DRAFT
ENVIRONMENTAL ASSESSMENT
for
Munitions Storage Igloos
at
Andersen Air Force Base, Guam
ABSTRACT

Designation: Environmental Assessment

Title of Proposed Action: Munitions Storage Igloos

Project Location: Andersen Air Force Base (AFB), Guam

Lead Agency for the EA: Headquarters Pacific Air Forces

Affected Region: Guam

Action Proponent: The 36th Wing, Andersen AFB, Guam

Point of Contact: Jeffrey Laitila, United States Air Force (USAF)
36 CES/CEV Environmental Flight Chief
NAVFAC IEPD
Andersen AFB, Guam
Email address: jeffrey.laitila@us.af.mil

Date: December 2019

On behalf of the Headquarters Pacific Air Forces, a Major Command of the USAF, Naval Facilities Engineering Command Pacific has prepared this Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA), as implemented by the Council on Environmental Quality Regulations. Per the Joint Region Marianas (JRM) Memorandum of Agreement (2009) implementing the 2005 Base Realignment and Closure Commission’s (BRAC) decisions and the 2011 JRM Memorandum of Agreement, Navy NEPA regulations are implemented at Andersen AFB. The Proposed Action is to construct an additional 48 Hayman style munitions storage igloos in Munitions Storage Area I at Andersen AFB in Joint Region Marianas, Guam to reduce the current existing munitions storage capacity shortfall and to enable 36th Wing’s mission requirements under Title 10 U.S Code Section 8062. The new igloos would require lighting and electrical support, an intrusion detection system, ventilation, reinforced concrete foundations, rated 7-bar construction, floor slabs, columns, beams, and a lightning protection system. Supporting facilities would include site development, utilities and connections, road improvements, and loading aprons. Project construction would occur between approximately 2020 and 2022. This EA evaluates the potential environmental impacts associated with the two action alternatives, Alternative 1 (Preferred Alternative), Alternative 2, and the No Action Alternative. The environmental resource areas analyzed in this EA include: air quality, water resources, geological resources, cultural resources, biological resources, noise, infrastructure, transportation, public health and safety, and hazardous materials and wastes.

Written comments may be provided by email to NFPAC-Receive@navy.mil or by mail to: Naval Facilities Engineering Command Pacific, Building 258 Makalapa Drive, Suite 100, Joint Base Pearl Harbor-Hickam, HI 96860-3134, Attn: EV21 Andersen AFB Munitions Storage Igloos EA Project Manager; Telephone (808) 472-1450.
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<td>36th Wing</td>
<td>JRM</td>
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<td>ACM</td>
<td>asbestos-containing material</td>
<td>kv</td>
<td>kilovolt</td>
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<td>AFB</td>
<td>Air Force Base</td>
<td>LBP</td>
<td>lead based paint</td>
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<td>AFI</td>
<td>Air Force Instruction</td>
<td>LED</td>
<td>light-emitting diode</td>
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<td>AFMAN</td>
<td>Air Force Manual</td>
<td>L&lt;sub&gt;eq&lt;/sub&gt;</td>
<td>equivalent sound level</td>
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<td>APE</td>
<td>Area of Potential Effect</td>
<td>LFTRC</td>
<td>live-fire training range complex</td>
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<td>Antiterrorism Force Protection</td>
<td>L&lt;sub&gt;max&lt;/sub&gt;</td>
<td>maximum A-weighted sound level</td>
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<td>BMP</td>
<td>best management practice</td>
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<td>Clean Air Act</td>
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<td>level of service</td>
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<td>Council on Environmental Quality</td>
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<td>Civil Engineer Squadron</td>
<td>MEC</td>
<td>Munitions and Explosives of Concern</td>
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<td>CFR</td>
<td>Code of Federal Regulations</td>
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<td>cable handhole</td>
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<td>Community Noise Equivalent Level</td>
<td>NAVFAC</td>
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<td>Commonwealth of the Northern Mariana Islands</td>
<td>NAVFAC Pacific</td>
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<td>CO&lt;sub&gt;2&lt;/sub&gt;</td>
<td>carbon dioxide</td>
<td>NAVRAMP</td>
<td>Navy Radon Assessment and Mitigation Program</td>
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<td>Navy</td>
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<td>Division of Aquatic and Wildlife Resources</td>
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<td>Naval Base Guam</td>
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<td>decibel</td>
<td>NEPA</td>
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<td>dBA</td>
<td>A-weighted sound level</td>
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<td>DNL</td>
<td>day-night average sound level</td>
<td>NEW</td>
<td>Net Explosive Weight</td>
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<td>National Historic Preservation Act</td>
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<td>EA</td>
<td>Environmental Assessment</td>
<td>NIOSH</td>
<td>National Institute for</td>
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<td>ECM</td>
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<td>Noise Induced Permanent Threshold Shift</td>
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<td>Executive Order</td>
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<td>NO&lt;sub&gt;2&lt;/sub&gt;</td>
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<td>Endangered Species Act</td>
<td>NO&lt;sub&gt;x&lt;/sub&gt;</td>
<td>nitrogen oxide</td>
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<td>ESS</td>
<td>Explosives Safety Submission</td>
<td>NOAA</td>
<td>National Oceanic and</td>
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<td>ESZ</td>
<td>explosive safety zone</td>
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<td>Atmospheric Administration</td>
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<tr>
<td>ft&lt;sup&gt;2&lt;/sup&gt;</td>
<td>square feet</td>
<td>NPDES</td>
<td>National Pollutant Discharge</td>
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<td>FY</td>
<td>Fiscal Year</td>
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<td>Elimination System</td>
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<td>Guam Environmental Protection Agency</td>
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<td>Government of Guam</td>
<td>OSHA</td>
<td>Occupational Safety and Health Administration</td>
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<td>HAP</td>
<td>hazardous air pollutant</td>
<td>PACAF</td>
<td>Pacific Air Forces</td>
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<td>IMD</td>
<td>inter-magazine distance</td>
<td>Pb</td>
<td>lead</td>
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<tr>
<td>IRAA</td>
<td>Indoor Radon Abatement Act</td>
<td>PCB</td>
<td>polychlorinated biphenyl</td>
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<td>Installation Restoration Program</td>
<td>PM&lt;sub&gt;2.5&lt;/sub&gt;</td>
<td>particulate matter less than or equal to 2.5 microns in diameter</td>
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<tr>
<td>PM$_{10}$</td>
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<td>THAAD</td>
<td>Terminal High-Altitude Area Defense</td>
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<tr>
<td>QD</td>
<td>quantity-distance</td>
<td>tpy</td>
<td>tons per year</td>
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<td>Record of Decision</td>
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<td>Supplemental Environmental Impact Statement</td>
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<td>U.S. Fish and Wildlife Service</td>
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<td>USINDOPACOM</td>
<td>United States Indo-Pacific Command</td>
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<td>TARRP</td>
<td>tactical air-munitions rapid response package</td>
<td>UXO</td>
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<td>traditional cultural property</td>
<td>VOC</td>
<td>volatile organic compound</td>
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<td></td>
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<td>World War II</td>
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1 Purpose of and Need for the Proposed Action

1.1 Background

1.1.1 Background

Andersen AFB is a strategically located forward main operating base. The 36 WG is host unit to USAF
Active, Reserve, National Guard, and U.S. Naval forces and its mission is to provide the highest quality
peacetime and wartime support from its strategic Pacific location. Guam serves as a stopping point for
numerous aircraft enroute to Japan, Korea, and other Indo-Asia Pacific locations. Andersen AFB is
positioned to support operations across the spectrum of conflict to include sustained combat
operations.

In April 2002, the USAF Safety Center evaluated existing munitions magazines from the 1950s (USAF
2002, USAF 2005). A total of 132 igloos were improperly sited and had substandard storage capability,
providing a total of 263,000 ft² of storage capacity. The magazines failed to meet the standard rating
due to faulty door design. Additionally, the earth coverings on the magazines have deteriorated from
age, typhoon winds, and rain. With this loss of storage capability, the 36 WG was challenged to meet the
operational requirement. As a result of failing the safety rating, these munitions magazines were
downgraded from storing 500,000 pounds of net explosive weight (NEW) to 250,000 pounds of NEW.
The age and wear of these facilities have caused a shortfall in munitions storage that is needed to
support the current mission.

Every functional munitions storage unit at Andersen AFB is currently in use and essential to meet the
minimum storage capacity. The loss or temporary loss of a magazine will negatively impact the mission
of Andersen AFB. A total of 60 additional munitions storage igloos were determined to be needed to
provide adequate munitions storage (USAF 2005). A portion of that total amount (12 igloos) was
completed as Phase I in FY08, with the remaining 48 igloos to be constructed in subsequent phases,
subject to funding.

The 36 WG initially proposed to construct 60 munitions storage igloos in two phases: Phase 1 (12
munitions storage igloos) and Phase 2 (48 munitions storage igloos). In October 2005, the Environmental
Assessment of Proposed Munitions Storage Igloo Construction at Andersen Air Force Base, Guam was
prepared to analyze the effects of siting all 60 munitions storage igloos within MSA I (USAF 2005). Phase
1 was constructed in FY 2008, with the remaining 48 igloos planned to be constructed in Phase 2,
subject to funding. However, Phase 2 was not implemented due to constraints identified during agency
review of the 2005 Draft EA. The U.S. Fish and Wildlife Service (USFWS) and Guam Department of
Agriculture, Division of Aquatic and Wildlife Resources (Guam DAWR) indicated that Phase 2 (the
proposed construction of the 48 igloos) would encroach on biologically sensitive habitat. Areas north
and west of Phase 1 possess limestone forest components that serve as important habitat to several
endangered species on Guam. The 36 WG subsequently revised alternatives for the remaining 48 igloos
to avoid and minimize potential effects on biologically sensitive habitat. These revised alternatives are
analyzed in this EA.

The current munitions storage capability at Andersen AFB is 384,000 square feet (ft\(^2\)). The future
operational floor space requirement is 664,000 ft\(^2\), leaving the base with a storage capacity shortfall of
280,000 ft\(^2\). There are no other anticipated storage capacity shortfalls currently identified for munitions
storage at Andersen AFB.

1.2 Location

Guam is located approximately 3,700 miles west of Hawaii, 1,500 miles east of the Republic of the
Philippines, and 1,550 miles south of Japan. The island of Guam is the westernmost territory of the U.S.
and is the southernmost island of the Marianas chain. NBG is the primary military presence on Guam,
occupying over 18,000 acres of land on seven noncontiguous sites located throughout the 212 square
mile island. These sites include the main base, NBG Barrigada, NBG North Finegayan, NBG Munitions
Site, Polaris Point, Tenjo Valley, and Sasa Valley.

Andersen AFB is located on the northern tip of the island and covers over 14,000 acres. The base hosts
the largest MSA in the USAF and is a key base in the U.S. Indo-Pacific Command (USINDOPACOM) Area
of Responsibility. The proposed munitions storage facilities would be constructed within MSA I, which is
located northwest of Andersen AFB’s airfield and southeast of the Northwest Field Training Area. MSA I
is used exclusively for the receiving, storage, and maintenance of munitions. Figure 1-1 shows the
location of the project within Andersen AFB.
Purpose of and Need for the Proposed Action

Figure 1-1
Project Location
Guam, AAFB, MSA I
The majority of Andersen AFB is within the Refuge Overlay Unit of the Guam National Wildlife Refuge (NWR). The Guam NWR was established in 1993 through a Memorandum of Understanding between the U.S. Fish and Wildlife Service (USFWS), Department of the Navy (DON), USAF, and the Government of Guam (GovGuam) (GovGuam et al., 1993). By way of cooperative agreements signed in 1994, the USAF, DON, USFWS, and the Guam Department of Agriculture, Division of Aquatic and Wildlife Resources established the Refuge Overlay Units to provide a coordinated program for protecting threatened and endangered species and native flora and fauna, maintaining native ecosystems, and conserving biological diversity on Department of Defense lands on Guam. Further detail on Overlay Refuge lands can be found in Section 3.5.1.

1.3 Purpose of and Need for the Proposed Action

The purpose of and need for the Proposed Action is to enable Andersen AFB to fulfill its mission of providing a sufficient supply of new, highly sophisticated munitions deemed critical in the initial stages of any armed conflict in the region. To fully achieve this mission, 280,000 ft² of additional munitions storage capacity and associated infrastructure upgrades are needed. The Proposed Action is needed to enable the 36 WG, a PACAF wing at Andersen AFB, to perform its existing mission and ongoing military operations by providing adequate munitions storage.

The USAF has congressionally mandated roles and responsibilities under Title 10 U.S. Code (U.S.C.) section 8062, which specifies that the USAF, “shall be organized, trained, and equipped primarily for prompt and sustained offensive and defensive air operations.” By addressing the NEW storage shortfall, the Proposed Action supports the USAF’s Title 10 U.S.C. section 8062 directive to “form the basis for a complete and immediate mobilization for the national defense in the event of a national emergency.”

1.4 Scope of Environmental Analysis

This EA includes an analysis of potential environmental impacts associated with the action alternatives and the No Action Alternative. The environmental resource areas analyzed in this EA include: air quality, water resources, geological resources, cultural resources, biological resources, noise, infrastructure, transportation, public health and safety, and hazardous materials and waste. The study area for each resource analyzed may differ due to how the Proposed Action and alternative actions interact with or impact the resource.

