the Proposed Action. The HMUs associated with the placement of the AN/TPY-2 are HMU 50 and HMU 31. HMU 50 is described as "*Tournefortia* scrub, somewhat open with beach morning glory and a few *Casuarinas*." HMU 31 is described as "sparse *Tournefortia* scrub with beach morning glory." (USAF, 2015)

Vegetation clearing and site preparation noise and the presence of personnel could impact wildlife within the area. Vegetation clearing and site preparation would only take place during daytime hours. Vegetation clearing, site preparation, and equipment noise-related impacts could include loss of habitat, displacement of wildlife, and short-term disruption of daily/seasonal behavior. At 15 m (50 ft) from equipment, noise levels typically range from 70 to 98 A-weighted decibels (dBA). The combination of increased noise levels and human activity would likely displace some birds that forage, feed, or nest within and adjacent to the vegetation clearing and site preparation areas. Foraging water birds would be subjected to increased energy demands if flushed by this noise, but this should be a short-term, minimal impact. Bird migration patterns would not be altered. To the extent practicable, vegetation clearing and site preparation activities would be scheduled so that as much of it as possible would occur outside of the nesting season.

There are components of this project that would require some ground disturbance and vegetation removal. Through a collaborative effort with the 611 CES Natural Resources Environmental Element, the areas identified for the placement and operation of test assets were chosen because they minimize MDAs tactical footprint and minimize vegetation clearing and ground disturbance requirements while still satisfying mission objectives. MDAs tactical footprint totals approximately 6 acres, which is less than 1 per cent of the total Wake Atoll land mass of approximately 739 hectares (1,826 acres). The majority of the tactical footprint consists of existing launch pads and previously disturbed areas and is expected to result in little to no impact to rare vegetation or the migratory birds on Wake Atoll. Little to no impact to migratory birds, including nesting and breeding seabird colonies is expected to result from the site preparation ground disturbance and vegetation removal activities associated with the Proposed Action. Nevertheless, to the extent practicable and consistent with mission requirements, the following will be conducted prior to all vegetation removal related to the placement and operation of test assets:

- A site survey of the area to be disturbed or cleared will be conducted by the 611 CES assigned environmental manager prior to the clearing activities.
- The site survey will include activity logs identifying all bird species and the presence of rare grass species observed within the immediate and surrounding project areas.
- The activity logs will be maintained by the 611 CES Natural Resources Environmental Element Program Manager for record keeping purposes consistent with the migratory bird monitoring protocols set out in the 2015 INRMP (USAF, 2015).
- If nesting birds rare bunch grasses are identified within the project area, the 611 CES Natural Resources Environmental Element Program Manager will coordinate with MDA to determine whether there are any measures that can be implemented to prevent impacts to these resources. To the extent practicable and consistent with mission requirements, potential measures may include: avoiding specific bunch grass areas and trees with active nests, scheduling vegetation removal outside of the nesting season, using active measures to drive birds away from the project area, and managing project area habitat to make it less attractive to nesting birds.
- In the unlikely event that the required ground disturbance and vegetation clearing related to the placement and operation of test assets, a military readiness activity as defined by 50 CFR 21.3, results in incidental takes of migratory birds authorized by 50 CFR 21.15, then the 611 CES assigned environmental manager will document the take using a bird activity log and incorporate this information into the migratory bird monitoring protocols set out in the 2015 INRMP (USAF, 2015).

Table 4-4 Vegetation Type and Area Disturbed by Proposed Action

Vegetation Type and Acreage						
Location	**Total Hectares (Acres)**	**Unclassified**	***Tournefortia***	**Ruderal**	***Casuarina***	**Mowed**
THAAD Radar	*1.060 (2.62)*	*0 (0)*	*0 (0)*	*0 (0)*	*0.975 (2.41)*	*0.085 (0.21)*
AN/TPY-2 Radar	*0.52 (1.28)*	*0 (0)*	*0.52 (1.28)*	*0 (0)*	*0 (0)*	*0 (0)*
Near Building 1654	*0.004 (0.01)*	*0 (0)*	*0 (0)*	*0.004 (0.01)*	*0 (0)*	*0 (0)*
Near Building 1644	*0.002 (0.006)*	*0 (0)*	*0 (0)*	*0 (0)*	*0 (0)*	*0.002 (0.006)*
Near Building 1176	*0.08 (0.21)_*	*0 (0)*	*0 (0)*	*0 (0)*	*0.016 (0.04)*	*0.069 (0.17)*
Near Building 1172	*0.07 (0.16)_*	*0.014 (0.032)*	*0 (0)*	*0 (0)*	*0.035 (0.08)*	*0.021 (0.048)*

The Proposed Action qualifies as Military Readiness Activities as legislated in 50 CFR 21.15 (a) (1), “Authorization of take incidental to military readiness activities.” The military readiness exception generally states that the military is authorized incidental takes for the death of migratory birds that result from "military readiness" activities. In discussing this rule in the Federal Register, USFWS provides the following definitions for military readiness activities:

> (a) all training and operations of the Armed Forces that relate to combat, and
> (b) the adequate and realistic testing of military equipment, vehicles, weapons, and sensors for proper operation and suitability for combat use. (72 Federal Register 8931, 8944 [February 28, 2007]).

Routine activities for managing a military installation are not included. In this regard, the Federal Register provides that the exemption specifically does not apply to:

> (a) routine operation of installation operating support functions, such as: administrative offices; military exchanges; commissaries; water treatment facilities; storage facilities; schools; housing; motor pools; laundries; morale, welfare, and recreation activities; shops; and mess halls,
> (b) operation of industrial activities, or

(c) construction or demolition of facilities listed above. (72 Federal Register 8931, 8944 [February 28, 2007]).

For ongoing activities, the Air Force must determine whether or not the activity "may result in a significant adverse effect on the population of a migratory bird species." (50 CFR 21.15). Unlike the Endangered Species Act, where the analysis is on whether the activity will have an impact on a member of a protected species, there is an important distinction in that the adverse impact must be on the migratory bird population.

Section 704(a) of the MBTA prescribes regulations to exempt the Armed Forces from the requirement to obtain an incidental take permit for migratory birds during military readiness activities authorized by the Secretary of Defense or the Secretary of the military department concerned. Congress determined that allowing incidental take of migratory birds as a result of military readiness activities is consistent with the MBTA and the treaties. The Armed Forces must give appropriate consideration to the protection of migratory birds when planning and executing military readiness activities, but not at the expense of diminishing the effectiveness of such activities. The low probability of debris capable of significantly impacting a population of a particular bird species should not require the development of conservation measures for the species (U.S. Department of the Navy, 2010).

The Armed Forces may take migratory birds incidental to military readiness activities as long as those ongoing or proposed activities do not result in a significant adverse effect on a population of a migratory bird species. If there is a significant adverse effect, then the Armed Forces must confer and cooperate with the USFWS to develop and implement appropriate conservation measures to minimize or mitigate such significant adverse effects.

For the following reasons, MDA, in coordination with the USAF, has determined that the military readiness activities of the Proposed Action will not result in an adverse impact on migratory bird populations.

1. The MDA tactical footprint of approximately 2.4 hectares (6 acres) is less than 1 per cent of the available Wake Atoll land mass of 739 hectares (1,826 acres). The majority of the footprint consists of existing launch pads and previously disturbed areas and as such the vegetation clearing required for placement and operation of test assets is minimal.
2. Habitat loss would not be a significant impact because the habitat type in the MDA project areas is common within the Atoll. While increased noise levels and human activity would likely displace some birds that forage, feed, nest, or have dens in proximity to the proposed project areas, sufficient foraging and feeding habitat occurs in adjacent areas to accommodate potentially displaced wildlife. Disturbance from equipment noise and temporary increase in personnel would be brief given the infrequency of test activities.
3. According to the 2015 INRMP (USAF, 2015), a significant number of migratory and nesting birds inhabit Wake Atoll. Wilkes and Peale Islands support large numbers of resident and migratory seabirds and visiting winter resident shorebirds and waterfowl. Aircraft operations have the potential to disturb or inadvertently strike birds during aircraft landings and takeoffs. Disturbance to birds may also occur with other human activities and base operations including runway maintenance, grounds maintenance, cutting or trimming of trees, and

unauthorized access to Wilkes Island. Incidental bird deaths may also occur in collisions with motor vehicles. Missile launches are not likely to have a substantial impact on birds, by comparison, due to the infrequency of events and distance from primary bird habitat on Wilkes and Peale Islands.