1.5 Key Documents

Key documents are sources of information incorporated into this EA. Documents are considered to be key because of similar actions, analyses, or impacts that may apply to the Proposed Action. CEQ guidance encourages incorporating documents by reference. Documents incorporated by reference in part or in whole include:


- Joint Region Marianas Andersen Air Force Base Area Development Plan, MSA 1 Earth Covered Magazines Final Report, April 2017. Report assessed existing facilities and infrastructure, developed and evaluated concepts for safely increasing munitions storage at Andersen AFB.
1.6 Relevant Laws and Regulations

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

- NEPA (42 U.S.C. sections 4321–4370h), which requires an environmental analysis for major federal actions that have the potential to significantly impact the quality of the human environment
- CEQ Regulations for Implementing the Procedural Provisions of NEPA (40 CFR parts 1500–1508)
- Navy regulations for implementing NEPA (32 CFR part 775), which provides Navy policy for implementing CEQ regulations and NEPA
- Clean Air Act (42 U.S.C. section 7401 et seq.)
- Clean Water Act (33 U.S.C. section 1251 et seq.)
- Coastal Zone Management Act (16 U.S.C. section 1451 et seq.)
- National Historic Preservation Act (NHPA) (54 U.S.C. section 300101 et seq.)
- Archaeological Resources Protection Act (1979) (16 U.S.C. section 470aa et seq.)
- Endangered Species Act (16 U.S.C. section 1531 et seq.)
- Comprehensive Environmental Response and Liability Act (42 U.S.C. section 9601 et seq.)
- Emergency Planning and Community Right-to-Know Act (42 U.S.C. sections 11001–11050)
- Federal Insecticide, Fungicide, and Rodenticide Act (7 U.S.C. section 136 et seq.)
- Resource Conservation and Recovery Act (42 U.S.C. section 6901 et seq.)
- Executive Order (EO) 11988, Floodplain Management
- EO 12088, Federal Compliance with Pollution Control Standards
- EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations
- EO 13045, Protection of Children from Environmental Health Risks and Safety Risks
- EO 13186, Responsibilities of Federal Agencies to Protect Migratory Birds
- EO 13834, Efficient Federal Operations
• Department of Defense Initial Guidance for BRAC 2005 Joint Base Implementation, 22 January 2008
• Department of Defense Supplemental Guidance for Operating a Joint Base, April 15, 2008

A description of the Proposed Action’s consistency with these laws, policies, and regulations, as well as the names of regulatory agencies responsible for their implementation, is presented in Chapter 5 (Table 5-1).

1.7 Public and Agency Participation and Intergovernmental Coordination

CEQ Regulations for Implementing the Procedural Provisions of the NEPA (40 CFR 1500-1508) require agencies to encourage and facilitate public involvement in decisions which affect the quality of the human environment (1500.2(d)).

The USAF published a Notice of Availability of the Draft EA for three consecutive days in the Pacific Daily News and Guam Post (Appendix A). The notice described the Proposed Action, solicited public and agency comments on the Draft EA, provided dates of the open comment period, and announced that a copy of the EA would be available for review (explain how or where). The Draft EA was made available for review by interested parties at the Nieves M. Flores Memorial Library, 254 Martyr Street Hagatna, Guam; and the Dededo Public Library, West Santa Barbara Avenue, Dededo, Guam. The Draft EA was also made available on the following website:

The USAF initiated formal consultation with the USFWS under Section 7 of the Endangered Species Act regarding the Preferred Alternative (Appendix C). The USAF also consulted with the Guam State Historic Preservation Officer regarding the Preferred Alternative (Appendix D). The USAF will coordinate with the Guam Bureau of Statistics and Plans to ensure the proposed action is consistent with the Guam Coastal Management Program and is in compliance with the Coastal Zone Management Act to the maximum extent practicable. Appendix E will include the coastal consistency analysis for the proposed action (coordinated with Guam Bureau of Statistics and Plans).

1.8 Organization of this Document

This EA is organized into eight sections, not including the executive summary or appendices. Section 1 contains background information, a description of the purpose of and need for the Proposed Action, a description of the applicable regulatory requirements, and an introduction to the organization of the EA. Section 2 provides a detailed description of the Proposed Action, the action alternatives, the No Action Alternative, the alternatives not carried forward for analysis, and best management practices (BMPs) included in the project. Section 3 contains a general description of the baseline conditions that could potentially be affected by the Proposed Action or the No Action Alternative, and it presents an analysis of the environmental consequences. Section 4 includes an analysis of the potential cumulative impacts. Section 5 looks at other special considerations under NEPA. Section 6 lists the sources of information used in the preparation of the document. Section 7 lists the preparers of the document. Section 8 lists the federal, territorial, and other organizations to which the Draft EA was distributed.

Appendix A includes distribution letters sent during the public review period. Appendix B includes air emission calculations to support the Air Quality section. Appendix C includes information from the natural resource surveys and consultation documentation for the project (coordinated with USFWS).
Appendix D includes information from the cultural resource surveys and consultation documentation for the project (coordinated with Guam State Historic Preservation Officer). Appendix E will include the coastal consistency analysis for the proposed action (coordinated with Guam Bureau of Statistics and Plans). Appendix F contains the Munitions Storage Area Plant Survey Report.
Proposed Action and Alternatives

2.1 Proposed Action

2.1.1 Baseline Conditions

MSA I contains facilities for the storage, receiving, and maintenance of munitions. The area is heavily vegetated and surrounding development includes Northwest Field to the north and west, undeveloped jungle to the west and south, and a cliffline to the east. The area is moderately sloped with an average slope of approximately 2.5 percent. Drainage within MSA I is mostly via surface runoff to the west.

The project area under consideration in this EA is located within MSA I and includes the footprints of Alternative 1 and Alternative 2. The project area is generally located between E Avenue and D Avenue on the north and south sides, respectively, and between 4th Street and 8th Street on the east and west sides, respectively. Figure 2-1 shows an aerial look at existing conditions within MSA I and the project area. Figure 2-2 illustrates topography and drainage in the project area.

The transportation system within MSA I consists of a grid of paved and unpaved roads that provide access to the various munitions storage facilities. The primary entrance to MSA I is through a controlled gate near the intersection of B Avenue and 5th Street.

Utilities in the project area include electrical service and fiber optic communications cabling. Under existing conditions, the primary voltage at Andersen Air Force Base (AFB) is 13,800Y/7,970 volts. In 2008, an underground primary electrical feeder was installed to serve the first 12 ECMs in Phase I as well as the future ECMs. This feeder extends from the east on the north side of 4th Street to a 4-way, pad-mounted 15-kilovolt (kV) switch near the intersection of 4th Street and C Avenue. From this switch, a radial feeder is extended to a new pad-mounted transformer located on the east side of ECM 8418. This transformer has a 13.8-kV primary and 480Y/277 volts secondary. A standby generator is located in a building near the transformer.

Communications infrastructure was also expanded in the project area in 2008. An underground communications ductbank with 100-pair copper and 48-strand fiber optic cabling was installed to serve the first 12 ECMs in Phase I as well as the future ECMs. The fiber optic cable originates in Building 23028 and the copper cable originates in Building 25008. This cable is extended to MSA I where the copper cable is terminated in a splice case in cable handhole (CHH) 123 and the fiber optic cable is terminated in a splice case in CHH 124. From these handholes, the cable is extended to the ECMs. Figure 2-3 shows existing facilities and utilities within the project area. This figure also shows explosives safety arcs within and adjacent to the study area that constrain development potential.

2.1.2 Site Development Considerations

The site planning process must consider factors that may have the potential to or will affect the planned laydown of program requirements.
Proposed Action and Alternatives

Figure 2-1
Existing Conditions (MSA I and Project Location)
Figure 2-2
Topography and Drainage

Proposed Action and Alternatives
Figure 2-3
Development Considerations

Legend

- Existing Roadway
- Proposed Roadway
- Project Area
- Alternative 1
- Alternative 2
- Existing Aboveground Magazines
- Phase I: 12 ECMs
- Proposed TARRP Facilities
- Marine Operations Facilities
- Proposed Inspection Facility
- Proposed TARRP Facility
- Munitions Maintenance Facility
- Existing Aboveground Magazines (Typ.)
- Existing ECMs (Typ.)
- Proposed ECMs

Exposures Safety Quantity Distances
- Explosives Safety Quantity Distances
- Intratime Distance

Notice: The general location at intersection of 9th Street and 0 Avenue for 12 Marine Corps Bunker Style ECMs - Reasonably Foreseeable

Proposed Action and Alternatives
2.1.2.1 Existing Facilities

Most existing facilities within MSA I must remain and will limit the areas where new facilities could be constructed. The primary existing facilities in the project vicinity are ECMs. There are two existing ECMs within the Alternative 1 footprint that would be retained. Alternative 2 would provide the option to demolish 30 existing ECMs to construct the proposed 48 new Hayman ECMs. Other existing facilities include: access roads, aboveground magazines, inspection facility, bomb assembly area, plus electrical and communications connections.

2.1.3 Explosives Safety

For existing storage facilities, the controlling constraint to siting new explosives storage facilities is the minimum inter-magazine distance that is based on the amount of munitions to be stored and the construction type of each storage facility. The inter-magazine distance (IMD), the distance from one magazine to another, for the existing ECMs and proposed Hayman style ECMs is approximately 100 feet for up to 500,000 pounds of hazard class/division (HC/D) 1.1 munitions. IMD arcs for existing ECMs are not depicted as a constraint in the summary constraints drawing that follows, but each alternative for new munitions storage facilities considered the minimum IMD from existing storage facilities. In addition to the IMD, each proposed facility must consider other explosives safety siting criteria including the minimum intra-line distance (the distance to related personnel or facilities), minimum public traffic route distance (the distance to unrelated public traffic routes), and the minimum inhabited building distance (the distance to unrelated facilities or personnel).

In addition to existing facilities, proposed facilities also impose siting constraints due to their explosives safety spacing requirements. See Section 4.3.3 for a list of Present and Reasonably Foreseeable Actions. Based on preliminary explosives site plans approved by the Department of Defense (DOD) Explosives Safety Board, proposed projects near the study area have the following explosives safety spacing requirements (USAF 2017):

- The proposed Marine Operation Locations have an approximate IMD of 680 feet
- Proposed tactical air-munitions rapid response package (TARRP) facilities have the following IMD:
  - Aboveground magazines have an approximate IMD of 680 feet
  - Operations pads have an approximate IMD of 694 feet
  - The T-2 pad has an approximate IMD of 694 feet
- The proposed Munitions Inspection Facility has an approximate IMD of 337 feet

2.1.4 Design Standards

Basic design standards for construction in northern Guam, munitions storage facilities in general, and munitions storage igloos specifically would be followed. Geotechnical conditions would be investigated and integrated into project design. Design standards specific to munitions storage facilities include the following:

- Air Force Handbook 32-1084, Facility Requirements
- Air Force Instruction 32-1021, Planning and Programming Military Construction Projects
- Air Force Manual (AFMAN) 91-201, Explosives Safety Standards
2.1.5 Description of Proposed Action

The USAF 36WG proposes to construct new munitions storage facilities and infrastructure upgrades in MSA I on Andersen AFB, Guam. The Proposed Action would help the 36 WG reduce its munitions storage capacity deficit.

The Proposed Action would include two action alternatives and one No Action alternative. Each action alternative proposes construction of 48 new Hayman style ECMs, based on the DOD Explosives Safety Board-approved Hayman ECM for Guam. The program requirement for munitions storage is guided by AFMAN 32-1084 Earth Covered Magazines (CC 422-264), AFMAN 91-201, Unified Facilities Criteria (UFC) 4-420-01. Figure 2-4 depicts a standard Hayman style ECM design. Figure 2-5 shows photographs of existing munitions storage igloos on Andersen AFB.

The igloos would be constructed with reinforced concrete floor and roof slabs, approximately 25 feet wide and 80 feet long interior dimension. Excavation depth would vary from at least 2 feet below the planned igloo footings to a depth of at least 5 feet beyond footing limits (DON, 2018a). Wing walls would be cast in place. Rear and side walls would be cast in place. The walls and roof are designed to be covered in a minimum of 24 inches (61 centimeters) of fill with a topping of shotcrete to prevent plant growth and erosion. Each new ECM would have approximately 2,000 square feet (ft²) of floor space for munitions storage. Access to the storage area would be provided through a pair of blast resistant structural steel access doors of 7-bar construction that provides an 11-foot clear height and a 24-foot clear width opening. The doors are required to be secured with high security hasps and an intrusion detection system. Each igloo would have a concrete apron at the igloo door.

Each igloo would include electrical outlets, standard fluorescent lighting, and exterior lighting. Flood lights over the igloo doors would be hooded to avoid disturbing bats. Primary power would require 13.8 kV, and secondary power would require 480 volts and 120/208 volts. Each storage ECM would be lightning and surge protected and would have a grounding system.

No water or sewer infrastructure would be included for the igloos. Shotcrete erosion control of the exterior and waterproofing of the interior would also be included. For moisture drainage, the interior floor slab would be ridged in the center, parallel with the long direction, and sloped down 1 inch (2.5 centimeters) to a gutter. The space requires mechanical ventilation in two places, one in the side wall near the front entry, and one in the rear wall.

Construction fill material would be obtained from an established borrow location on Andersen AFB.

2.1.6 Timeline

The Proposed Action would occur in multiple phases based on the availability of funds. The anticipated timeline for construction, design and acquisition of the 48 igloos is approximately 3 years, anticipated between approximately 2020 and 2022. The 3-year timeline includes: 1 year for design, six months for acquisition, and 18 months for actual construction.
Proposed Action and Alternatives

Source: DON, 2018a.

Figure 2-4 Typical Hayman Style ECM Design
Proposed Action and Alternatives

Figure 2-5  Photographs of Existing Munitions Storage Igloos, Andersen AFB
2.2 Screening Factors

NEPA’s implementing regulations provide guidance on the consideration of alternatives to a federally proposed action and require rigorous exploration and objective evaluation of reasonable alternatives. Only those alternatives determined to be reasonable and to meet the purpose and need require detailed analysis.

Potential alternatives that meet the purpose and need were evaluated against the following screening factors:

- Operational Readiness: Operational readiness must be preserved so the 36 WG is able to meet their USAF-assigned missions. Operational readiness is the capability of a unit/formation, aircraft, weapon system, or equipment to perform the missions or functions for which it is organized or designed.

- DOD Explosives Safety Board Approval: Proposed improvements must satisfy NEW square footage requirements and receive DOD Explosives Safety Board approval.

- Safety Requirements: The individual igloos must be sited in accordance with all regulatory guidance to ensure the safe working environment for munitions and other installation personnel. The igloo configurations are as close together as safety setback distances allow. This (1) helps maintain quantity-distance (QD) setback arcs within MSA 1 and prevent unnecessary exposure to habitable spaces outside the MSA; and (2) minimizes logistical and maintenance requirements due to a more compact project area footprint.

2.3 Alternatives Carried Forward for Analysis

Based on the reasonable alternative screening factors and meeting the purpose and need for the Proposed Action, two action alternatives were identified and will be analyzed within this EA. The No Action Alternative is also described below.

2.3.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur. Construction of new munitions storage facilities and infrastructure upgrades would not occur, and no additional storage capacity would be gained. There would be no site disturbance due to construction activities and utilities would not be extended or upgraded. The No Action Alternative would not meet the purpose and need for the Proposed Action; however, as required by NEPA, the No Action Alternative is carried forward for analysis in this EA. The No Action Alternative will be used to analyze the consequences of not undertaking the Proposed Action, not simply conclude no impact, and will serve to establish a comparative baseline for analysis and a determination of the significance of any effect.

2.3.2 Alternative 1 (Preferred Alternative)

Alternative 1 (the Preferred Alternative) proposes construction of 48 new Hayman style ECMs directly north and west of the existing 12 ECMs that were completed under Phase 1 in FY2008. Alternative 1 would be constructed in Phases 2 through 4. The number of igloos constructed in each phase may be adjusted, but the total number of new igloos remains at 48. Initial plans call for the following number of igloos in each phase:
Proposed Action and Alternatives

- Phase 2: Construction of up to 16 Hayman style storage ECMs generally south of D Avenue on 6th Street.
- Phase 3: Construction of up to 20 Hayman style storage ECMs along 5th, 6th, 7th and 8th Street west of the Phase 1 ECMs.
- Phase 4: Construction of the remaining balance of Hayman-style storage ECMs to meet a total of 48, along 5th and 6th Street, north of the Phase 1 ECMs.

Figure 2-6 depicts the proposed site plan for Alternative 1. Constructing 48 new Hayman style ECMs would result in a net increase of approximately 97,392 ft² of munitions storage capacity, reducing the operational storage capacity deficit at Andersen AFB from 280,000 ft² to approximately 182,600 ft². The Preferred Alternative would have the least amount of operational impact to existing ECMs, and the 48 new ECMs would be constructed without the need to demolish existing storage facilities, resulting in immediate storage capacity increase.

2.3.2.1 Existing Conditions
The site selected for Alternative 1 is currently undeveloped space and demolition of existing facilities would not be required. The site is heavily overgrown and would require vegetation clearance.

2.3.2.2 Site Disturbance
Construction and implementation of Alternative 1 would involve disturbance of 51 acres, 19 acres of which would be new impervious surface. Areas of the Proposed Action are detailed in Table 2-1.

<table>
<thead>
<tr>
<th>Alternative 1</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impervious Surface (Igloos, Pavement)</td>
<td>19.3</td>
</tr>
<tr>
<td>Pervious Construction Area (Grading, LID)</td>
<td>21.6</td>
</tr>
<tr>
<td>Pervious Utility Corridor</td>
<td>3.5</td>
</tr>
<tr>
<td>Construction Staging Area</td>
<td>1.6</td>
</tr>
<tr>
<td>Existing Igloo Site</td>
<td>1.25</td>
</tr>
<tr>
<td>Non-Impacted Pervious Surface</td>
<td>3.8</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>51.05</strong></td>
</tr>
</tbody>
</table>

Key: LID = Low Impact Development.

2.3.2.3 Access
Existing access roads within the Alternative 1 footprint are in poor condition and improvements would be needed. New roads would be 24 feet wide with 2-foot wide shoulders and constructed of asphaltic concrete. Roads would be crowned to drain.

A paved apron between an adjacent road and the access doors would be required for each ECM. Each apron would consist of two separate elements: an asphaltic concrete transition approximately 26.5 feet long and 127 feet wide, and a Portland cement concrete apron centered on the ECM doors and approximately 24 feet long and 26 feet wide. It is assumed that excavation depths would be similar those described earlier for construction of the igloos (2-5 feet).
2.3.2.4 Utilities

New electrical and communications services would be provided for Alternative 1. New electrical facilities would consist of a new radial feeder extended from the pad-mounted switch installed in Phase 1, to a new pad-mounted transformer and enclosure located near the intersection of 6th Street and D Avenue. A new building would be constructed adjacent to the transformer enclosure to house a new standby generator, which would serve the additional 48 ECMs. An automatic transfer switch would be provided from the new pad-mounted transformer and the standby generator to provide redundant electrical sources for the new ECMs. A distribution panel supplied from the automatic transfer switch would provide secondary service to the ECMs. Primary and secondary electrical service would be distributed to the ECMs via new utility corridors with ductbanks with intermediate handholes.

A new air-conditioned communications equipment building would be provided as well as a new standby generator building. Existing fiber optics would be extended from the communications equipment room and connected to serve the ECMs. New communications infrastructure housing would be located in the new utility corridors.

Storm drainage would be managed with percolation basins and meet the requirements of UFC 3-210-10, Low Impact Development. Potable water and sewer services are not required to serve the project area.

2.3.2.5 Antiterrorism Force Protection

In October 2006, the DOD issued Instruction Number 2000.16, DOD Antiterrorism Standards, requiring all DOD Components to adopt and adhere to common criteria and minimum construction standards to mitigate antiterrorism vulnerabilities and terrorist threats. The intent of these building standards is to integrate greater resistance to a terrorist attack into all inhabited buildings. That philosophy affects the general practice of designing inhabited buildings. Antiterrorism Force Protection (ATFP) standards consist of restrictions for onsite planning, including standoff distances, building separation, unobstructed space, drive-up and drop-off areas, access roads, and parking; structural design; structural isolation; and electrical and mechanical design. The igloos, Generator Building, and Telecom Building are considered low occupancy per UFC 4-010-01 as they are not routinely inhabited by 11 or more DoD personnel; therefore, they are exempt from the minimum ATFP standards. ATFP standards would be incorporated into the design of the project, where applicable.

2.3.3 Alternative 2

Alternative 2 proposes demolishing 30 existing substandard ECMs and constructing 48 new Hayman style ECMs in their place. The Alternative 2 project area is located directly south of the Phase I ECMs between 4th Street and 6th Street. Facilities that could be demolished include:

- ECMs 8463 through 8470 (8 total)
- ECMs 8408 through 8416 (9 total)
- ECMs 8504 through 8516 (13 total)

Demolishing the existing 30 ECMs would result in a loss of approximately 50,000 ft² of storage capacity. The proposed 48 ECMs would add approximately 47,392 ft² of munitions storage capacity. Alternative 2 would reduce the operational storage capacity deficit at Andersen AFB from 280,000 ft² to approximately 232,600 ft².

Figure 2-7 depicts the proposed Alternative 2 site plan.
Proposed Action and Alternatives

Figure 2-7
Alternative 2 Site Plan
2.3.3.1 Existing Conditions

There are 30 existing ECMs located within the Alternative 2 project area. The magazines were constructed in the 1950s and have since been rated as substandard due to their limited capacity for ordnance storage. The area proposed for construction has been previously disturbed so less existing vegetation would be cleared.

2.3.3.2 Site Disturbance

Construction and implementation of Alternative 2 would involve disturbance of 50 acres, 18 acres of which would be impervious surface. Areas of the Proposed Action are detailed in Table 2-2.

<table>
<thead>
<tr>
<th></th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impervious Surface (Igloos, Pavement)</td>
<td>18.2</td>
</tr>
<tr>
<td>Pervious Construction Area (Grading, LID)</td>
<td>20.3</td>
</tr>
<tr>
<td>Pervious Utility Corridor</td>
<td>2</td>
</tr>
<tr>
<td>Construction Staging Area</td>
<td>1.6</td>
</tr>
<tr>
<td>Non-Impacted Pervious Surface</td>
<td>7.4</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>49.5</strong></td>
</tr>
</tbody>
</table>

Key: LID = Low Impact Development.

2.3.3.3 Access

Existing access roads are already improved and would only require minor patching to repair construction damage under Alternative 2.

2.3.3.4 Utilities

The electrical distribution for Alternative 2 would be the same as that described for Alternative 1 with the exception that the pad-mounted transformer and generator building would be located at the intersection of 5th Street and C Avenue. The electrical distribution plans and stormwater management for Alternative 2 would also be the same as Alternative 1.

2.3.3.5 Antiterrorism Force Protection

The same ATFP requirements listed under Alternative 1 would also apply to Alternative 2.

2.3.4 Alternatives Comparison

A comparison of alternatives is presented in Table 2-3.
2.4 Alternatives Considered but not Carried Forward for Effects Evaluation

The following alternatives were considered, but not carried forward for evaluation of potential effects to resources in this EA as they did not meet the purpose and need for the project and satisfy the reasonable alternative screening factors presented in Section 2.2.

2.4.1 Alternative Locations on Base for Munitions Storage Facilities

According to munitions siting criteria in AFMAN 91-201, Explosives Safety Standards, munitions storage facilities can only be constructed within an MSA. There are two MSAs on Andersen AFB: MSA I and MSA II (refer to Figure 1-2). MSA I is the primary MSA and is used to store large quantities of munitions (114 igloos), whereas MSA II, just north of the airfield, is much smaller (18 igloos) and cannot be adequately expanded to accommodate 48 additional munitions storage igloos. In addition, MSA II cannot be expanded to accommodate additional munitions storage igloos because it is constrained by topography and the airfield; safety setbacks and munitions siting criteria prohibit an increase in storage capacity. Furthermore, it is not operationally feasible or safe to store only a portion of the munitions shortfall in MSA II. It would not be safe or practical to transport munitions between MSA I and MSA II, or between the MSAs and other more distant locations, with the frequency needed to support the existing mission. Only MSA I would have adequate space for the proposed munitions storage igloos. Therefore, locations outside of MSA I on Andersen AFB were eliminated from detailed evaluation. Alternative configurations within MSA I were considered but are not being carried forward for detailed analysis in the EA because they do not meet operational or safety requirements.
2.4.2 Alternative Designs for Munitions Storage Facilities

Munitions storage facilities are used to store munitions explosives materiel, inert components, and equipment used for the operating requirements of the USAF. Table 2-4 presents a description of various types of munitions storage facilities and the basis for analysis or elimination. As indicated in Table 2-4, storage igloos were found to be the only reasonable munitions storage facility for the Proposed Action. As defined in Air Force Handbook 32-1084, Facility Requirements, storage igloos are used to store all types of explosives and are the preferred facility where moisture condensation is not a factor. They would be either concrete or steel arch-type construction (see Figure 2-4). The typical munitions storage module is 24 feet by 80 feet long and no wider than 30 feet; however, length can vary in 66-foot increments to provide greater mission-specific flexibility. Of the various types of munitions storage facilities, the storage igloo was found to be the only reasonable alternative. Alternative designs for munitions storage facilities were considered but eliminated from detailed analysis in this EA because they did not meet operational or safety requirements.

2.4.3 Renovate, Upgrade, or Replace Existing Munitions Storage Igloos

The existing munitions storage igloos are rated to store only nonstandard-type munitions (i.e., limited to 250,000 pounds NEW capacity). The 36 WG could theoretically meet the storage shortfall by replacing the nonstandard doors and eroded earthen covering, or demolishing all 114 existing nonstandard storage igloos in MSA I and constructing enough 7-bar-rated replacement storage igloos to meet the shortfall (i.e., 117 storage igloos). These alternatives were eliminated from detailed evaluation due to the current 36 WG munitions storage capacity deficit. In order to upgrade or replace any of the existing storage igloos, the munitions in that existing igloo (and possibly surrounding igloos) would have to be temporarily relocated for safety purposes. There is no other location on Andersen AFB that could safely accommodate a temporary relocation of munitions from the existing igloos. The only safe option would be to temporarily store munitions at an installation other than Andersen AFB during renovation or construction periods. The 36 WG would not be able to meet their current mission requirements if their existing capabilities were further reduced by temporarily storing munitions at other installations. Therefore, this alternative was eliminated from detailed evaluation. This alternative was considered but is not being carried forward for detailed analysis in the EA because it does not meet operational requirements.
### Table 2-4: Munitions Storage Facility Alternatives