4. To the extent practicable and consistent with mission requirements, MDA will incorporate the following actions into its military readiness activity planning such as: avoiding specific trees with active nests during vegetation clearing, scheduling vegetation clearing outside of the nesting season, using active measures to drive birds away from the project area and managing project area habitat to make it less attractive to nesting birds.
5. In the unlikely event that the required ground disturbance and vegetation clearing related to the placement and operation of test assets results in incidental takes of migratory birds authorized by 50 CFR 21.15, then the 611 CES assigned environmental manager would document the take using a bird activity log and incorporate this information into the migratory bird monitoring protocols set out in the 2015 INRMP (USAF, 2015).

No impacts are expected to the federally protected marine resources, including threatened green sea turtles, endangered hawksbill sea turtles, and coral reef ecosystems as a result of site preparation activities.. MDA personnel would be advised of the restrictions on fishing and to not take living shells and corals, in accordance with the Wake Island Fishing Management Plan (PRSC, 2014). According to information provided in the *Wake Island Launch Center Supplemental EA*, (MDA, 1999) although the green sea turtle has been observed in the ocean near shore and in the lagoon, neither sea turtle species has been observed nesting on the island (USAF, 2015). In March of 2015, NMFS published a proposed rule to revise the green sea turtle listing asking for public comment. If the rule moves forward, the green turtles would be listed as 11 DPS. The DPS for the green turtles that would be found at Wake is the CNP (CSP). Green turtles of the CNP (CSP) DPS are listed as Threatened (Endangered) (NMFS, 2015).

Pre-flight Test Activities

Procedures are in place, which require cargo handling personnel to inspect arriving aircraft/crafts for pest species of plants and animals. Program personnel would be briefed on methods of pest detection. MDA would comply with applicable DTR, the Wake Biosecurity Plan, and any other instructions provided by the USAF. MDA has coordinated with the USDA for inspection of shipments traveling through the port at Guam and would use USAF provided checklists for monitoring and managing the spread of invasive species. The checklists would be placed on containers at their point of origin To prevent the introduction of invasive species, MDA would ensure compliance with the Wake Island Biosecurity Management Plan (USAF, 2015) for all cargo shipped by air or barge to Wake Island. MDA would arrange for brown tree snake surveys for flat rack equipment and vehicles in Guam. Therefore, any short-term potential increase in sea and air traffic associated with the Proposed Action is not expected to increase the transportation of non-native pest species to the atoll.

Because the fresh water wash down of the THAAD and PATRIOT equipment would be allowed to percolate into the soil and would not reach the ocean or lagoon to affect coral, impacts would be not significant.

Flight Test Activities

Vegetation

Nominal launch activities are not expected to result in impacts to vegetation. Observations of vegetation at other launch locations indicate that vegetation continues to thrive in the immediate areas surrounding launch pads. Based on these observations and resultant analyses in the *Wake Island EA* (USASSDC, 1994b), the potential effects to vegetation from the proposed target missile launches are also expected to be minimal.

Wildlife

The Proposed Action is an operational test and because the test scenarios are representative of the threat, the actual test could occur at any time (day or night). The mission areas would be lit at night for safety and security but those safety/security lights would be the minimum necessary. To the extent practicable, consistent with mission requirements, MDA will incorporate USFWS lighting recommendations into project planning. There would not be any increase in the use of night-time lighting except for security measures. Any new lighting would be positioned low to the ground and be shielded, so that light from the shielded source cannot be seen from the beach.

Potential impacts could result from launch related activities such as launch noise and emissions. The impacts of noise on wildlife vary from serious to no impact in different species and situations. Behavioral responses to noise also vary from startling to retreat from favorable habitat. Animals can also be very sensitive to sounds in some situations and very insensitive to the same sounds in other situations. (Larkin, 1996) Noise from launches may startle nearby wildlife and cause flushing behavior in birds, but this startle reaction would be of short duration. Sufficient foraging and feeding habitat occurs in adjacent areas to accommodate potentially displaced wildlife.

Disturbance from equipment and temporary increase in personnel would be brief and would not be expected to have a significant adverse effect on resident wildlife species or migratory birds. The increased presence of personnel and vehicles immediately before a launch would tend to cause birds and other mobile species of wildlife to temporarily leave the area that would be subject to the highest level of launch noise. However, testing is usually short in duration and occurs within regularly used range areas. According to the *Wake Island Launch Center Supplemental EA* (USASMDC, 1999), several previous studies have shown that intermittent noises (other than noises 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. After an initial flushing, they will return to their nest or foraging site and may not be subsequently flushed by the same noise. Other wildlife also typically exhibits a momentary startle effect. While it is very unlikely that migratory birds would be close to the equipment during a test (the noise and number of personnel would likely cause birds to temporarily leave the area), MDA is working with the 611 CES on habitat management for the project areas and would work with the 611 CES on effective hazing techniques to move wildlife out of the area.

In terms of the potential for EMR impacts to wildlife, the power densities emitted from the THAAD radar are unlikely to cause any biological effects in animals or birds. The THAAD radar is not expected to radiate lower than 5 degrees, which would preclude EMR impacts to terrestrial species on the beach from either operation of the THAAD radar during flight tests or later during proposed tactical testing. The potential for main-beam (airborne) exposure thermal effects to birds exists. The potential for impacts to birds and other wildlife was addressed in the *Ground-Based Radar Family of Radars EA*. The analysis was based on the conservative assumption that the energy absorption rate of a bird's body was equal to its resting metabolic rate and that this could pose a potential for adverse effects. Birds in general typically expend energy at up to 20 times their resting metabolic rates during flight. Mitigating these concerns is the fact that radar beams are relatively narrow. To remain in the beam for any period requires that the bird flies directly along the beam axis, or that a hovering bird does so for a significant time. There is presently insufficient information to make a quantitative estimate of the joint probability of such an occurrence (beam stationary/bird flying directly on-axis or hovering for several minutes), but it is estimated to be insubstantial. Since birds are not likely to remain continuously within the radar beam, the likelihood of harmful exposure is not great. (U.S. Department of the Navy, 1998)

A launch mishap on the launch pad could impact wildlife species such as, migratory birds (red-tailed tropicbird, black-footed albatross, and the Laysan albatross), which nest within the LHA. However, because THAAD and PATRIOT are mature systems, the risk of a mishap is very remote. Implementation of launch safety procedures helps to minimize the potential for on-pad failure or explosion and thus minimize the potential for impacts to migratory birds. Additionally, MDA will work with the 611 CES assigned environmental manager to use active measures to drive birds away from the project area and to manage project area habitat to make it less attractive to nesting birds.

Based on MDAs experience with previous THAAD and PATRIOT interceptor launches at PMRF and USAKA/RTS and previous target launches at Wake and previous use of sensors such as the AN/TPY sensors on PMRF, USAKA/RTS and Wake, it is very unlikely that the activities associated with IFTs (the placement and operation of test assets described in the Proposed Action) would result in incidental takes of migratory birds. However, in the unlikely event that the Proposed Action, a military readiness activity as defined by 50 CFR 21.3, results in incidental takes of migratory birds authorized by 50 CFR 21.15, then MDA will notify the 611 CES assigned environmental manager who will document the take using a bird activity log and incorporate this information into the migratory bird monitoring protocols set out in the 2015 INRMP (USAF, 2015).

The MDA would notify the 611 CES assigned environmental manager of any dead or wounded birds in the project area or as a result of the proposed IFT activities. Based on previous THAAD and PATRIOT interceptor launches at PMRF and RTS and previous target launches at Wake and previous use of sensors such as the AN/TPY sensors on PMRF, RTS and Wake, it is very unlikely that the Proposed Action would result in incidental takes but MDA would notify the 611 CES assigned environmental manager. MDA, to the extent practicable, would employ active, non-lethal techniques, similar to those in the BASH plan, to frighten birds away from the LHA prior to launch.