<table>
<thead>
<tr>
<th>Type of Munitions Storage Facility</th>
<th>Description and Most Appropriate Use</th>
<th>Basis for Analysis or Elimination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage Igloo</td>
<td>Aboveground, covered with a minimum of 24 inches of earth. Preferred storage facility type for all explosives.</td>
<td>The storage igloo is the preferred storage facility type and meets the 36 WG’s munitions storage needs. This alternative is analyzed in this EA.</td>
</tr>
<tr>
<td>Aboveground Magazine Storage</td>
<td>Aboveground, similar to storage igloo but not earth-covered. Requires large QD setbacks to ensure proper protection.</td>
<td>While similar in size and function to igloos, the QD arc for the aboveground magazines would encroach on habitable buildings outside MSA I. This is not a safe alternative. Therefore, this alternative was eliminated.</td>
</tr>
<tr>
<td>Multi-cubicle Magazine Storage</td>
<td>Aboveground, used to store small quantities of explosives. Ideal for segregating incompatible explosive groups.</td>
<td>The 36 WG needs to increase munitions storage space. Multi-cubicle magazines are designed for storing small quantities of munitions. Therefore, this alternative was eliminated.</td>
</tr>
<tr>
<td>Segregated Magazine Storage</td>
<td>Aboveground, similar to multi-cubicle magazine storage. Ideal for segregating incompatible explosive groups. Each cubicle is akin to a small locker with a door width of 36 inches.</td>
<td>The 36 WG needs to increase munitions storage space. Segregated magazines are designed for storing small quantities of munitions. Therefore, this alternative was eliminated.</td>
</tr>
<tr>
<td>Rocket Check Out and Assembly Storage</td>
<td>Serves as an operating location to accommodate the assembly, disassembly, and electrical checkout and provides a site to store built-up rockets.</td>
<td>Rocket checkout and assembly facilities are designed for the assembly and storage of rockets. This capability is beyond the scope of the 36 WG’s needs. Therefore, this alternative was eliminated.</td>
</tr>
<tr>
<td>Module Barricaded Storage</td>
<td>Provides field storage for large quantities of explosives in constrained land uses. Maximum NEW permitted is 250,000 pounds. Locations for use must be specifically approved under AFMAN 91-201.</td>
<td>Module barricaded storage supports less NEW than storage igloos. Furthermore, this would be an expensive venture to accommodate the munitions storage required. Therefore, this alternative was eliminated.</td>
</tr>
<tr>
<td>Inert Spares Storage</td>
<td>Stores inert munitions components, materials, and support equipment.</td>
<td>The 36 WG needs to store live munitions. Therefore, this alternative was eliminated.</td>
</tr>
<tr>
<td>Ancillary Explosives Facility</td>
<td>Used in pads, locations, revetments, and facilities primarily for munitions holding, inspection, loading, and unloading.</td>
<td>The 36 WG needs permanent munitions storage. This alternative is for the temporary storage of munitions. Therefore, this alternative was eliminated.</td>
</tr>
</tbody>
</table>

2.5 Best Management Practices Included in Proposed Action

This section presents an overview of the BMPs that are incorporated into the Proposed Action in this document. BMPs are existing policies, practices, and measures that the Air Force would adopt to reduce the environmental impacts of designated activities, functions, or processes. Although BMPs mitigate potential impacts by avoiding, minimizing, or reducing/eliminating impacts, BMPs are distinguished from potential mitigation measures because BMPs are (1) existing requirements for the Proposed Action, (2) ongoing, regularly occurring practices, or (3) not unique to the Proposed Action. In other words, the BMPs identified in this document are inherently part of the Proposed Action and are not potential mitigation measures proposed as a function of the NEPA environmental review process for the Proposed Action. Table 2-5 includes a list of BMPs. Mitigation measures are discussed separately in Chapter 3.

<table>
<thead>
<tr>
<th>BMP</th>
<th>Description</th>
<th>Impacts Reduced/Avoided</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Quality</td>
<td>Properly maintain vehicles and construction equipment.</td>
<td>Reduce/minimize gaseous and particulate pollutant emissions during construction.</td>
</tr>
<tr>
<td>Air Quality</td>
<td>Water exposed soil for dust suppression.</td>
<td>Minimize fugitive dust associated with soil disturbance during construction.</td>
</tr>
<tr>
<td>Water Quality</td>
<td>Comply with Program and Site-Specific Stormwater Pollution Prevention Plans and use measures such as diversion dikes and swales, gravel/sand bag berms, and fiber rolls.</td>
<td>Reduce/minimize off-site transport of stormwater runoff and sediment.</td>
</tr>
<tr>
<td>Water Quality</td>
<td>Comply with Clean Water Act Section 401 Water Quality Certification: prepare and implement Environmental Protection Plan and use measures such as diversion dikes and swales, gravel/sand bag berms, and fiber rolls.</td>
<td>Reduce/minimize off-site transport of stormwater runoff and sediment during construction.</td>
</tr>
<tr>
<td>Water Quality</td>
<td>Equip all vehicles with on-board spill containment kits, park on paved surfaces where possible, and place drip pans beneath parked vehicles.</td>
<td>Prevent/minimize potential for construction vehicle fuel to enter surface and groundwater.</td>
</tr>
<tr>
<td>Water Quality</td>
<td>In the event of an accidental release of fuel, follow the Andersen AFB Oil and Hazardous Substance Contingency Plan, and implement the Guam Environmental Protection Agency Spill Prevention Control Countermeasure Program.</td>
<td>Prevent/minimize potential for construction vehicle fuel to enter surface and groundwater.</td>
</tr>
<tr>
<td>Water Quality</td>
<td>Construct percolation basins between the new ECMs according to the requirements of Unified Facilities Criteria (UFC) 3-210-10, Low Impact Development.</td>
<td>Prevent erosion and sediment mobilization into stormwater drainage resulting from the increased impervious surfaces created by construction of the ECMs.</td>
</tr>
<tr>
<td>Water Quality</td>
<td>Following completion of construction and utility line trenching replant exposed soil with native vegetation.</td>
<td>Prevent long-term soil erosion in the areas disturbed during construction.</td>
</tr>
<tr>
<td>Geological Resources</td>
<td>Use drainage diversion and control to divert stormwater away from the construction area.</td>
<td>Prevent increased erosion, compaction, and soil loss from physical disturbance during construction activity.</td>
</tr>
<tr>
<td>Geological Resources</td>
<td>Limit the size of the unstabilized disturbed areas for each project phase to less than 20 acres during construction.</td>
<td>Prevent increased erosion, compaction, and soil loss from physical disturbance during construction activity.</td>
</tr>
</tbody>
</table>
Table 2-5  Best Management Practices

<table>
<thead>
<tr>
<th>BMP</th>
<th>Description</th>
<th>Impacts Reduced/Avoided</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geological Resources</td>
<td>Implement standard soil erosion control practice construction practices.</td>
<td>Minimize soil erosion during clearing, grubbing, grading, embankment or filling, excavation, stockpiling, or other earthmoving operations.</td>
</tr>
<tr>
<td>Geological Resources</td>
<td>Construct percolation basins between the new ECMs according to the requirements of UFC 3-210-10, Low Impact Development.</td>
<td>Prevent erosion and sediment mobilization into stormwater drainage resulting from the increased impervious surfaces created by construction of the ECMs.</td>
</tr>
<tr>
<td>Geological Resources</td>
<td>Construct ECMs in accordance with UFC 3-310-04, Seismic Design of Buildings dated June 1, 2013 (U.S. Army Corps of Engineers [USACE], 2013).</td>
<td>Minimize potential for seismic safety hazards at the new ECMs.</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>Locate and mark existing underground fire suppression, electrical, and communications lines and avoid them during construction activities.</td>
<td>Prevent damage to existing utility infrastructure in the project area.</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>Recycle all project municipal solid waste, including concrete demolition debris, to the maximum extent possible. Mulch cleared vegetation for landscaping.</td>
<td>Divert project-related solid waste from the Andersen AFB to minimize impacts to the landfill capacity.</td>
</tr>
<tr>
<td>Public Health and Safety</td>
<td>Comply with DOD Directive 6055.9-STD (DOD Ammunition and Explosive Safety Submission [ESS]) and prepare ESS documentation.</td>
<td>Outline specific measures that would be implemented to ensure the safety of workers and the public.</td>
</tr>
<tr>
<td>Public Health and Safety</td>
<td>Have qualified unexploded ordnance (UXO) personnel perform surveys to identify and remove potential UXO and munitions and explosives of concern (MEC) items prior to the initiation of ground-disturbing activities.</td>
<td>Prevent/minimize potential UXO and MEC hazards before construction begins.</td>
</tr>
<tr>
<td>Public Health and Safety</td>
<td>Have the Andersen AFB Explosive Ordnance Disposal Unit present at the work site during all active groundbreaking and clearing activities.</td>
<td>Prevent/minimize potential UXO and MEC hazards during construction.</td>
</tr>
<tr>
<td>Public Health and Safety</td>
<td>Provide UXO awareness training to construction personnel involved in grading and excavations prior to and during ground-disturbing activities that would occur in previously disturbed areas that have a high probability of UXO.</td>
<td>Prevent/minimize potential UXO and MEC hazards to workers during construction.</td>
</tr>
<tr>
<td>Hazardous Materials and Waste</td>
<td>Conduct ongoing radon gas monitoring in the new ECMs and maintain the ventilations following construction (U.S. Navy 2017).</td>
<td>Minimize potential impacts of radon gas accumulation inside the ECMs.</td>
</tr>
</tbody>
</table>

2.6 Decision to be Made and Identification of the Preferred Alternative

The 36 WG will make one of the following decisions:

- Take no action as described in Section 2.3.1
- Implement Alternative 1 as the Preferred Alternative as described in Section 2.3.2
- Implement Alternative 2 as described in Section 2.3.3
3 Affected Environment and Environmental Consequences

This chapter presents a description of the environmental resources and baseline conditions that could be affected from implementing any of the alternatives and an analysis of the potential direct and indirect effects of each alternative.

All potentially relevant environmental resource areas were initially considered for analysis in this Environmental Assessment (EA). In compliance with the National Environmental Policy Act (NEPA), the Council on Environmental Quality (CEQ), and the Department of the Navy’s “Procedures for Implementing NEPA (32 CFR Part 775), Secretary of the Navy Instruction (SECNAVINST) 50906.A, Environmental Planning for Department on the Navy Actions, and Office of the Chief of Naval Operations Instruction (OPNAVINST) M-5090.1 Chapter 10 , the discussion of the affected environment (i.e., existing conditions) focuses only on those resource areas potentially subject to impacts. Additionally, the level of detail used in describing a resource is commensurate with the anticipated level of potential environmental impact.

“Significantly,” as used in NEPA, requires considerations of both context and intensity. Context means that the significance of an action must be analyzed in several contexts such as society as a whole (e.g., human, national), the affected region, the affected interests, and the locality. Significance varies with the setting of a proposed action. For instance, in the case of a site-specific action, significance would usually depend on the effects in the locale rather than in the world as a whole. Both short- and long-term effects are relevant. Intensity refers to the severity or extent of the potential environmental impact, which can be thought of in terms of the potential amount of the likely change. In general, the more sensitive the context, the less intense a potential impact needs to be in order to be considered significant. Likewise, the less sensitive the context, the more intense a potential impact would be expected to be significant.

This section includes air quality, water resources, geological resources, cultural resources, biological resources, noise, infrastructure, transportation, public health and safety, and hazardous materials and wastes.

The potential impacts to the following resource areas are considered to be negligible or non-existent so they were not analyzed in detail in this EA:

Land Use: Both alternatives are located on Andersen Air Force Base (AFB) within Munitions Storage Area (MSA) 1 (land already designated for munitions storage). The entire territory of Guam lies within the Coastal Zone. Neither Alternative 1 nor Alternative 2 would alter or modify the existing land use designations; therefore, this resource has been excluded from further detailed analysis. The USAF will coordinate with the Guam Bureau of Statistics and Plans to ensure the proposed action is consistent with the Guam Coastal Management Program and is in compliance with the Coastal Zone Management Act to the maximum extent practicable. Appendix E will include the coastal consistency analysis for the proposed action (coordinated with Guam Bureau of Statistics and Plans).

Visual Resources: Both alternatives would be located on Andersen AFB within MSA 1 (land already designated for munitions storage). This area cannot be accessed or seen by anyone other than Andersen AFB personnel. Multiple earth-covered magazines (ECMs) resembling those that would be constructed with either Alternative 1 or Alternative 2 are already present in MSA 1. Neither Alternative 1 nor Alternative 2 would change the visual characteristics of MSA 1; therefore, this resource has been excluded from further detailed analysis.
Airspace: Both alternatives are located on Andersen AFB, within MSA 1 (land already designated for munitions storage). With either alternative, there would be no changes to airspace. Therefore, this resource has been excluded from further detailed analysis.

Socioeconomics: Neither Alternative 1 nor Alternative 2 would involve any activities that would contribute to changes in socioeconomic conditions at Andersen AFB or on the island of Guam. There would be no change in the number of personnel assigned to Andersen AFB, and, therefore, there would be no changes in area population or associated demands for housing and support services. There would be short-term minor beneficial economic impacts from the local purchase of goods and services during construction of either alternative. Neither alternative would pose any adverse or disproportionate environmental health or safety risks to children living on or in the vicinity of Andersen AFB. Therefore, this resource has been excluded from further detailed analysis.

Environmental Justice: Consideration of environmental justice concerns includes race, ethnicity, and the poverty status of populations in the vicinity of a proposed action. Short-term direct minor beneficial impacts on the local economy through increased employment and purchase of goods and services would be expected as a result of construction activities. Both alternatives are located entirely within MSA 1, an area designated for munitions storage that is only accessible to Andersen AFB munitions personnel. Neither Alternative 1 nor Alternative 2 would pose any adverse or disproportionate environmental health or safety risks to the population living on or in the vicinity of Andersen AFB. Therefore, this resource has been excluded from further detailed analysis.

3.1 Air Quality

Air quality in a given location is defined by the concentration of various pollutants in the atmosphere. A region’s air quality is influenced by many factors, including the type and amount of pollutants emitted into the atmosphere, the size and topography of the air basin, and the prevailing meteorological conditions.

Most air pollutants originate from human-made sources, including mobile sources (e.g., cars, trucks, buses) and stationary sources (e.g., factories, refineries, power plants), as well as indoor sources (e.g., some building materials and cleaning solvents). Air pollutants are also released from natural sources such as volcanic eruptions and forest fires.

3.1.1 Regulatory Setting

3.1.1.1 Criteria Pollutants and National Ambient Air Quality Standards

The principal pollutants defining the air quality, called “criteria pollutants,” include carbon monoxide (CO), sulfur dioxide (SO₂), nitrogen dioxide (NO₂), ozone (O₃), suspended particulate matter less than or equal to 10 microns in diameter (PM₁₀), fine particulate matter less than or equal to 2.5 microns in diameter (PM₂.₅), and lead (Pb). CO, SO₂, Pb, and some particulates are emitted directly into the atmosphere from emissions sources. O₃, NO₂, and some particulates are formed through atmospheric chemical reactions that are influenced by weather, ultraviolet light, and other atmospheric processes.

Under the Clean Air Act (CAA), the U.S. Environmental Protection Agency (USEPA) has established National Ambient Air Quality Standards (NAAQS) (40 Code of Federal Regulations [CFR] part 50) for these pollutants. NAAQS are classified as primary or secondary. Primary standards protect against adverse health effects; secondary standards protect against welfare effects, such as damage to farm crops and vegetation and damage to buildings. Some pollutants have long-term and short-term
standards. Short-term standards are designed to protect against acute, or short-term, health effects, while long-term standards were established to protect against chronic health effects.

Areas that are and have historically been in compliance with the NAAQS are designated as attainment areas. Areas that violate a federal air quality standard are designated as nonattainment areas. Areas that have transitioned from nonattainment to attainment are designated as maintenance areas and are required to adhere to maintenance plans to ensure continued attainment.

The CAA requires local air quality management agencies to develop a general plan to attain and maintain the NAAQS in all areas of the country and a specific plan to attain the standards for each area designated nonattainment for a NAAQS. These implementation plans are developed by local air quality management agencies and submitted to USEPA for approval.

In addition to the NAAQS for criteria pollutants, national standards exist for hazardous air pollutants (HAPs), which are regulated under Section 112(b) of the 1990 CAA Amendments. The National Emission Standards for Hazardous Air Pollutants regulate HAP emissions from stationary sources (40 CFR part 61). Because the Proposed Action does not involve any new stationary sources of emissions, HAPs are not discussed further in this section.

### 3.1.1.2 General Conformity

The USEPA General Conformity Rule applies to federal actions occurring in nonattainment or maintenance areas when the total direct and indirect emissions of nonattainment pollutants (or their precursors) exceed specified thresholds. The emissions thresholds that trigger requirements for a conformity analysis are called *de minimis* levels. *De minimis* levels (in tons per year [tpy]) vary by pollutant and also depend on the severity of the nonattainment status for the air quality management area in question.

A conformity applicability analysis is the first step of a conformity evaluation and assesses if a federal action must be supported by a conformity determination. This is typically done by quantifying applicable direct and indirect emissions that are projected to result due to implementation of the federal action. Indirect emissions are those emissions caused by the federal action and originating in the region of interest, but which can occur at a later time or in a different location from the action itself and are reasonably foreseeable. The federal agency can control and will maintain control over the indirect action due to a continuing program responsibility of the federal agency. Reasonably foreseeable emissions are projected future direct and indirect emissions that are identified at the time the conformity evaluation is performed. The location of such emissions is known and the emissions are quantifiable, as described and documented by the federal agency based on its own information and after reviewing any information presented to the federal agency. If the results of the applicability analysis indicate that the total emissions would not exceed the *de minimis* emissions thresholds, then the conformity evaluation process is completed. *De minimis* threshold emissions are presented in Table 3-1.
### General Conformity de minimis levels

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Area Type</th>
<th>tpy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ozone (VOC or NOₓ)</td>
<td>Serious nonattainment</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Severe nonattainment</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>Extreme nonattainment</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Other areas outside an ozone transport region</td>
<td>100</td>
</tr>
<tr>
<td>Ozone (NOₓ)</td>
<td>Marginal and moderate nonattainment inside an ozone transport region</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Maintenance</td>
<td>100</td>
</tr>
<tr>
<td>Ozone (VOC)</td>
<td>Marginal and moderate nonattainment inside an ozone transport region</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Maintenance within an ozone transport region</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Maintenance outside an ozone transport region</td>
<td>100</td>
</tr>
<tr>
<td>Carbon monoxide, SO₂ and NOₓ</td>
<td>All nonattainment and maintenance</td>
<td>100</td>
</tr>
<tr>
<td>PM₁₀</td>
<td>Serious nonattainment</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>Moderate nonattainment and maintenance</td>
<td>100</td>
</tr>
<tr>
<td>PM₂.₅</td>
<td>Direct emissions, SO₂, NOₓ (unless determined not to be a significant precursor), VOC or ammonia (if determined to be significant precursors)</td>
<td>All nonattainment and maintenance</td>
</tr>
<tr>
<td>Lead (Pb)</td>
<td>All nonattainment and maintenance</td>
<td>25</td>
</tr>
</tbody>
</table>

**Key:** NOₓ = nitrogen oxide; VOC = volatile organic compound.

### 3.1.1.3 Greenhouse Gases

Greenhouse Gases (GHGs) are gas emissions that trap heat in the atmosphere. These emissions occur from natural processes and human activities. Scientific evidence indicates a trend of increasing global temperature over the past century due to an increase in GHG emissions from human activities. The climate change associated with this global warming is predicted to produce negative economic and social consequences across the globe.

USEPA issued the Final Mandatory Reporting of Greenhouse Gases Rule on September 22, 2009. GHGs covered under the Final Mandatory Reporting of Greenhouse Gases Rule are carbon dioxide (CO₂), methane, nitrogen oxide (NOₓ), hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, and other fluorinated gases including nitrogen trifluoride and hydrofluorinated ethers. Each GHG is assigned a global warming potential. The global warming potential is the ability of a gas or aerosol to trap heat in the atmosphere. The global warming potential rating system is standardized to CO₂, which has a value of one. The equivalent CO₂ rate is calculated by multiplying the emissions of each GHG by its global warming potential and adding the results together to produce a single, combined emissions rate representing all GHGs. Under the rule, suppliers of fossil fuels or industrial GHGs, manufacturers of mobile sources and engines, and facilities that emit 25,000 metric tons or more per year of GHG emissions as CO₂e are required to submit annual reports to USEPA.

### 3.1.2 Affected Environment

Guam has been designated as Air Quality Control Region No. 246. Guam is in attainment of the NAAQS for all criteria pollutants, with the exception of the areas within a 3.5-mile radius of the Piti and Tanguisson Power Plants. These areas are in nonattainment of the NAAQS for SO₂, however, Andersen
AFB is outside of these nonattainment areas (USEPA, 2017). Because the project area is in attainment of the NAAQS, Conformity Applicability Requirements do not apply to the Proposed Action; however, as explained in Section 3.1.3 below, estimates of potential air quality emissions have been provided for planning purposes.

3.1.3 Environmental Consequences

Effects on air quality are based on estimated direct and indirect emissions associated with the action alternatives. The region of influence (ROI) for assessing air quality impacts is the air basin in which the project is located. Guam has been designated as Air Quality Control Region No. 246.

Estimated emissions from a proposed federal action are typically compared with the relevant national and state standards to assess the potential for increases in pollutant concentrations. Although the ROI is in attainment of the NAAQS for all criteria pollutants and no de minimis thresholds apply, emissions estimates are provided and are compared with de minimis thresholds of 100 tpy for criteria pollutants (i.e., de minimis threshold for a basic nonattainment area), for planning purposes only.

3.1.3.1 Approach to Analysis

The air quality analysis estimated the magnitude of emissions that would occur from proposed construction activities. Construction-related activities would include clearing vegetation and grading to prepare the site, paving the igloo pads, constructing the additional 48 Hayman style munitions storage igloos and infrastructure upgrades, and architectural coating.

Operational emissions from maintenance and repair activities would be minor and infrequent and are, therefore, evaluated only briefly and qualitatively.

3.1.3.2 Emissions Evaluation Methodology

Air quality impacts from construction activities proposed under each action alternative would primarily occur from combustive emissions due to the use of fossil fuel-powered equipment and fugitive dust emissions (PM$_{10}$ and PM$_{2.5}$) from the operation of equipment on exposed soil. Construction emissions were estimated using CalEEMod (Version 2016.3.1), which is an industry accepted comprehensive air quality modeling tool for quantifying air quality emissions from land use projects. Assumptions were made regarding the total number of days each piece of equipment would be used, and the number of hours per day each type of equipment would be used. Assumptions and model inputs are located within the modeling calculations presented in Appendix B.

3.1.3.3 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change to baseline air quality. Therefore, no significant impacts to air quality or air resources would occur with implementation of the No Action Alternative.

3.1.3.4 Alternative 1 Impacts

Construction of 48 new Hayman style ECMs under Alternative 1 would be divided over the three-year construction period and would include clearing vegetation, grading to prepare the site, paving the ECM pads, construction of the ECMs and supporting structures (standby generator building, telecommunications building, and transformer enclosure), and architectural coating. Since phasing of
Affected Environment and Environmental Consequences

the projects could potentially change, it is assumed for the air quality analysis that the amount of
construction would be roughly equal for each of the three years. These activities would generate minor
amounts of air emissions and dust, which would have the potential to migrate off-site, depending on
wind and soil conditions and the intensity of surface disturbance on any given day. Construction
activities would be temporary.

Table 3-2 presents a summary of the annual estimated air quality emissions associated with construction
activities at Andersen AFB under Alternative 1. Because the potential emissions from construction
activities would occur over the course of three years, they are not additive. As shown in Table 3-2,
construction emissions would be below the *de minimis* thresholds of a basic nonattainment area. As
previously discussed, the ROI is in attainment of the NAAQS for all criteria pollutants and even if the ROI
was located in a basic nonattainment area, the estimated emission would not trigger a formal
Conformity Determination under the CAA General Conformity Rule.

Table 3-2  
Alternative 1 – Construction Emissions at Andersen AFB with Evaluation of Conformity

<table>
<thead>
<tr>
<th>Approximate Calendar Year</th>
<th>Emissions (tons/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>VOCs</td>
</tr>
<tr>
<td>Year 1 – Phase 2</td>
<td>9.06</td>
</tr>
<tr>
<td>Year 2 – Phase 3</td>
<td>9.09</td>
</tr>
<tr>
<td>Year 3 – Phase 4</td>
<td>8.93</td>
</tr>
<tr>
<td>Conformity <em>de minimis</em> Limits (for a basic nonattainment area)&lt;sup&gt;1&lt;/sup&gt;</td>
<td>100</td>
</tr>
</tbody>
</table>

Exceeds Conformity *de minimis* Limits?<sup>1</sup>  
No  No  No  No  No  No

**Note:**<sup>1</sup> The ROI is in attainment of the NAAQS for all criteria pollutants and no *de minimis* thresholds apply; however, emission estimates have been provided and are compared with the *de minimis* thresholds of a basic nonattainment area, for planning purposes only.

The estimated emissions presented in Table 3-2 would be negligible and would not trigger a formal
Conformity Determination under the CAA General Conformity Rule. Standard BMPs such as proper
maintenance of vehicles and construction equipment and dust suppression methods (watering of
exposed soil) would be implemented by the construction contractor as needed to minimize and further
reduce air quality impacts.

**General Conformity**

The General Conformity rule applies to federal actions proposed within areas designated as either
nonattainment or maintenance areas for a NAAQS for any of the criteria pollutants. Emissions of
pollutants for which an area is in attainment are exempt from conformity analyses. As such, a Record of
Non-Applicability for CAA conformance is not required for this project.

Because the ROI is in attainment of all criteria pollutants, the *de minimis* thresholds for General
Conformity Applicability analysis do not apply. The temporary and minor increases in construction and
operation emissions would be negligible (as shown in Table 3-2), would not trigger a formal Conformity
Determination under the CAA General Conformity Rule, and would be not be considered significant.

**Greenhouse Gases**

Implementation of Alternative 1 would contribute a nominal amount of emissions of GHGs from the
combustion of fossil fuels from construction and operational activities. Total emissions for all
constituents in the maximum construction year for Alternative 1 is 18 tons (see Table 3-2), and only a
A subset of these are considered GHG emissions. Therefore, due to the relatively small project scale, the annual GHG emissions would fall well below the CEQ threshold of 25,000 metric tons. The limited amount of emissions would not likely contribute to global warming to any discernible extent. Therefore, implementation of Alternative 1 would not result in significant impacts to air quality.

3.1.3.5 Alternative 2

Impacts

Air quality impacts under Alternative 2 would be similar as described for Alternative 1, except that emissions associated with construction activities would be slightly higher during Phase 2 (approximately 2019) when compared to Alternative 1. This is because the proposed demolition of 30 existing ECMs is assumed to occur in Phase 2, before construction of the new ECMs. Emission estimates would be slightly lower for Phase 3 and Phase 4 when compared to Alternative 1, due to a slightly smaller construction footprint proposed under Alternative 2. However, since phasing of the projects could potentially change, it is assumed for the air quality analysis that the amount of construction would be roughly equal for each of the three years. Table 3-3 presents a summary of the estimated annual emissions associated with construction activities at Andersen AFB under Alternative 2.

### Table 3-3 Alternative 2 – Construction Emissions at Andersen AFB with Evaluation of Conformity

<table>
<thead>
<tr>
<th>Approximate Calendar Year</th>
<th>Emissions (tons/year)</th>
<th>Conformity de minimis Limits (for a basic nonattainment area)</th>
<th>Exceeds Conformity de minimis Limits?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>VOCs</td>
<td>NO\textsubscript{x}</td>
<td>CO</td>
</tr>
<tr>
<td>Year 1 – Phase 2</td>
<td>9.12</td>
<td>6.44</td>
<td>4.32</td>
</tr>
<tr>
<td>Year 2 – Phase 3</td>
<td>8.98</td>
<td>4.86</td>
<td>3.86</td>
</tr>
<tr>
<td>Year 3 – Phase 4</td>
<td>8.80</td>
<td>3.42</td>
<td>2.82</td>
</tr>
<tr>
<td>Conformity de minimis</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Notes: 1. The ROI is in attainment of the NAAQS for all criteria pollutants and no de minimis thresholds apply; however, emission estimates have been provided and are compared with the de minimis thresholds of a basic nonattainment area, for planning purposes only.