An early flight termination or mishap could result in debris impact along the flight corridor, which may temporarily impact fishing activities by birds in the immediate area. A launch mishap could result in the unlikely, but possible, limited emission of nitric acid through release of the hypergolic bi-propellants in the Divert and Attitude Control System. Only a maximum of 1.9 L (0.5 gal) would be involved. The reaction of the acid with water could initially cause spattering, a localized increase in water temperature, and local lowering of the pH value. However, the low levels of emission combined with the natural buffering capacity of seawater would neutralize the reaction in a relatively short period of time. Due to the small amount of propellant involved and the unlikelihood of a mishap, the project is not anticipated to adversely affect marine resources. The potential ingestion of toxins by fish species, which may be used for food sources, would be remote because of the diluting effect of the ocean water and the relatively small area that would be affected. (USASMDC, 2002)

The LHA extends into the ocean area for several hundred feet where federally protected green and hawksbill sea turtles might be found. Of the internationally protected species, sea turtles and marine mammals would have the greatest risk, although remote, of incidental impact from a falling MQM booster or missile debris in the ocean close to Wake. The MQM booster is small and the likelihood of it striking a cetacean or sea turtle is remote since these species are widely scattered and spend most of their time below the surface. By the time the spent rocket motor impacted in the ocean, generally all of the propellants would be consumed and it would land in deep water well outside the reef. The likelihood that debris from a terminated launch would strike a sea turtle or marine mammal is remote since the potential for a launch mishap is small, any pieces of intercept debris would mostly be small, and these marine species tend to be widely scattered and spend most of their time at subsurface depths. For radars supporting integrated flight tests on Wake Island, the radar main beam would not radiate water or ground and the energy from any side lobes would be significantly less and would be very close to the radar face. Although sea turtle nesting is not known on Wake, any potential sea turtle nesting habitat is 5 km (3 mi) away from the project area and no test assets would be placed in areas of potential habitat.

The Proposed Action is not expected to have a lasting impact nor a measurable negative effect on the bird nesting area on the western end of Wilkes and Peale because the launches of targets and missiles are discrete events of short duration. The loud noise would only last for one or two seconds. Nominal launch activities would not affect sea turtle nesting habitat again because the launches associated with the Proposed Action are discrete events of short duration. Nominal launches are not expected to have a negative effect on nearby reefs since debris would be located further out in the open ocean. No test assets would be placed on or near the beach and no impacts to coral reefs are anticipated. The 611 CES will monitor and, in the unlikely event that flight test debris is found on the reef or beach or in the lagoon at Wake Atoll, such that recovery of the debris is possible, taking into consideration the health and safety of personnel performing the work, then MDA will coordinate recovery activities with the 611 CES. Personnel would not enter the water to recover flight debris. Water recovery, to the extent practicable, would be coordinated with the Wake Island Environmental Office. If debris is found to have washed ashore, the 611 CES assigned environmental manager would assess any damage and report the findings to MDA. These activities would result in impacts similar to, but less than, those caused by site preparation. Specific restoration actions, if any, would be determined on a case-by-case basis. Because of the programs in place at Wake to protect biological resources, impacts from the Proposed Action would be not significant.

Post Flight Test Activities

As part of the Proposed Action, personnel would remove all mobile equipment/assets brought to Wake and collect any trash or litter deposited on land during the flight test events in accordance with the INRMP for Wake Atoll (USAF, 2015).

Because of the programs in place at Wake to protect biological resources, impacts from the Proposed Action would be not significant.

4.3.1.2 No-action Alternative

Under the No-action Alternative, ongoing activities and programs would continue at Wake Atoll without the addition of the IFTs. The effects to biological resources would remain the same. There would be no additional impacts to biological resources from the No-action Alternative.

4.3.1.3 Cumulative Impacts

Adherence to the DTR, Wake Biosecurity Plan and standard procedures in place to minimize the introduction of invasive species would reduce the potential for cumulative impacts of these species to existing vegetation and wildlife.

The use of Wake Atoll to support BMDS testing has been analyzed in various NEPA documents starting nearly two decades ago. Each of the NEPA analyses have resulted in a FONSI, determining that the proposed actions of target and interceptor launches, missile intercepts, radar use, and other aspects of flight testing would not significantly affect the quality of the natural or human environment. The analyses in these environmental documents assessed the impacts of missile testing and radar use at a tempo of operation significantly higher than this Proposed Action. For example, the deployment and operation of a THAAD firing battery at Wake Atoll was first described in the *Final Wake Island Environmental Assessment (EA),* (U.S. Army Space and Strategic Defense Command, 1994b). That document described "…extended range tests of target missiles, defensive missiles, and sensor systems at Wake Island," and analyzed the impacts of 100 flight tests occurring at Wake Atoll over a 6-year period (1994-2000) with an average of 4 to 20 target missiles and interceptors launched each year. *The Theater High Altitude Area Defense (THAAD) Pacific Test Flights Environmental Assessment* (MDA, 2002) looked at the launch of up to 50 target missiles from either Wake Island or an island in the Republic of the Marshall Islands over a 4 year period (2005-2010). The use of land based and/or airborne mobile sensors was analyzed in the *Mobile Sensors Environmental Assessment* (MDA, 2005), assuming that land based mobile sensors, such as the THAAD radar, would be used up to 10 times per year at Wake Island. The launch of target missiles and placement of sensors such as AN/TPY-2 on Wake Island, along with intercepts over the BOA were analyzed in the *USAKA/RTS Integrated Flight Test Environmental Assessment* (MDA, 2012). These documents concluded that no substantial cumulative impacts to biological resources were expected from the continued use of Wake Atoll for missile launch programs and associated radar use. While implementation of the Proposed Action could have the potential to impact biological resources found on Wake Atoll, given that MDAs tactical footprint is less than 1 per cent of the available land mass and the majority of the footprint consists of existing launch pads and previously disturbed areas, it is very unlikely that substantial cumulative impacts will result. As shown in Figure 4-4, the total area of disturbance associated with the Proposed Action would not be significant and would not create a cumulative impact.

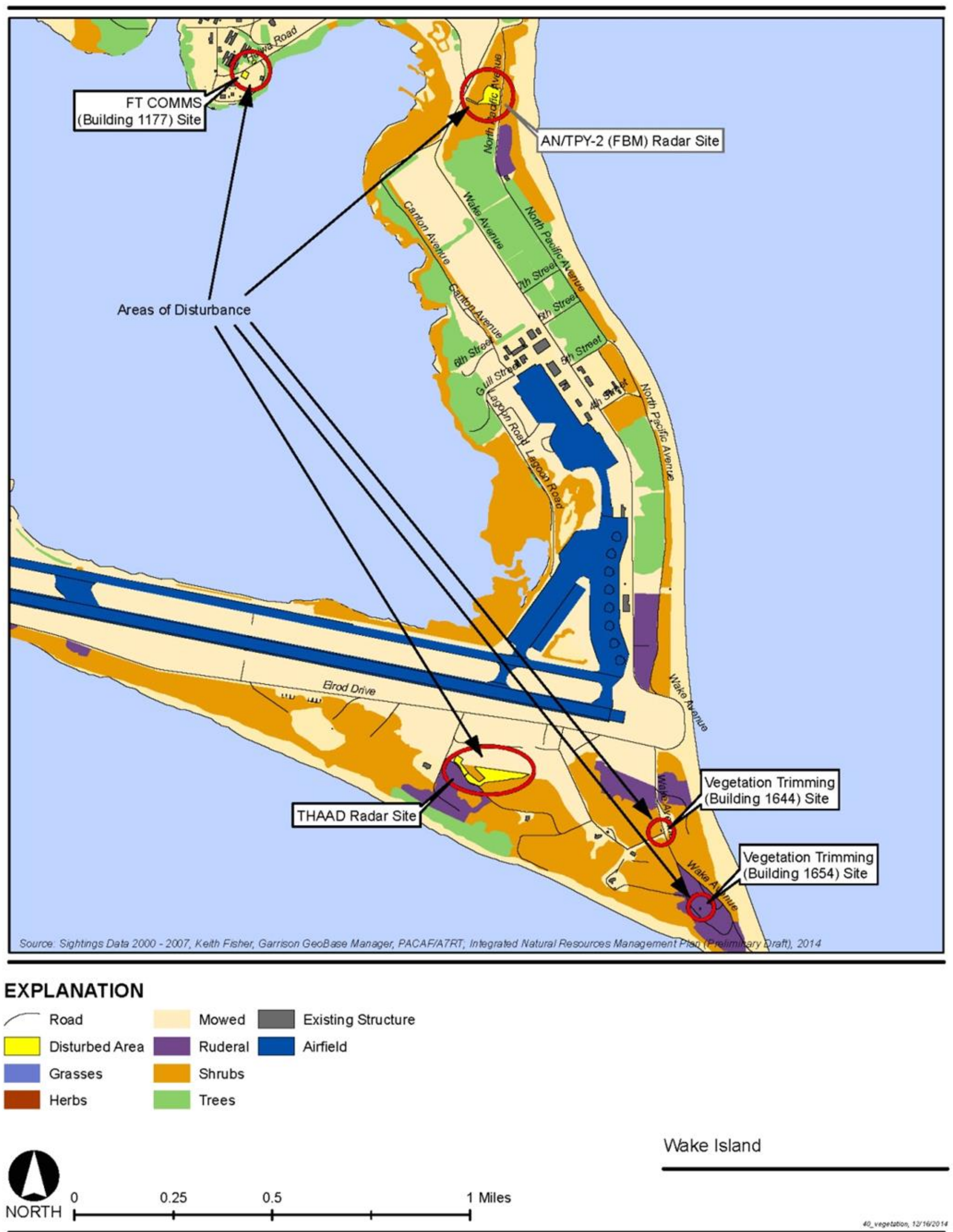

Figure 4-4 Cumulative Areas of Disturbance for the Proposed Action

No additional future projects are expected at Wake Atoll. No substantial cumulative impacts have been identified as a result of previous launches from Wake Island Launch Center.