Total emissions for all constituents in the maximum construction year for Alternative 2 is less than 22 tons (see Table 3-3), and only a subset of these are considered GHG emissions. Therefore, due to the relatively small project scale, the annual GHG emissions would fall well below the CEQ threshold of 25,000 metric tons. Similar to Alternative 1, the estimated emissions in Table 3-3 for Alternative 2 would be temporary and minor and would not trigger a formal Conformity Determination under the CAA General Conformity Rule. As stated for Alternative 1, a Record of Non-Applicability for CAA conformity is not required for this project. The temporary and minor increases in construction and operation emissions would be negligible (as shown in Table 3-3), would not trigger a formal Conformity Determination under the CAA General Conformity Rule, and would be not be considered significant. The annual GHG emissions would fall well below the CEQ threshold of 25,000 metric tons, so the limited amount of emissions would not likely contribute to global warming to any discernible extent. Therefore, implementation of Alternative 2 would not result in significant impacts to air quality.

3.2 Water Resources

This discussion of water resources includes groundwater, surface water, wetlands, and floodplains. This section only discusses the physical characteristics of wetlands. Related wildlife and vegetation are...
addressed in Section 3.5, Biological Resources. The project location is inland. No runoff from
construction or operational activities will reach cliff edges and flow offshore, thereby ensuring that coral
reefs will not be affected. Measures to avoid and minimize runoff at the project site are discussed in
Section 3.2.3, Environmental Consequences.

Groundwater is water that flows or seeps downward and saturates soil or rock, supplying springs and
wells. Groundwater is used for water consumption, agricultural irrigation, and industrial applications.
Groundwater properties are often described in terms of depth to aquifer, aquifer or well capacity, water
quality, and surrounding geologic composition. Sole source aquifer designation provides limited
protection of groundwater resources that are used as drinking water supplies.

Surface water resources generally consist of wetlands, lakes, rivers, and streams. Surface water is
important for its contributions to the economic, ecological, recreational, and human health of a
community or locale. A Total Maximum Daily Load is the maximum amount of a substance that can be
assimilated by a water body without causing impairment. A water body can be deemed impaired if
water quality analyses conclude that exceedances of water quality standards occur.

Wetlands are jointly defined by USEPA and U.S. Army Corps of Engineers (USACE) at 40 CFR 232.2 as
those areas that are inundated or saturated by surface or ground water at a frequency and duration
sufficient to support, and that under normal circumstances do support, a prevalence of vegetation
typically adapted for life in saturated soil conditions. Wetlands generally include “swamps, marshes,
bogs, and similar areas.”

Floodplains are areas of low-level ground present along rivers, stream channels, large wetlands, or
coastal waters. Floodplain ecosystem functions include natural moderation of floods, flood storage and
conveyance, groundwater recharge, and nutrient cycling. Floodplains also help to maintain water quality
and are often home to a diverse array of plants and animals. In their natural vegetated state, floodplains
slow the rate at which the incoming overland flow reaches the main water body. Floodplain boundaries
are most often defined in terms of frequency of inundation, that is, the 100-year and 500-year flood.
Floodplain delineation maps are produced by the Federal Emergency Management Agency, and provide
a basis for comparing the locale of the Proposed Action to the floodplains.

### 3.2.1 Regulatory Setting

The Safe Drinking Water Act is the federal law that protects public drinking water supplies throughout
the U.S. and Guam. Under the Safe Drinking Water Act, the USEPA sets standards for drinking water
quality. Groundwater quality and quantity are regulated under several statutes and regulations,
including the Safe Drinking Water Act.

The Clean Water Act (CWA) establishes federal limits, through the National Pollutant Discharge
Elimination System (NPDES) program, on the amounts of specific pollutants that can be discharged into
surface waters to restore and maintain the chemical, physical, and biological integrity of the water. The
NPDES program regulates the discharge of point (i.e., end of pipe) and nonpoint sources
(i.e., stormwater) of water pollution.

The Guam Coastal Management Program requires consistency with its Erosion and Siltation
development policy for applicable federal activities on Guam. The policy states that “development shall
be limited in areas of 15 percent or greater slope by requiring strict compliance with erosion,
sedimentation, and land use regulations, as well as other related land use guidelines for such areas.”

The laws and regulations that follow describe the networked management framework that all non-
exempted federal actions, including the proposed action, must be consistent with to the maximum extent practicable as required by the Coastal Zone Management Act, administered by the Guam Bureau of Statistics and Plans. The Guam Environmental Protection Agency (GEPA) administers portions of federal statutes via a Memorandum of Agreement with the USEPA Region 9. In addition to compliance with the USEPA NPDES program, federal projects must also comply with local requirements (e.g., “respecting the control and abatement of water pollution”) per Section 313(a) of the CWA.

Construction or demolition that necessitates an individual permit also requires preparation of a Notice of Intent to discharge stormwater and a Stormwater Pollution Prevention Plan (SWPPP) that is implemented during construction. As part of the 2010 Final Rule for the CWA, titled *Effluent Limitations Guidelines and Standards for the Construction and Development Point Source Category*, activities covered by this permit must implement non-numeric erosion and sediment controls and pollution prevention measures.

CWA Section 401 Water Quality Certification issuance identifies that construction or operation of a proposed project or facility would be conducted in a manner consistent with Guam Water Quality Standards. As part of a Water Quality Certification, an Environmental Protection Plan (EPP) is required. EPPs describe the methods, practices, and equipment to be used on site; expected or anticipated environmental problems during and after construction; and the methods, practices, and equipment that may be used to avoid, mitigate, or control potential adverse effects on the environment. EPPs are specifically identified in 22 Guam Administrative Rules and Regulations (GAR), Division II, Chapter 10, § 10103.C.5 (d). For work occurring within or affecting surface waters, a USACE permit applicant must prepare a Water Quality Monitoring Plan that describes measures to maintain Guam Water Quality Standards. These measures typically include procedures for monitoring, corrective actions, reporting, and recordkeeping. The local requirement for a Water Quality Monitoring Plan is usually incorporated by the USACE or GEPA in their permit programs regulating activities affecting surface water or wetlands.

Section 438 of the Energy Independence and Security Act establishes stormwater design requirements for development and redevelopment projects. Under these requirements, federal facility projects larger than 5,000 square feet ($\text{ft}^2$) must “maintain or restore, to the maximum extent technically feasible, the predevelopment hydrology of the property with regard to the temperature, rate, volume, and duration of flow.”

### 3.2.2 Affected Environment

The following discussions provide a description of the existing conditions for each of the categories under water quality resources at MSA 1 on Andersen AFB.

#### 3.2.2.1 Surface Water

There are no surface water resources in the Andersen AFB area. Sinkholes and depressions in the porous limestone bedrock (karst) covering the northern portion of Guam, including Andersen AFB channel surface runoff downward into the bedrock. The direction of overland surface water runoff in MSA 1 is generally westward to several sinkholes and depressions.

#### 3.2.2.2 Groundwater

Andersen AFB overlies the northern portion of three groundwater basins: the Finegayan Basin under the western third of the base, the Agafa-Gumas Basin under the central portion of the base, and the Andersen Basin under the eastern portion of the base. The Andersen AFB SWPPP protects against
groundwater contamination from recharge of stormwater runoff via approximately 100 dry wells that
were drilled to facilitate the flow of stormwater into the underlying groundwater.

3.2.2.3  Wetlands
As described above in Section 3.2.2.1, surface water percolates downward into the bedrock in the
Andersen AFB area. In addition, Andersen AFB and MSA 1 are located on an elevated bedrock platform
with a very gentle slope. The physical setting at MSA 1 does not support the formation of wetlands,
thus, none are found at MSA 1.

3.2.2.4  Floodplains
Andersen AFB and MSA 1 are not located within either the 100-year or the 500-year flood zones
(Department of the Navy [DON], 2015).

3.2.3  Environmental Consequences
In this EA, the analysis of water resources looks at the potential impacts on groundwater, surface water
wetlands, and floodplains. Groundwater analysis focuses on the potential for impacts to the quality,
quantity, and accessibility of the water. The analysis of surface water quality considers the potential for
impacts that may change the water quality, including both improvements and degradation of current
water quality. The impact assessment of wetlands considers the potential for impacts that may change
the local hydrology, soils, or vegetation that support a wetland. The analysis of floodplains considers if
any new construction is proposed within a floodplain or may impede the functions of floodplains in
conveying floodwaters.

3.2.3.1  No Action Alternative
Under the No Action Alternative, the Proposed Action would not occur and there would be no change to
baseline water resources. Therefore, no significant impacts to water resources would occur with
implementation of the No Action Alternative.

3.2.3.2  Alternative 1
The study area for the analysis of effects to water resources associated with Alternative 1 includes
Andersen AFB MSA 1.

Construction activities under Alternative 1 would result in the removal of vegetation and soil
disturbance, which could increase potential for short-term increases in stormwater runoff and erosion.

No surface waters are located within or near the Alternative 1 construction area. The Program SWPPP, a
site-specific SWPPP, and EPP would require the use of potential construction BMPs such as diversion
dikes and swales, gravel/sand bag berms, and fiber rolls to control erosion and reduce runoff. Through
implementation of the BMPs required in the SWPPPs and the EPP, off-site transport of stormwater
runoff, sediment, or other pollutants would be unlikely. Project design would include components to
withstand and minimize potential effects of typhoon-level events. No construction activities would occur
in the 100-year or 500-year flood zones. Therefore, construction activities associated with Alternative 1
would have minimal effect on surface waters, and no construction-associated runoff would reach cliff
edges and flow offshore.

Stormwater percolates rapidly in the Andersen AFB limestone karst bedrock. Construction vehicles and
equipment have the potential to leak fuel or other hazardous materials, which could have adverse
effects on the aquifer due to rapid infiltration. The construction contractor would be responsible for
ensuring that their equipment is in good operating condition, and following BMPs to prevent/minimize
accidental releases of fuels and hazardous materials, such as equipping all vehicles with on-board spill
containment kits, parking on paved surfaces where possible, and placing drip pans beneath parked
vehicles. Should a spill occur, the contractor would follow the Andersen AFB Oil and Hazardous
Substance Contingency Plan, and implement the GEPA Spill Prevention Control Countermeasure
Program.

The Alternative 1 construction stormwater runoff protection measures would also serve to protect
groundwater quality. The Proposed Action would be implemented in compliance with the Program
SWPPP, a site-specific SWPPP, EPP, and BMPs associated with addressing site- and activity-specific water
resource protection requirements. Therefore, there would be a reduction in stormwater pollutant
loading potential, and thus a reduction in pollution loading potential to the groundwater basins
underlying Andersen AFB.

Percolation basins would be constructed between the new ECMs to manage stormwater drainage
resulting from the increased impervious surfaces created by construction of the ECMs. The percolation
basins would meet the requirements of Unified Facilities Criteria (UFC) 3-210-10, Low Impact
Development. Following completion of construction and utility line trenching, exposed soil would be
replanted with native vegetation to avoid long-term soil erosion.

Following construction, operations would consist of vehicles transporting ordnance primarily on paved
surfaces to and from the ECMs. The percolation basins and replanted vegetation would avoid
mobilization of soil in runoff into surface and groundwater. Andersen AFB personnel operating the
vehicles would comply with the Andersen AFB Spill Prevention, Control, and Countermeasure Plan to
avoid and minimize the impacts of accidental releases of fuel from the transport vehicles.

Given the use of stormwater protection measures and BMPs to minimize soil transport and accidental
release of hazardous materials during construction, the incorporation of stormwater management in
project design and construction, and compliance with the Andersen AFB Spill Prevention, Control, and
Countermeasure Plan during operations, Alternative 1 would not result in significant impacts to water
resources.

3.2.3.3 Alternative 2

The study area for the analysis of effects to water resources associated with this alternative includes
Andersen AFB MSA 1.

Construction activities under Alternative 2 would result in the removal of vegetation and soil
disturbance, which could increase potential for short-term increases in stormwater runoff and erosion.
However, vegetation removal would be less than under Alternative 1 since 30 existing ECMs would be
demolished before construction of the 48 new ECMs.

No surface waters are located within or near the Alternative 2 construction area. Through
implementation and compliance with the Program SWPPP, a site-specific SWPPP, and EPP, off-site
transport of stormwater runoff, sediment, or other pollutants would be unlikely. Project design would
include components to withstand and minimize potential effects of typhoon-level events. No
construction activities would occur in the 100-year or 500-year flood zones. Therefore, construction
activities associated with Alternative 2 would have minimal effect on surface waters, and no
construction-associated runoff would reach cliff edges and flow offshore.
Similar to Alternative 1, under Alternative 2 the construction contractor would be responsible for ensuring that their equipment is in good operating condition, and following BMPs to prevent/minimize accidental releases of fuels and hazardous materials, such as equipping all vehicles with on-board spill containment kits, parking on paved surfaces where possible, and placing drip pans beneath parked vehicles. Should a spill occur, the contractor would follow the Andersen AFB Oil and Hazardous Substance Contingency Plan, and implement the GEPA Spill Prevention Control Countermeasure Program.

Compliance with the same plans described for Alternative 1 would be required for Alternative 2. Similar to Alternative 1, implementation of stormwater runoff protection measures during construction would also serve to protect groundwater quality under Alternative 2. Thus under Alternative 2, the effect on groundwater would be similar to that of Alternative 1, i.e., there would be a reduction in pollution loading potential to the groundwater basins underlying Andersen AFB.

Under Alternative 2, the same percolation basins would be constructed between the new ECMs to manage stormwater drainage resulting from the increased impervious surfaces created by the ECMs as for Alternative 1. Following completion of construction and utility line trenching, exposed soil would be replanted with native vegetation to avoid long-term soil erosion. Operations following construction of Alternative 2 would be the same as described for Alternative 1.

Given the use of stormwater protection measures and BMPs to minimize soil transport and accidental release of hazardous materials during construction, the incorporation of stormwater management in project design and construction, and compliance with the Andersen AFB Spill Prevention, Control, and Countermeasure Plan during operations, implementation of Alternative 2 would not result in significant impacts to water resources.