4.3.2 BROAD OCEAN AREA

4.3.2.1 Proposed Action

Biosecurity to control the spread of alien invasive species in the BOA via target and intercept missiles is not necessary since there would be no living marine organisms on either of these assets, and even if there were, it would not be possible for any living organism to survive a test flight.

Vegetation

Debris resulting from missile intercepts is planned to fall into BOA or PRIMNM waters that have previously been analyzed for that purpose (MDA, 2004). This debris has the potential to impact phytoplankton in near surface ocean water. However, the potential loss of phytoplankton would be negligible due to enormous size of this resource, the low number of potential impacts, and the relatively small sizes of anticipated debris. The debris would consist of a few large pieces 4.5 to 45 kg (10 to 100 lbs), many medium pieces 4.5 kg (10 lbs or less), but mostly small lightweight fragments. The quantities of falling debris from the test intercepts would be very low and widely scattered**.** Momentum would carry the debris along the respective paths of the two missiles until the debris falls to earth. Such missile components would immediately sink to the ocean bottom.

Many small pieces of prescribed intercept debris may land in the PRIMNM. If an intercept was not successful, the target and interceptor missiles would continue flying on a ballistic path until they were destroyed by impact with the ocean surface, most likely in the BOA. The interceptor payload would be expected to land in the BOA outside of 200 nm from Wake Atoll. The target payload could possibly land in the PRIMNM. It is possible that some or all of debris from the destroyed target payload could be deposited on benthic vegetation in the PRIMNM, but potential impacts would likely be negligible due to the limited potential size of this resource on the seafloor (expected to be primarily near the top of some seamounts), the low number of potential event occurrences, and the relatively small sizes of anticipated debris.

In the case of air launched targets, parachutes would be used to deploy the target from the aircraft in preparation for actual target launch after separation from the aircraft. The parachutes may use a ring-slot design with multiple panel openings or a ribbon parachute made of a nylon/Kevlar composition. They would range from approximately 4.6 to 29 m (15 to 94 ft) in diameter. Air launched MRBM targets are held to an extraction pallet with a blanket made of nylon or similar material and is released from the pallet at a predetermined time after the target and its extraction pallet are pulled from the C-17 aircraft. The pallet and parachutes, which are weighted, then fall to the ocean surface and sink relatively quickly. The impact areas for the pallets and parachutes would be outside the boundaries of the PRIMNM.

For safety reasons, recovery of the parachutes is not possible. There is no safe method for personnel to recover the parachutes and pallets during an operational test. There likewise is no safe method to recover these items after they have sunk to ocean floor. If the parachutes were to fall in the PRIMNM, it would be the result of an unplanned event. If any protected vegetation resources were harmed, MDA would promptly coordinate with the Secretary of the Interior or Commerce, as appropriate, for the purpose of taking appropriate actions to respond to and mitigate any actual harm and, if possible, restore or replace the monument resource or quality as called for in the PRIMNM Proclamation.

Wildlife

Debris impacts and booster drops in the BOA are not expected to adversely affect cetacean and sea turtle species protected under the MMPA and the ESA. Any boosters would expend all fuel prior to dropping into the BOA beyond 200 nm of Wake Atoll. Boosters and individual pieces of debris from ballistic missile intercept tests are dispersed over a large area and these sensitive marine species are widely scattered. Thus, it is very unlikely that a cetacean or sea turtle would be within the area to be impacted by falling debris and boosters. While a direct hit from a piece of debris would likely injure or kill a sea turtle or marine mammal at the surface, these animals spend most of their time in mid-water depths and are expected to be at or very near the surface of the water for only relatively small amounts of time. The velocity of sinking debris is expected to be substantially reduced after hitting the water's surface. It is possible that some fish, squid, or other pelagic species may be injured or killed if present at the initial point of large debris contact with the ocean surface, but it is unlikely that the smaller pieces of sinking debris would have sufficient velocity to harm individual organisms. Thus, the probability of cetaceans, sea turtles, fish or other pelagic organisms being struck by debris is considered remote (MDA, 2002).

In a successful intercept, both missiles would be destroyed by the impact over the PRIMNM. The potential ingestion of toxins, such as the small amount of propellant or simulant remaining on pieces of missile debris, by sea turtles, marine mammals, fish or squid, which may be used as food by cetaceans, would be remote because of (1) atmospheric dispersion, (2) the diluting and neutralizing effects of seawater, and (3) the relatively small area that could potentially be affected. The same is true for boosters falling into the BOA. By the time spent rocket motors impact in the ocean, all of the propellants in them would have been consumed. Any residual aluminum oxide, burnt hydrocarbons, or propellant materials are not expected to present toxicity concerns.

In an evaluation of the effects of rocket systems that are deposited in seawater, the National Aeronautics and Space Administration concluded that the release of hazardous materials carried onboard launch vehicles would not significantly impact marine life. Materials would be rapidly diluted in the seawater and, except for the immediate vicinity of the debris, would not be found at concentrations that produce adverse effects (U.S. Department of the Navy, 1998).

An early flight termination or mishap could result in debris impact along the flight corridor, which may temporarily impact fishing activities by birds in the immediate area. A mishap could result in the unlikely, but possible, limited emission of nitric acid through release of the hypergolic bi-propellants in the Divert and Attitude Control System. Only a maximum of 1.9 L (0.5 gal) would be involved. The reaction of the acid with water could initially cause spattering, a localized increase in water temperature, and local lowering of the pH value. However, the low levels of emission combined with the natural buffering capacity of seawater would neutralize the reaction in a relatively short period of time. Due to the small amount of propellant involved and the unlikelihood of a mishap, the project is not anticipated to adversely affect marine resources in the BOA. The potential ingestion of toxins by fish or other species, which may be used for food sources, would be remote because of the diluting effect of the ocean water and the relatively small area that would be affected (USASMDC, 2002).

All proposed activities conducted in the PRIMNM would be performed in a manner that avoids, to the extent practicable and consistent with training requirements, adverse impacts on Monument resources and qualities in accordance with Presidential Proclamations 9173 and 8336.

As mentioned, if a pallet or parachutes were to fall into the PRIMNM, it would be the result of an unplanned event. Falling pieces of large debris, including pallets and parachutes, have the potential to impact potentially important colonies of deep-water corals and other resources on seamounts in the PRIMNM and BOA .The risk of this happening is greatest when missile test trajectories are aligned above such seamounts. When feasible and to the extent practicable, consideration will be given to alterations in missile flight trajectories to further minimize the potential for debris impacts to seamounts in the PRIMNM. If any protected seamount resource, including deep-water corals were harmed, MDA would promptly coordinate with the Secretary of the Interior or Commerce, as appropriate, for the purpose of taking appropriate actions to respond to and mitigate any actual harm and, if possible, restore or replace the monument resource or quality as called for in the PRIMNM Proclamation.

The proposed activities include interceptor and targets launched from Wake and the BOA. These activities could result in an increase in sound events. In addition to aircraft noise, instantaneous sounds over the BOA, such as low level sonic booms, may accompany the proposed missile launches. While the supersonic flight of missiles generates sonic booms, the size, design, and trajectory of interceptors limits the magnitude of the sonic boom generated. In the case of the Proposed Action, the magnitude of the sonic boom is not expected to be loud. Estimates of sound pressures for much larger missiles than those which will be used in the Proposed Action are less than 149 dB in air and less than 175 dB re 1 µPa in water at the ocean surface (USAF, 2006). The peak pressures for missile flights over the BOA for the Proposed Action are likely to be less than these estimates and very short duration. Therefore, noise impacts on wildlife in the BOA would not be significant.