### 3.3 Geological Resources

This discussion of geological resources includes topography, geology, and soils of a given area. Topography is typically described with respect to the elevation, slope, and surface features found within a given area. The geology of an area may include bedrock materials, mineral deposits, and fossil remains. The principal geological factors influencing the stability of structures are soil stability and seismic properties. Soil refers to unconsolidated earthen materials overlying bedrock or other parent material. Soil structure, elasticity, strength, shrink-swell potential, and erodibility determine the ability for the ground to support structures and facilities. Soils are typically described in terms of their type, slope, physical characteristics, and relative compatibility or limitations with regard to particular construction activities and types of land use.

#### 3.3.1 Regulatory Setting

Consideration of geologic resources extends to prime or unique farmlands. The Farmland Protection Policy Act was enacted in 1981 in order to minimize the loss of prime farmland and unique farmlands as a result of federal actions. The implementing procedures of the Farmland Protection Policy Act require federal agencies to evaluate the adverse effects of their activities on farmland, which includes prime and unique farmland and farmland of statewide and local importance, and to consider alternative actions that could avoid adverse effects.
3.3.2 Affected Environment

The following discussions provide a description of the existing conditions for each of the categories under geological resources at MSA 1 at Andersen AFB, Guam.

3.3.2.1 Topography

MSA 1 is located at the top of a broad, near-level plateau that slopes gently downward towards the west. Surface elevations in the proposed project area range from approximately 505 to 480 feet above mean sea level.

3.3.2.2 Geology

The island of Guam is located on a volcanic arc adjacent to the Mariana subduction boundary and comprises a volcanic core partially overlain with limestone (karst). The entire island is a potentially active seismic area. Geologic hazards on Guam include the potential for earthquakes that can cause liquefaction (loss of soil cohesiveness and stability in response to earthquake ground motion) and tsunamis, steep slopes where landslides can occur due to earthquakes or heavy rainfall, and sinkholes associated with the limestone karst.

Andersen AFB is located on the northeastern portion of Guam’s uplifted limestone (karst) plateau. There are no earthquake fault zones within Andersen AFB. However, there is a minor earthquake fault zone approximately 1 mile west of the proposed project area in MSA 1 (DON, 2015a). MSA 1 is located in an area with low landslide potential, and is not located in an area subject to tsunamis (DON, 2015a). Basic design standards for construction in northern Guam, munitions storage facilities in general, and munitions storage igloos specifically would be followed. Geotechnical conditions would be investigated and integrated into project design (see Section 2.1.4, Design Standards).

3.3.2.3 Soils

The soil in MSA 1 is classified by the U.S. Department of Agriculture as “Urban Land Complex” due to previous disturbance for military purposes. Prime farmland soils, as defined by the U.S. Department of Agriculture, are soils best suited to producing food, seed, forage, fiber and oilseed crops, are favorable for economic production and sustained high yield, and require minimal inputs of energy and result in the least damage to the environment (DON, 2015a). The soil underlying MSA 1 is not identified as prime farmland by the U.S. Department of Agriculture (DON, 2015a).

3.3.3 Environmental Consequences

Geological resources are analyzed in terms of drainage, erosion, prime farmland, land subsidence, and seismic activity. The analysis of topography and soils focuses on the area of soils that would be disturbed, the potential for erosion of soils from construction areas, and the potential for eroded soils to become pollutants in downstream surface water during storm events. The analysis also examines potential impacts related to seismic events. BMPs are identified to minimize soil impacts and prevent or control pollutant releases into stormwater. The potentially affected environment for geological resources is limited to lands that would be disturbed by any proposed facility development or demolition.
### 3.3.3.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change to baseline geology, topography, or soils. Therefore, no significant impacts to geological resources would occur with implementation of the No Action Alternative.

### 3.3.3.2 Alternative 1

The study area encompasses the proposed construction and ground disturbance areas related to Alternative 1.

As listed in Table 2-1, Alternative 1 would involve disturbance of 51 acres. Under existing conditions, there are 19.3 acres of impervious surfaces in the Alternative 1 Project area. Upon completion, there would be 38.6 acres of impervious surface in the project area. With Alternative 1, construction of the new Hayman style ECMs and associated support facilities would include clearing and grubbing, grading, roadway improvements, excavation, utility line trenching, and landscaping. Construction fill material would be obtained from an established borrow location on Andersen AFB.

The near-level limestone plateau where the work would occur does not have substantial grade changes such as steep hills or canyons that would be leveled or filled. In addition, cut and fill volumes generated during construction would be relatively balanced. For these reasons, only relatively minor changes in grade are anticipated to provide a buildable surface to construct the ECMs and improve the roadways associated with Alternative 1. The limestone karst underlying Andersen AFB is subject to the formation of sinkholes. Known sinkholes in the project area would be avoided. Construction of Alternative 1 would not involve major elevation changes, substantially alter the surrounding landscape, affect important geologic features, or diminish slope stability.

The potential geologic hazards associated with slope instability and liquefaction are minimal at Andersen AFB MSA 1. Potential structural damage or injuries during operations from seismic ground-shaking and fault rupture during an earthquake would be minimized by adherence to UFC 3-310-04, *Seismic Design of Buildings*, Change 1 dated June 20, 2016 (USACE, 2016). Therefore, impacts with respect to seismic hazards would be less than significant.

There is a potential for increased erosion, compaction, and soil loss from physical disturbance during construction activity. However, project design and construction would incorporate engineering controls as BMPs to minimize erosion. Examples of such engineering controls include:

- Use of drainage diversion and control to direct stormwater flow away from construction sites
- Limiting the size of the unstabilized disturbed areas for each project phase to less than 20 acres during construction

Percolation basins would be constructed between the new ECMs to manage stormwater drainage resulting from the increased impervious surfaces created by the ECMs. The percolation basins would meet the requirements of UFC 3-210-10, *Low Impact Development*. Following completion of construction and utility line trenching, exposed soil would be replanted with native vegetation to avoid long-term soil erosion.

There is no prime farmland in the Alternative 1 project area, so implementation of Alternative 1 would have no impact on prime farmland.
Following construction, operations would consist of vehicles transporting ordnance primarily on paved surfaces to and from the ECMs. There would be no further soil disturbance or other effects on geological resources.

Given the minimal changes to topography, the use of engineering controls and BMPs to minimize erosion during construction, the incorporation of stormwater management in project design and construction, implementation of the Alternative 1 would not result in significant impacts with respect to seismic hazards and geological resources.

### 3.3.3.3 Alternative 2

The study area encompasses the proposed construction and ground disturbance areas related to the Alternative 2.

As listed in Table 2-2, Alternative 2 would involve disturbance of 50 acres, 18 acres of which would be existing impervious surface. Under existing conditions, there are 17.9 acres of impervious surfaces in the Alternative 2 Project area. Upon completion, there would be 36.1 acres of impervious surface in the project area.

Similar to Alternative 1, only relatively minor changes in grade are anticipated to provide a buildable surface for construction of the ECMs and roadway improvements with Alternative 2. Construction fill material would be obtained from an established borrow location on Andersen AFB. In addition, cut and fill volumes generated during construction would be relatively balanced. Localized high karst outcrops would be avoided in the project design phase. Because construction activities under Alternative 2 would not involve major elevation changes, Alternative 2 would not substantially alter the surrounding landscape, affect important geologic features, or diminish slope stability. Under Alternative 2, similar construction activities would take place as under Alternative 1, in similar geologic, soil, and seismic conditions. However, new ground disturbance would be less than under Alternative 2 since 30 existing ECMs would be demolished before construction of the 48 new ECMs. No prime farmland is identified within the Alternative 2 project footprint, thus there would be no impact to prime farmland soil.

As described for Alternative 1, project design and construction for Alternative 2 would incorporate engineering controls as BMPs to minimize erosion. The same construction BMPs described for Alternative 1 would be implemented for Alternative 2.

As with Alternative 1, percolation basins would be constructed between the new ECMS to manage stormwater drainage resulting from the increased impervious surfaces created by the ECMs. The percolation basins would meet the requirements of UFC 3-210-10, Low Impact Development. Following completion of construction and utility line trenching, exposed soil would be replanted with native vegetation to avoid long-term soil erosion.

Potential structural damage or injuries during operations from seismic ground-shaking and fault rupture during an earthquake would be minimized by adherence to UFC 3-310-04, Seismic Design of Buildings, with Change 1, dated June 2016 (USACE 2016). Therefore, impacts with respect to seismic hazards would be less than significant.

Following construction, operations would consist of vehicles transporting ordnance primarily on paved surfaces to and from the ECMs. There would be no further soil disturbance or other effects on geological resources.
Given the minimal changes to topography, the use of engineering controls and BMPs to minimize erosion during construction, the incorporation of stormwater management in project design and construction, implementation of Alternative 2 would not result in significant impacts with respect to seismic hazards and geological resources.

### 3.4 Cultural Resources

Cultural resources include prehistoric or historic archaeological sites, buildings, structures, districts, or other places or objects considered important to a culture, a subculture, or a community for traditional, religious, or other reasons. Cultural resources can be divided into three major categories:

- Archaeological sites are locations where past human activity measurably altered the earth, left deposits of physical remains, or created measurably modified landscapes.
- Architectural resources include standing buildings, structures, or other built-environment resources of historic significance.
- Traditional cultural properties may include archaeological resources, structures, neighborhoods, prominent topographic features, habitat, plants, animals, and minerals that traditional Chamorro or other groups consider essential for the preservation of traditional culture.

### 3.4.1 Regulatory Setting

Cultural resources are protected and identified under several federal laws and executive orders. Federal laws include the NHPA (1966), the Archaeological and Historic Preservation Act (1974), and the Archaeological Resources Protection Act (1979). Cultural resources may also be covered by state, local, and territorial laws.

Federal agencies’ responsibility for protecting significant cultural resources is defined primarily by sections 106 and 110 of the NHPA. Section 106 requires federal agencies to take into account the effects of their undertakings on historic properties. Historic properties are defined by 36 CFR § 800.16 as any prehistoric or historic district, site, building, structure, or object (per Part 800) included in, or eligible for inclusion in, the National Register of Historic Places (NRHP). Section 110 of the NHPA requires federal agencies to establish—in conjunction with the Secretary of the Interior—historic preservation programs for the identification, evaluation, and protection of historic properties.

Program comments are an alternate method for federal agencies to meet their Section 106 obligations. The *Program Comment for World War II and Cold War Era (1939-1974) Ammunition Storage Facilities* (Advisory Council on Historic Preservation, 2006:1) “provides the Department of Defense (DoD) and its Military Departments with an alternative way to comply with their responsibilities under Section 106 of the National Historic Preservation Act with regard to the effect of the following management actions on World War II and Cold War Era ammunition storage facilities that may be eligible for listing on the National Register of Historic Properties ongoing operations, maintenance and repair, rehabilitation, renovation, mothballing, cessation of maintenance, new construction, demolition, deconstruction and salvage, remediation activities, and transfer, sale, lease, and closure of such facilities.” Under the Program Comment, Section 106 review is considered to be complete for ammunition storage facilities built from 1939-1974 that are identified by a DoD Category Group (2 digit) code of 42, Ammunition Storage. The Program Comment does not apply to ammunition storage facilities in historic districts where the ammunition storage facility is a contributing element of the district and the proposed undertaking has the potential to adversely affect such historic district. This third exclusion does not
apply to historic districts that are made up solely of ammunition storage facility properties” (Advisory Council on Historic Preservation, 2006:4).

3.4.2 Affected Environment

The area of potential effect (APE) for cultural resources is the geographic area or areas within which an undertaking (project, activity, program, or practice) may directly or indirectly cause alterations in the character or use of historic properties (§800.16(d). The APE is influenced by the scale and nature of the undertaking and may be different for various kinds of effects caused by the undertaking. For the Proposed Action, the APE is the potential Munitions Storage Area historic district that includes the footprint of the project area on Andersen AFB. The potential Munitions Storage Area historic district is made up of MSA 1 and MSA 2, totaling approximately 1,372 acres. MSA 1 contains the footprints for Alternative 1 and Alternative 2.

The Navy has conducted nine cultural resource inventories within MSA 1 (Davis, 1983; Dixon and Walker, 2011; Dixon et al., 2017; Hokanson et al., 2008; Hunter-Anderson and Moore, 2003; Defant and Leon Guerrero, 2006; Mason Architects, Inc., 2004; Yee et al., 2004). One archaeological survey (Defant and Leon Guerrero, 2006) partially overlapped the Alternative 1 footprint. Dixon et al. (2017) conducted an intensive archaeological survey of the remaining portions of the Alternative 1 footprint and all of the Alternative 2 footprint. The other previous surveys covered areas adjacent to but not within the footprints of Alternative 1 and 2. A 2004 architectural survey (Mason Architects, Inc., 2004) covered most of MSA 1 and 2, but focused on architectural resources only. In 2017, a survey of architectural resources within MSA 1 and MSA 2 (Dixon et al., 2017) was conducted in order to provide data for this analysis.

3.4.2.1 Archaeological Resources

NRHP criteria to categorize sites are listed below:

- A = eligible because they are associated with events that have made a significant contribution to the broad pattern of history
- B = eligible because they are associated with the lives of significant persons
- C = eligible because they embody the distinctive characteristics of a type, period, or method of construction
- D = eligible for potential to yield information important in prehistory or history

Sixteen archaeological sites are located within MSA 1 (Table 3-4). These sites include Latte Period ceramic scatters, Latte Period artifact scatters, Post World War II (WW II)/Second American Territorial artifact scatters, Post WW II/Second American Territorial Period concrete curbs and slabs, and a Spanish Colonial Period oven. Of these 16 sites, 11 are eligible for listing in the NRHP under Criterion D (have yielded or may be likely to yield, information important in history or prehistory) (Aguon, 2005; Defant and Leon Guerrero, 2006; Dixon and Walker, 2011; Hokanson et al., 2008; Dixon et al., 2017). One (Site 66-08-2728) is eligible for listing in the NRHP under Criteria A, C, and D (Yee et al., 2004).