Missile intercept tests by their very nature involve some degree of risk and it is for this reason that MDA has specific safety policies and procedures to ensure that any potential risks to significant biological resources are minimized. Should cetaceans or sea turtles be observed during prelaunch survey flights of the hazard area, flight tests would be delayed until these species vacate the area. Because of the factors mentioned above and the procedures in place to protect biological resources in the BOA, impacts to wildlife in the BOA from the Proposed Action would be not significant.

4.3.2.2 No-action Alternative

Under the No-action Alternative, ongoing activities and programs would continue at Wake Atoll without the addition of the IFTs. The effects to biological resources would remain the same. It is unlikely that a direct hit from a piece of missile test debris would impact a sea turtle or marine mammal at the water's surface, test activities would have minimal effects on fish, and potential impacts on potentially important deep-water corals and other resources would be very limited. In addition, safety and test policies and procedures would be followed to ensure that any potential risks to sensitive species would are minimized. Therefore, no additional impacts to biological resources from the No-action Alternative would be expected.

4.3.2.3 Cumulative Impacts

No substantial impacts to the BOA and associated wildlife have been identified from current and past missile test activities. Prior analyses have not identified a significant potential for cumulative impacts (MDA, 2002, 2012). Although MDA IFT activities would take place in the BOA, these would be discrete, short-term events and cumulative impacts would be not significant.

4.4 CULTURAL RESOURCES

4.4.1 WAKE ATOLL

4.4.1.1 Proposed Action

There are no known prehistoric or traditional resources sites identified on Wake Island (U.S. Army Space and Strategic Defense Command, 1994b; Jackson, 1996; Burgett and Rosendahl, 1990) and historic military resources will be protected in accordance with the Wake Island HPP (Jackson 1996). Activities would take place within previously developed post-World War II areas in accordance with NHPA, and specific historic features would be avoided. Given the military history of Wake, there is potential for unexpected cultural remains to be encountered. Project personnel would be informed during the routine site preparation activities briefing regarding the significance of these types of resources and the penalties associated with their disturbance or collection. If, during the course of program activities, prehistoric, historic, or traditional cultural materials, particularly human remains, are unexpectedly discovered (e.g., during vegetation removal, site leveling for the AN/TPY-2 radar, emplacement of lightning protection poles or grounding rods), activities in the immediate vicinity of the find would be halted, and the Wake Atoll environmental coordinator would be notified.

Because of the programs in place at Wake to protect cultural resources, impacts from the Proposed Action would be not significant. On December 22, 2014, the Alaska SHPO determined no historic properties would be adversely affected by the Proposed Action. (Appendix A)

4.4.1.2 No-action Alternative

No ground disturbance activities other than those routinely conducted on Wake Island would happen if the No-action Alternative were selected by the proponent. Therefore, no impacts to cultural resources would result.

4.4.1.3 Cumulative Impacts

When reviewed against ongoing and reasonably foreseeable actions at Wake Atoll, the proposed activities associated with this EA would have no appreciable cumulative effects on cultural resources. The demolition of building 1644 was reviewed in August 2014, by the Alaska SHPO who agreed that the undertaking would not affect historic properties. All work would be performed by the AF Base Operation and Support contractor, who is familiar with, and would follow all Wake Atoll procedures for site preparation. Cumulative impacts to cultural resources from the Proposed Action in conjunction with other Wake Island projects would be not significant.

4.4.2 BROAD OCEAN AREA

4.4.2.1 Proposed Action

No adverse effects are anticipated. There are no known marine cultural resources (e.g., shipwrecks) within the areas of the BOA beneath the proposed IFT paths. Average ocean depths within these areas are approximately 3,900 m (12,900 ft), and any unidentified resources at that depth would have a very low probably of being affected by impacts from missile components or debris during planned activities or abnormal flight termination. Any impacts as a result of the Proposed Action would be not significant.

4.4.2.2 No-action Alternative

Under the No-action Alternative, ongoing activities and programs would continue in the BOA without the addition of the IFTs. The effects to any cultural resources would remain the same. The impacts to cultural resources from the No-action Alternative would be not significant.

4.4.2.3 Cumulative Impacts

The presence of additional personnel on the island has the potential to impact cultural resources because of recreational activities and incidental collecting of archaeological and historical resources while on the island. However, with the training programs for visiting personnel, the cumulative impacts to any cultural resources in the BOA would be not significant.

4.5 GEOLOGY AND SOILS

Wake Atoll is not known to be volcanically or seismically active. However, due to its location, and low-lying geography, the atoll is subject to tsunamis caused by earthquakes occurring in the Pacific Rim region. Tsunami height and energy are minimized by the small or lacking shallow offshore shelf at Wake Atoll.

4.5.1 WAKE ATOLL

4.5.1.1 Proposed Action

Site Preparation Activities

Site preparation for life support area activities from the Proposed Action would make the selected sites more prone to erosion; implementation of best management practices would resolve the potential for erosion and sedimentation. Soil disturbance for site preparation would not be considered an impact since the soil is poor. No flooding, mass wasting, mineral resource consumption, contamination, or alternative land uses would result to geology or soils from the Proposed Action.

The movement of the interceptors and targets and the placement of portable sensors on pre-existing launch sites on Wake are not expected to result in any increase in soil erosion. Spill prevention measures would be followed to minimize the potential for soil contamination.

Flight Test Activities

No adverse changes to soil chemistry are predicted to occur as a result of solid rocket motor emission products deposited on the soil. Deposition of these materials is expected to be minimal because they disperse in the air. Any emission products falling on the land would be buffered by contact with the calcium carbonate soil material.

Post Flight Test Activities

Adverse impacts to soils, other than slight compaction, are unlikely to occur as a result of the removal of all mobile equipment/assets brought to the range. Spill prevention measures would be followed to minimize the potential for soil contamination.

Impacts to geology and soils as a result of the Proposed Action would be not significant.

4.5.1.2 No-action Alternative

Implementation of the No-action Alternative would mean IFT facilities and equipment would not be constructed or operated on Wake Atoll. Any impacts to geology or soils from the No-action Alternative would be not significant.

4.5.1.3 Cumulative Impacts

The site for the life support area has been used for the same purpose for previous projects on Wake, with no significant impacts. An AF Form 813 determined the life support area qualified for a categorical exclusion and there was no impact to the environment. No other future projects are currently planned in the area of the Proposed Action. Therefore, cumulative impacts expected from the Proposed Action in concurrence with other activities would be not significant.

No cumulative adverse effects to soils are anticipated from program activities. Emission products from nominal launches would be rapidly buffered by the soil. Hazardous byproducts from any spill would be removed and any residual accumulation of nitrogen compounds would be ultimately washed out to sea or taken up by plants. Any cumulative impacts to geology or soils would be not significant.

4.5.2 BROAD OCEAN AREA

Proposed IFT activities would involve pieces of debris that can sink, but impacts to the ocean floor would be not significant.

4.6 HAZARDOUS MATERIAL AND WASTE

4.6.1 WAKE ATOLL

The IFT activities on Wake would require use of diesel fuel and lubricants for the operation of the radar. Radar components would be brought to Wake Island as the initial arrival point and transported to the two radar sites. The THAAD activities on Wake would require the use of diesel fuel and lubricants for the operation of the radar generators, solid propellant for the missile/inceptor liftoff, and small quantities of motor oil and/coolant would be generated through normal operations. All fuel handling areas will include secondary containment. The Proposed Action would adhere to the WIA SPCC Plan that is an appendix to the INRMP (USAF, 2015)

4.6.1.1 Proposed Action

The solid propellants associated with the Proposed Action would be similar to past missile systems launched from Wake and would follow the same hazardous materials and hazardous waste handling procedures developed under existing plans described in the affected environment. The types of hazardous materials used and hazardous waste generated would be similar to current materials and would not result in any procedural changes to the existing hazardous materials and hazardous waste management plans currently in place.

Generators would be fueled in accordance with Wake standard operating procedures and applicable management plans. The diesel fuel storage tanks would have secondary containment in accordance with the WIA SPCC Plan. (USAF, 2015)

During launches of the THAAD missile there is the potential for a mishap to occur, resulting in potentially hazardous debris and propellants falling within the ground hazard area. As addressed for similar launch programs at other launch sites, the hazardous materials that result from a flight termination or mishap would be cleaned up, and any contaminated areas would be remediated in accordance with existing emergency response plans and hazardous materials and hazardous waste plans. All hazardous waste generated in such a mishap would be disposed of in accordance with appropriate federal regulations. Overall, no adverse impacts would result from hazardous materials used or hazardous waste generated under the Proposed Action.

The operation of the radars on Wake would require use of diesel fuel to operate the two PPUs. The C2BMC would receive shore power; therefore, the operation of the C2BMC would not further impact the hazardous material and waste management for Wake.

Minimal quantities of hazardous waste would be produced by operating the AN/TPY-2 on Wake. These materials are similar to waste already generated and handled at Wake. Management of this hazardous waste is the responsibility of the MDA IFT 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 any impacts from hazardous material and waste would be not significant.

4.6.1.2 No-action Alternative

Implementation of the No-action Alternative would mean interceptor launches would not occur on Wake Atoll. No additional impacts to hazardous material or waste would occur from the No-action Alternative.

4.6.1.3 Cumulative Impacts

Hazardous materials used and any hazardous waste generated would be very similar to materials and waste presently generated on Wake Island. All materials would be stored and handled according to appropriate health and safety procedures, and all hazardous waste generated during the operation would be handled in accordance to applicable regulatory requirements. Cumulative impacts to hazardous materials and hazardous waste would be not significant.

4.6.2 BROAD OCEAN AREA

The Proposed Action is not anticipated to produce an accumulation of hazardous material or waste in the BOA; therefore, no impacts are anticipated to the BOA.

4.7 HEALTH AND SAFETY

For the Proposed Action for the Wake Island IFT program, workers (including both military personnel and contractors) would be required to comply with applicable USAF and OSHA regulations and standards. Because best management practices would be followed during IFT proposed activities, the personnel on the island would not be exposed to health and safety risks. Consequently, no significant impacts to health and safety are expected.

Based on the above safety precautions that the IFT program would implement as part of the Proposed Action, no significant impacts to safety and occupational health are expected.

4.7.1 WAKE ATOLL

4.7.1.1 Proposed Action

Site Preparation Activities

Target preflight activities, including the transportation and storage of potentially hazardous materials, are considered to be routine operation and would be conducted in accordance with applicable USAF and OSHA health and safety regulations. No substantial health and safety impacts are expected.

Flight Test Activities

Missile launch operations within the military have been conducted for many years. Safety requirements have been developed based on USAF and other applicable health and safety regulations. While there will be risks associated with launch activities, the use of standard safety procedures minimizes the risks. The probability for a launch mishap is very low.

All operational activities at the Wake Island Launch Center are subject to USAF health and safety regulations. These governing regulations include Air Force Policy Directive 92-2, *Safety Programs*, Air Force Guidance Memorandum to Air Force Instruction 91-203, *Air Force Consolidated Occupational Safety Instruction*, Air Force Instruction 91-202, *The US Air Force Mishap Prevention Program*, and DoD Instruction 6055.1, *DoD Safety and Occupational Health*. The current safety program at Wake is administered through two BOS departments: safety health issues such as chemical exposure and other hazards. The missile safety program is provided by USAKA/RTS.

The EMR and radio frequency from radars can potentially impact aircraft equipment and people (in airplanes or helicopters). MDA followed the procedures in FAA Notification 8110.71, "Guidance for the Certification of Aircraft Operating in a High Intensity Radiation Field (HIRF) Environment," to calculate a 3,000 m (10,000 ft) keep out zone for aircraft (6,000 m [20,000 ft] for aircraft with ordnance). MDA notes that this distance is extremely conservative because it neither accounts for how a phased-array, X-band radar works nor how MDA would use the radar to track a satellite or missile. For radars supporting IFTs on Wake Island, the radar main beam would not radiate water or ground and the energy from any side lobes would be significantly less and would be very close to the radar face. Specifically, phased-array radars do not have a single beam of energy; rather, they have tens of thousands of diodes that emit brief, discrete “points” of EMR. The radar then stops emitting and “listens” for the EMR to bounce off an object of interest. The process of emitting and listening continues as the radar operates. (MDA, 2005)

In addition, MDA would be using the AN/TPY-2 radar to track moving objects (satellites and missiles); therefore, the area in which the radar is looking would continue to change as the object being tracked moves across the sky, whereas, the health based standard for protecting people from EMR is based on continuous exposure averaged over 15 minutes[1]. Thus, neither airplanes (including those with open cockpits) nor helicopters are likely to remain continuously within the radar “beam” long enough to be affected. Nonetheless, MDA would work with the USAF and FAA to establish temporary flight restrictions and would issue NOTAMs to inform pilots of planes and helicopters from entering the keep out zone established for aircraft with ordnance (6,000 m [20,000 ft]). (MDA, 2005)

At radar unit operational locations at Wake Island, hazards associated with the Proposed Action would be limited to worker exposure to radio frequency radiation. The radar-related activities would only represent a small increase in the potential safety risk at Wake Island.

The missile range extending from Wake toward USAKA/RTS is under USAKA/RTS jurisdiction. USAKA/RTS Range Safety Manual procedures are applied to missile flight operations such as the interceptor and target launches from Wake. Requirements include presentation of a complete flight performance analysis to the Safety Office of all proposed operations and identification of all potential hazards to the range.

The LHA would be established around the rail launcher that represents the footprint of maximum hazard associated with debris impact and explosive overpressure. Essential personnel would remain within facilities rated to provide adequate blast and debris catastrophic missile failure.

Therefore, no health and safety impacts are anticipated from the interceptor and target launches.

MDA IFT activities would involve hazards, but these activities are considered to be a routine and performed in a safe manner. During missile fueling, personnel would be required to wear appropriate protective clothing. In the event of an accident, there is the potential for hazards associated with debris impact, explosion, and release of potentially toxic combustion products. In accordance with the Range Safety Manual, an LHA would be established around the launch facility. Any essential personnel inside this area would remain within facilities rated to provide adequate blast protection. All non-essential personnel would be evacuated to outside the impact limit line. Therefore, the risk of a health and safety impact resulting from such a failure is not considered substantial.

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[1] Although the Institute of Electrical and Electronics Engineers C95.1-2005 Standard for safety levels with respect to human exposure to radio frequency electromagnetic fields is $10W/m^2$, MDA used $5W/m^2$. Typical calibration events using satellites last approximately three minutes or less. (MDA, 2005)

Post Flight Activities

No health and safety impacts are expected from the removal of mobile equipment/assets brought to the range for MDA IFT activities. Removal activities would be considered routine and would be conducted under a standard of care considered appropriate for such procedures.

With the existing Range Safety controls in place and other required safety measures, impacts to health and safety would be not significant.

4.7.1.2 No-action Alternative

Implementation of the No-action Alternative would mean launches of interceptors would not occur on Wake Atoll. No impacts to health and safety would occur from the No-action Alternative.

4.7.1.3 Cumulative Impacts

The increased use of fuels, explosives, and the performance of other launch and radar-related activities would represent a small increase in the potential safety risk at Wake. No cumulative impacts to health and safety are predicted as a result of MDA IFT activities.

4.7.2 BROAD OCEAN AREA

4.7.2.1 Proposed Action

Every reasonable precaution is taken during the planning and execution of test and development activities to prevent injury to human life or property. Each test range conducts missile flight safety, which includes analysis of missile performance capabilities and limitations, of hazards inherent in missile operations and destruct systems, and of the electronic characteristics of missiles and instrumentation. It also includes computation and review of missile trajectories and hazard area dimensions, review and approval of destruct systems proposals and preparation of the Range Safety Approval and Range Safety Operational Plans required of all programs.

Impact zones in the BOA would be delineated. The location and dimensions of the impact zones would vary for each test flight scenario. Impact zones for each test flight would be determined by range safety personnel based on detailed launch planning and trajectory modeling. This planning and modeling would include analysis and identification of a flight corridor. Flights would be conducted when trajectory modeling verifies that flight vehicles and debris would be contained within predetermined areas, all of which would be over the open ocean and far removed from land and populated areas. Appropriate NOTMARs and NOTAMs would be issued before proceeding with a launch.

Furthermore, prior warning of flight testing and training would enable commercial shipping to follow alternative routes away from test areas. Safety programs as described in section 2.2.1.1 would include ground safety for general operations and flight safety for the protection of Wake personnel and traffic in areas where tests are being conducted. Each mission would have an approved flight safety plan that would define the areas affected by the mission, the caution and hazard areas, and precautions to protect inhabited. Flight safety plans would also include requirements for warning messages, evacuation, and surveillance. Missions affecting the BOA would require the implementation of current range safety measures, such as aircraft and ship clearance for the caution area. NOTAMs and NOTMARs would be published as required.

Consequently, impacts to public health and safety in the BOA from the Proposed Action would be not significant.

4.7.2.2 No-action Alternative

Implementation of the No-action Alternative would mean IFTs would not occur in the BOA. No impacts to health and safety would occur from the No-action Alternative

4.7.2.3 Cumulative Impacts

Each launch would result in the impact of boosters and the payload into the open ocean. The Proposed Action would result in a temporary increase in missile activities in the BOA. As such, there could be a cumulative impact to health and safety in the BOA. However, the Proposed Action also requires the administration of NOTAMs and NOTMARs to warn aircraft and surface vessels of the potentially hazardous areas and allows them ample time to avoid the hazards. As such, any cumulative health and safety impact in the BOA due to the Proposed Action would be not significant.

4.8 INFRASTRUCTURE

4.8.1 WAKE ATOLL

The use of infrastructure facilities at Wake for launch activities have been analyzed in previous documents (*i.e., Wake Island Launch Center Supplemental EA*, 1999; *MDA Wake Island Supplemental EA*, 2007) and both concluded no cumulative impacts to infrastructure and transportation would be expected from implementing launch test activities. Because the IFT activities only use a small portion of Wake Island and for only a few weeks at a time, no impacts are anticipated from the Proposed Action; therefore, this resource was not analyzed for Wake Island.

4.8.2 BROAD OCEAN AREA

Infrastructure is not applicable to the BOA; therefore, this resource was not analyzed for this location.

4.9 LAND USE

The Proposed Action would not alter the current land use pattern for Wake. The use of the facilities for the placement of radar, missile and target launcher is a normal operation. No impacts are anticipated from the Proposed Action; therefore, this resource was not analyzed for Wake Island.

4.10 NOISE

Short- and long-term minor adverse impacts would be expected from the Proposed Action. Impacts would be related to site preparation activities and the maintenance and operation of primary and backup power generators.

Individual pieces of site preparation equipment typically generate short-term noise levels of 80 to 90 dBA at a distance of 15 m (50 ft) (USEPA, 1974). With multiple items of equipment operating concurrently, noise levels can be relatively high during daytime periods at locations within a few hundred feet of site preparation activities. The zone of relatively high noise levels typically extends to distances of 122 to 244 m (400 to 800 feet) from the site of major equipment operations. However, there are no public residences or sensitive receptors within a mile of the site; therefore, these effects would be negligible and not significant. Noise may be audible but not annoying. Proposed site preparation and demolition activities would comply with existing standards and regulations.

Personnel in the immediate vicinity of site preparation activities where noise levels approach 70 dB would utilize proper ear protection to protect their hearing. Site preparation workers and base personnel would comply with the USAF Hearing Conservation Program requirements and other applicable occupational health and safety regulations.

Because of the continuous operation of the diesel-powered generators, hearing protection would be required for personnel at all times while inside the power generation plant. All facilities associated with the IFT operations would adhere to the requirements of USAF Occupational Safety and Health Standard 48-20, Occupational Noise and Hearing Conservation Program.

4.10.1 WAKE ATOLL

4.10.1.1 Proposed Action

THAAD Launchers and AN/TPY-2 (TM and FBM)

The *Theater Missile Defense ETR EIS* (U.S. Army Space and Strategic Defense Command, 1994a) concluded that up to 48 defensive missile launches per year would not result in significant noise impacts. Potential noise impacts from the launches of strategic launch vehicles and the operation of their support equipment on Meck Island were also addressed in the USAKA Final Supplemental EIS (U.S. Army Space and Strategic Defense Command, 1993). The EIS concluded that the resulting sound pressure levels would not cause workplace standards to be violated or sensitive receptors, such as nursing homes or schools, to experience maximum short-term noise levels greater than 92 dB. Noise from the PPU would be approximately 85 dBA 30 m (98 ft) from the truck and thus would not impact sensitive noise receptors. Noise levels of 92 dB would be experienced approximately 7.2 km (4.5 mi) away from the THAAD launch site for one or two seconds. For comparison purposes, Table 4-5 lists the noise levels of typical equipment. For example, a heavy truck has a noise level of 95 dBA (3 dBA higher than a defensive missile), and, if a person is standing 15 m (50 ft) away from the heavy truck, the noise level perceived drops to between 84-89 dB. Sensitive noise receptors are located beyond this noise contour and thus would not be affected.

Table 4-5: Typical Equipment Noise Levels

Source	Noise level (peak [dB])	Distance from Source			
		15 m (50 ft)	30 m (100 ft)	60 m (200 f)	120 m (400 ft)
Generator	96	76	70	64	58
Fork Lift	100	95	89	83	77
Loader	104	73-86	67-80	61-74	55-68
Crane	104	75-88	69-82	63-76	55-70
Heavy Trucks	95	84-89	73-83	72-77	66-71
Grader	108	88-91	82-85	76-79	70-73
Dozer	107	87-102	81-96	75-90	69-84

Source: Golden et al., 1980, as presented in MDA, 2012.

The operation of the radar system on Wake Island is a normal activity. As concluded in the *MDA Wake Island Supplemental EA*, with the high ambient noise levels from wind and surf, additional noise generated would be negligible. Therefore, impacts from the Proposed Actions would be not significant.

4.10.1.2 No-action Alternative

Implementation of the No-action Alternative would not add noise sources or activities to Wake Atoll. There would be no impacts to noise or noise management from the No-action Alternative.

4.10.1.3 Cumulative Impacts

The operation of the additional generators as part of the Proposed Action would incrementally increase the noise impacts on Wake. Implementation of existing SOPs for noise protection at the new power generation areas would ensure no additional impacts to personnel. Cumulative noise impacts that would occur from the Proposed Action in combination with existing noise sources at Wake Island would be not significant.

4.10.2 BROAD OCEAN AREA

4.10.2.1 Proposed Action

Flight and Post Flight Activities

The proposed activities include interceptor and targets launched from Wake and the BOA. These activities could result in an increase in sound events. These increases would contribute a negligible level of increased sound; however, they would occur in the BOA where typically no sensitive sound receptors are present.

Additional instantaneous sounds over the BOA, such as low level sonic booms, may accompany the proposed missile launches, as is the case for current operations. While the supersonic flight of missiles generates sonic booms, the size, design, and trajectory of interceptors limits the magnitude of the sonic boom generated. In the case of the Proposed Action, the magnitude of the sonic boom is not expected to be loud, and is not expected to impact populated areas. Therefore, noise impacts in the BOA would be not significant.

4.10.2.2 No-action Alternative

Implementation of the No-action Alternative would not add noise sources or activities to the BOA. The impacts to noise or noise management from the No-action Alternative would be not significant.

4.10.2.3 Cumulative Impacts

No substantial impacts to the BOA and its wildlife from program noise have been identified from current and past missile test activities. Prior analysis has not identified a significant potential for cumulative noise impacts. Test flight activities that would take place in the BOA would be discrete, short-term events, and any cumulative impacts would be not significant.

4.11 SOCIOECONOMICS

4.11.1 WAKE ATOLL

Because of Wake's location, lack of a native population, and occupation by military and contractor personnel, socioeconomics issues are not a factor; therefore, this resource was not analyzed for Wake.

4.11.2 BROAD OCEAN AREA

There are no known commercial fishing areas or commercial shipping routes in the vicinity of the Proposed Action; therefore, this resource was not analyzed for this location.

4.11.3 CUMULATIVE IMPACTS

There are no known additional actions proposed that would add or remove jobs from Wake Atoll at this time. Therefore, the cumulative impacts to socioeconomics from the Proposed Action would be not significant.

4.12 VISUAL AESTHETICS

4.12.1 WAKE ATOLL

4.12.1.1 Proposed Action

The facilities for the Proposed Action would occur only on Wake Island and would be similar to existing facilities. Impacts to visual aesthetics would be not significant.

4.12.1.2 No-action Alternative

There would be no change to the facilities on Wake Atoll under the No-action Alternative. Therefore, no impacts would result to visual aesthetics.

4.12.1.3 Cumulative Impacts

The Proposed Action would add additional buildings and equipment but would not change the overall visual aesthetics of Wake Atoll. The impact of demolition of building 1644 in the summer of 2014 was not significant. No other current or future projects are anticipated at this time that would create a cumulative impact on visual aesthetics in concert with the Proposed Action.

4.12.2 BROAD OCEAN AREA

4.12.2.1 Proposed Action

The Proposed Action is not anticipated to alter the scenic quality of the BOA.

4.12.2.2 No-action Alternative

There would be no change to the BOA under the No-action Alternative. Therefore, no impacts would result to visual aesthetics.

4.12.2.3 Cumulative Impacts

Because the Proposed Action is not expected to alter the scenic quality of the BOA, there would not be a cumulative impact to visual resources in the BOA.

4.13 WATER RESOURCES

4.13.1 WAKE ATOLL

No impacts are anticipated from the Proposed Action; therefore, this resource was not analyzed for Wake.

4.13.2 BROAD OCEAN AREA

4.13.2.1 Proposed Action

This section addresses the potential impacts to water resources (e.g., physical and chemical properties, salinity, density, temperature, pH, dissolved gases marine pollutants) due to the Proposed Action.

Flight and Post Flight Activities

The possibility of water pollution is associated primarily with toxic materials, which may be released to and are soluble in the water environment. Rocket propellants are the dominant source of such materials, although consideration must be given also to soluble materials originating from hardware and miscellaneous materials and to certain toxic combustion products. Solid propellants are primarily composed of plastics or rubbers such as polyvinylchloride, polyurethane, polybutadiene, polysulfide, etc., mixed with ammonium perchlorate. The plastics and rubbers are generally considered nontoxic and, in the water, would be expected to decompose and disperse at a very slow rate. No substantial effects on seawater quality due to solid fuel emissions, solid fuel debris, or their residuals in missile debris are expected because these would mostly be consumed during the activity. In the event that not all of the solid propellant is burned, the hard rubber-like solid fuel would dissolve slowly. The small amount of any potential toxic materials would be rapidly dispersed to nontoxic levels by ocean currents. (Fournier and Brady, 2005)

The activities associated with the Proposed Action would not introduce new types of expended materials or debris in the BOA. The impacts from the Proposed Action in the BOA would be not significant.

4.13.2.2 No-action Alternative

There would be no change to the BOA under the No-action Alternative. Therefore, no impacts would result to water resources.

4.13.2.3 Cumulative Impacts

No cumulative effects to water resources are anticipated as a result of the Proposed Action. The effect of any electric generator or rocket motor emission products deposited in the BOA would be very transient due to the buffering capacity of sea water and dilution by current mixing and any cumulative effects with ongoing BOA activities would be not significant.

4.14 ENVIRONMENTAL EFFECTS OF THE NO-ACTION ALTERNATIVE

Under the No-action Alternative, MDA would not conduct interceptor launches described in the Proposed Action to demonstrate regional BMDS ability to defeat up to five near-simultaneous targets in an operationally-relevant scenario at Wake Atoll. There would be no additional impacts to the environment based on the No-action Alternative.

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

Proposed activities would be conducted in a manner that would not substantially affect human health and the environment and would not create Environmental Justice concerns. No native population resides at Wake, which is occupied by military and contractor personnel. This EA has identified no effects that would result in disproportionately high or adverse effect on minority or low-income populations in the area. The activities also would be conducted in a manner that would not exclude persons from participating in, deny persons the benefits of, or subject persons to discrimination because of their race, color, national origin, or socioeconomic status.

4.16 FEDERAL ACTIONS TO ADDRESS PROTECTION OF CHILDREN FROM ENVIRONMENTAL HEALTH RISKS AND SAFETY RISKS (EXECUTIVE ORDER 13045, AS AMENDED BY EXECUTIVE ORDER 13229)

This EA has not identified any environmental health and safety risks that may disproportionately affect children, in compliance with EO 13045, as amended by EO 13229.

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Appendix A

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12-22-14

3130-1R USAF

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Ms. Judith Bittner
AK State Historic Preservation Office
550 W 7th Ave Ste 1310
Anchorage, AK 99501

Re: MDA Tests at Wake Island (entire project)

Dear Judy,

The Missile Defense Agency (MDA) is planning tests at Wake Island to take place in 2015 and possibly in future years. The undertaking consists of several use areas, and cumulative effects, but the areas are chosen in part to avoid effects to known National Historic Landmark features at Wake Atoll. There may be trenching in some areas to lay limited amounts of utilities for temporary housing. I visited Wake Island with the MDA team in August 2014 to view areas where MDA hoped to locate facilities. Facilities are better described in the *Coordinating Draft Environmental Assessment Integrated Flight Tests at Wake Atoll* (CDEA), sent to your office by email.

Map 1 shows the areas of principle activities and activities for the 2015 and other upcoming tests. This map shows the area of the THAAD storage and launch area at the southeast point of Wake Island, aka "Peacock Point". The launch facilities take place on previously paved areas in the MDA area of Wake. The launch area is not illustrated on a separate map.

Map 2 shows the locations of most National Historic Landmark features, primarily concrete and coral defense features from World War II.

Maps 3 and 4 show areas used for the THAAD radar, cameras, building 1615 and other temporary facilities associated with THAAD testing. This area is shown on map 1 as THAAD radar and CNET Café. Map 4 is an older map that shows some areas where vegetation removal is necessary. This is better shown on figure 4-1 in the CDEA.

Map 5 shows the TTS layout; mostly temporary structures on pavement.

Map 6 shows the area for the AN/TPY-2 radar, shown as "Radar" on Map 1. The location of this area was moved to the east, towards the ocean during a site visit in August to avoid disturbance of vegetation and a foundation that has not been identified or evaluated for historic function or significance. Most of this area has been previously flattened and cleared. Several trees will be moved to prepare the site.

Maps 7, 8 and 9 are located near the cantonment/housing area as shown on map 1, at the northwest end of Wake Island. The areas consist of temporary housing and communications facilities, some of which will be placed on concrete slabs that formerly had dormitory buildings on them. One new permanent building, shown on map 8 will be built in an area that has seen extensive flattening and surface modifications over the past 60 years.

The USAF has requested that MDA brief the 200+ staff, contractors and soldiers working on the tests on conservation issues, including historic preservation, artifacts, history, off-road driving, birds, non-disturbance of vegetation, fishing, rodent management within daily safety meetings to help prevent deterioration of historic properties and other conservation resources due to inexperience and lack of knowledge.

We believe that the Integrated Flight Tests at Wake Atoll (MDA) tests will have no adverse effect on historic properties within the area of potential effects and hope that you concur. Please contact me at (907) 552-5057, write or email at karlene.leeper@us.af.mil if you would like more information.

No Historic Properties Adversely Affected
Alaska State Historic Preservation Officer
Date: 12-22-14 File No.: 3130-1R USAF
Please review: 36 CFR 800.13 / A.S. 41.35.070(d)

Sincerely

KARLENE LEEPER
Cultural Resources Program Manager

Attachments: (sent with previous letter and by email)
1) Photo packet showing areas of MDA temporary and permanent facilities for upcoming tests
2) *Coordinating Draft Environmental Assessment Integrated Flight Tests at Wake Atoll* (CDEA) sent separately by email

DEPARTMENT OF THE AIR FORCE
PACIFIC AIR FORCES

Colonel Frank A. Flores
Commander, PACAF Regional Support Center
9480 Pease Ave, Suite 123
Joint Base Elmendorf-Richardson AK 99506-2101

MAR 2 3 2015

To Whom It May Concern:

The U.S. Missile Defense Agency (MDA) and the PACAF Regional Support Center (PRSC), in accordance with 32 CFR 989 (Environmental Impact Analysis Process), have prepared the Proposed Final Environmental Assessment (PFEA) and the Proposed Finding of No Significant Impact (FONSI) for Integrated Flight Tests at Wake Atoll.

This PFEA examines the potential environmental effects of performing Integrated Flight Tests at Wake Atoll and in the broad ocean area (BOA) and is summarized in the proposed FONSI. The analysis will show the potential impacts from the proposed integrated flight testing do not differ from previous tests contemplated in earlier environmental analyses conducted for flight testing at Wake Atoll and there will be no effect to species protected by the Endangered Species Act.

The PFEA and the proposed FONSI are found at the following web site http://www.mda.mil/news/environmental_reports.html. Please provide your comments using the comment form provided on the website. You may also e-mail your comments to James.Fife@us.af.mil. Lack of comments will be considered tacit approval of the PFEA. Please provide comments by 23 April 2015.

For questions or concerns, please contact my POC, Mr. James Fife, Engineering Flight Chief, 611th CES/CEN, (907) 552-0790, or e-mail him at james.fife@us.af.mil.

Sincerely,

FRANK A. FLORES, Colonel, USAF
Commander