Of the sites within MSA 1, three are located within the project footprints. Three eligible sites (66-08-2101, 66-08-2102, 66-08-2922) are located within the Alternative 1 footprint. No eligible sites are located within the Alternative 2 footprint. One eligible archaeological site (66-08-2921) is located adjacent to Alternative 2 but outside the construction footprint.
### Table 3-4  Archaeological Resources Located in MSA 1

<table>
<thead>
<tr>
<th>Site Number</th>
<th>Site Age</th>
<th>Description</th>
<th>Reference</th>
<th>NRHP Eligibility Determination*</th>
<th>Located within the Area of Potential Effects</th>
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<tbody>
<tr>
<td>66-08-2096</td>
<td>Post WW II/Second American Territorial</td>
<td>Concrete Slab</td>
<td>Defant and Leon Guerrero, 2006</td>
<td>Not Eligible (Aguon, 2005)</td>
<td>No</td>
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<td>Latte</td>
<td>Ceramic Scatter</td>
<td>Defant and Leon Guerrero, 2006</td>
<td>Eligible under D (Aguon, 2005)</td>
<td>No</td>
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<td>66-08-2098</td>
<td>Post WW II/Second American Territorial</td>
<td>Concrete curb</td>
<td>Defant and Leon Guerrero, 2006</td>
<td>Not Eligible (Aguon, 2005)</td>
<td>No</td>
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<td>Ceramic Scatter</td>
<td>Defant and Leon Guerrero, 2006</td>
<td>Not Eligible (Aguon, 2005)</td>
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<td>Ceramic Scatter</td>
<td>Defant and Leon Guerrero, 2006</td>
<td>Not Eligible (Aguon, 2005)</td>
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<td>Ceramic Scatter</td>
<td>Defant and Leon Guerrero, 2006</td>
<td>Eligible under D (Aguon, 2005)</td>
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<td>Latte</td>
<td>Ceramic Scatter</td>
<td>Defant and Leon Guerrero, 2006</td>
<td>Eligible under D (Aguon, 2005)</td>
<td>Alternative 1</td>
</tr>
<tr>
<td>66-08-2103²</td>
<td>Latte</td>
<td>Ceramic Scatter</td>
<td>Defant and Leon Guerrero, 2006</td>
<td>Not Eligible (Aguon, 2005)</td>
<td>Alternative 1</td>
</tr>
<tr>
<td>66-08-2155</td>
<td>Latte</td>
<td>Artifact Scatter</td>
<td>Hokanson et al., 2008</td>
<td>Eligible under D</td>
<td>No</td>
</tr>
<tr>
<td>66-08-2156</td>
<td>Latte</td>
<td>Artifact Scatter</td>
<td>Hokanson et al., 2008</td>
<td>Eligible under D</td>
<td>No</td>
</tr>
<tr>
<td>66-08-2728</td>
<td>Spanish Colonial</td>
<td>Spanish Oven</td>
<td>Yee et al., 2004</td>
<td>Eligible under A,C,D</td>
<td>No</td>
</tr>
<tr>
<td>66-08-2913</td>
<td>Latte</td>
<td>Ceramic Scatter</td>
<td>Dixon and Walker, 2011</td>
<td>Eligible under D</td>
<td>No</td>
</tr>
<tr>
<td>66-08-2914</td>
<td>Latte, Post WW II/Second American Territorial</td>
<td>Artifact Scatters</td>
<td>Dixon and Walker, 2011</td>
<td>Eligible under D</td>
<td>No</td>
</tr>
<tr>
<td>66-08-2915</td>
<td>Latte</td>
<td>Ceramic Scatter</td>
<td>Dixon and Walker, 2011</td>
<td>Eligible under D</td>
<td>No</td>
</tr>
<tr>
<td>66-08-2921</td>
<td>Latte</td>
<td>Ceramic Scatter</td>
<td>Dixon et al., 2017</td>
<td>Eligible under D</td>
<td>No</td>
</tr>
<tr>
<td>66-08-2922</td>
<td>Latte</td>
<td>Ceramic Scatter</td>
<td>Dixon et al., 2017</td>
<td>Eligible under D</td>
<td>Alternative 1</td>
</tr>
</tbody>
</table>

**Notes:** * NRHP criteria for significance contained in Federal Regulation 36 CFR 60.4: A = eligible because they are associated with events that have made a significant contribution to the broad pattern of history; B = eligible because they are associated with the lives of significant persons; C = eligible because they embody the distinctive characteristics of a type, period, or method of construction; D = eligible for potential to yield information important in prehistory or history.
3.4.2.2 Architectural Resources

The APE for architectural properties includes the entire potential MSA Historic District (MSA 1 and MSA 2). This potential historic district was first identified by Mason Architects, Inc. (2004) and recommended eligible for listing in the NRHP under Criterion A and C. The 2004 study defined the district as including “the various types of storage igloos” on MSA 1 and MSA 2. Because this project has the potential to impact buildings that are part of this district, the entire proposed district was considered in this analysis.

A 2017 architectural history study of MSA 1 and MSA 2 (Dixon et al., 2017) assessed the conditions and significance of 174 architectural resources located within MSA 1 and MSA 2, including all architectural resources in Alternative 1 and Alternative 2 (Table 3-5). All of the architectural resources in Alternatives 1 and 2 were evaluated as not eligible for listing in the NRHP. The study also found that none of the facilities in MSA 1 met any NRHP criteria and were not individually eligible for the NRHP. MSA 1 was analyzed as a historic district, and the study found that a district comprising MSA 1 facilities did not meet any NRHP criteria, and was not eligible for the NRHP. In accordance with the Program Comment for World War II and Cold War Era (1939 – 1974) Ammunition Storage Facilities (Advisory Council on Historic Preservation, 2006), the Air Force/Navy has no further obligations under Section 106 regarding the igloos in Alternatives 1 and 2.

In MSA 2, the same study found the igloos (Types 4 and 5) and Facility 51150 to be eligible for the NRHP under Criterion A for their associations with Strategic Air Command’s Cold War era nuclear program. Type 4 igloos and Facility 51150 are also eligible under NRHP Criterion C for their specialized designs that were specific to their direct roles in supporting Strategic Air Command’s program. Furthermore, a historic district comprising the individually eligible structures and secondary supporting structures is eligible under NRHP Criterion A. The boundary of the district encompasses the fenced area of MSA 2, which historically encompassed the Ordnance Storage Area.

3.4.2.3 Traditional Cultural Properties

No traditional cultural properties (TCPs) are found within the project area (Welch and Prasad, 2006).

3.4.3 Environmental Consequences

Analysis of potential impacts to cultural resources considers both direct and indirect impacts. Impacts may be the result of physically altering, damaging, or destroying all or part of a resource, altering characteristics of the surrounding environment that contribute to the importance of the resource, introducing visual, atmospheric, or audible elements that are out of character for the period the resource represents (thereby altering the setting), or neglecting the resource to the extent that it deteriorates or is destroyed.

3.4.3.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change to cultural resources. Therefore, no significant impacts to cultural resources would occur with implementation of the No Action Alternative.
### Table 3-5 Architectural Resources in the Area of Potential Effects

<table>
<thead>
<tr>
<th>Facility Number</th>
<th>Type</th>
<th>Date</th>
<th>NRHP Eligibility Determination*</th>
<th>Located within the Area of Potential Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>8200, 8202, 8204</td>
<td>Storage Magazine</td>
<td>1955</td>
<td>Not eligible</td>
<td>Yes</td>
</tr>
<tr>
<td>8400-8403</td>
<td>Storage Igloo 87.6 square meters (943 square feet) (TYPE 1)</td>
<td>1953</td>
<td>Not eligible</td>
<td>Yes</td>
</tr>
<tr>
<td>8404, 8405, 8406, 8407, 8408-8416&lt;sup&gt;2&lt;/sup&gt;</td>
<td>Storage Igloo 161.3 square meters (1,736 square feet) (TYPE 2)</td>
<td>1953</td>
<td>Not eligible</td>
<td>Yes</td>
</tr>
<tr>
<td>8463-8470&lt;sup&gt;2&lt;/sup&gt;, 8471-8479</td>
<td>Storage Igloo 161.3 square meters (1,736 square feet) (TYPE 2)</td>
<td>1954</td>
<td>Not eligible</td>
<td>Yes</td>
</tr>
<tr>
<td>8500-8503 8504-8516&lt;sup&gt;2&lt;/sup&gt;</td>
<td>Storage Igloo 161.3 square meters (1,736 square feet) (TYPE 2)</td>
<td>1954</td>
<td>Not eligible</td>
<td>Yes</td>
</tr>
<tr>
<td>8600-8616</td>
<td>Storage Igloo 161.3 square meters (1,736 square feet) (TYPE 2)</td>
<td>1954</td>
<td>Not eligible</td>
<td>Yes</td>
</tr>
<tr>
<td>8617-8630, 8631&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Storage Igloo 215.9 square meters (2,324 square feet) (TYPE 3)</td>
<td>1954</td>
<td>Not eligible</td>
<td>Yes</td>
</tr>
<tr>
<td>8700-8713</td>
<td>Storage Igloo 161.3 square meters (1,736 square feet) (TYPE 2)</td>
<td>1954</td>
<td>Not eligible</td>
<td>Yes</td>
</tr>
<tr>
<td>8714-8715</td>
<td>Storage Igloo 161.3 square meters (1,736 square feet) (TYPE 3)</td>
<td>1955</td>
<td>Not eligible</td>
<td>Yes</td>
</tr>
<tr>
<td>8716-8729 8730&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Storage Igloo 215.9 square meters (2,324 square feet) (TYPE 3)</td>
<td>1955</td>
<td>Not eligible</td>
<td>Yes</td>
</tr>
<tr>
<td>9000</td>
<td>Munitions Maintenance Administration Building</td>
<td>1952</td>
<td>Not eligible</td>
<td>Yes</td>
</tr>
<tr>
<td>9001/66-08-2923</td>
<td>Munitions Production Mobility and Training</td>
<td>1955</td>
<td>Not eligible</td>
<td>Yes</td>
</tr>
<tr>
<td>9002</td>
<td>36&lt;sup&gt;th&lt;/sup&gt; Munitions Squadron Building</td>
<td>1955</td>
<td>Not eligible</td>
<td>Yes</td>
</tr>
<tr>
<td>9020, 9022, 9024, 9026, 9028, 9030, 9032</td>
<td>Storage Magazine</td>
<td>1954</td>
<td>Not eligible</td>
<td>Yes</td>
</tr>
<tr>
<td>9034/66-08-2924</td>
<td>Storage Building (Surveillance and inspection Building)</td>
<td>1953</td>
<td>Not eligible</td>
<td>Yes</td>
</tr>
<tr>
<td>9040</td>
<td>Fabrication Shop (Renovation Shop Building)</td>
<td>1953</td>
<td>Not eligible</td>
<td>Yes</td>
</tr>
<tr>
<td>9041/66-08-2925</td>
<td>Inert Storage (Renovation Shop Building)</td>
<td>1953</td>
<td>Not eligible</td>
<td>Yes</td>
</tr>
<tr>
<td>51000/66-08-2926</td>
<td>Sentry House</td>
<td>1953</td>
<td>Contributor to MSA 2 Historic District</td>
<td>Yes</td>
</tr>
<tr>
<td>51104</td>
<td>WRM Storage Facility</td>
<td>1953</td>
<td>Not eligible</td>
<td>Yes</td>
</tr>
<tr>
<td>51110</td>
<td>Spare Inert Storage</td>
<td>1952</td>
<td>Contributor to MSA 2 Historic District</td>
<td>Yes</td>
</tr>
<tr>
<td>51112</td>
<td>Spare Inert Storage</td>
<td>1952</td>
<td>Contributor to MSA 2 Historic District</td>
<td>Yes</td>
</tr>
</tbody>
</table>
### Table 3-5 Architectural Resources in the Area of Potential Effects

<table>
<thead>
<tr>
<th>Facility Number</th>
<th>Type</th>
<th>Date</th>
<th>NRHP Eligibility Determination*</th>
<th>Located within the Area of Potential Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>51114</td>
<td>Spare Inert Storage</td>
<td>1952</td>
<td>Contributor to MSA 2 Historic District</td>
<td>Yes</td>
</tr>
<tr>
<td>51150</td>
<td>Munitions Support Equipment Maintenance</td>
<td>1953</td>
<td>Eligible (A and C); Contributor to MSA 2 Historic District</td>
<td>Yes</td>
</tr>
<tr>
<td>51175/66-08-2927</td>
<td>Station 7</td>
<td>1948</td>
<td>Not eligible; Noncontributing to MSA 2 Historic District</td>
<td>Yes</td>
</tr>
<tr>
<td>51250, 51254, 51265</td>
<td>Storage Igloo 70.6 square meters (760 square feet) (TYPE 4)</td>
<td>1953</td>
<td>Eligible under A and C; Contributor to MSA 2 Historic District</td>
<td>Yes</td>
</tr>
<tr>
<td>51253, 51255, 51257, 51259, 51261</td>
<td>Storage Igloo 200.2 square meters (2,155 square feet) (TYPE 5)</td>
<td>1956</td>
<td>Eligible under A; Contributor to MSA 2 Historic District</td>
<td>Yes</td>
</tr>
<tr>
<td>51256, 51258, 51260, 51262, 51264</td>
<td>Storage Igloo 200.2 square meters (2,155 square feet) (TYPE 5)</td>
<td>1953</td>
<td>Eligible under A; Contributor to MSA 2 Historic District</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Notes:** Structures less than 50 years old are not eligible except under specific circumstances.

* NRHP criteria for significance contained in Federal Regulation 36 CFR 60.4: A = eligible because they are associated with events that have made a significant contribution to the broad pattern of history; B = eligible because they are associated with the lives of significant persons; C = eligible because they embody the distinctive characteristics of a type, period, or method of construction; D = eligible for potential to yield information important in prehistory or history.

1 In Alternative 1.
2 In Alternative 2.

### 3.4.3.2 Alternative 1

Alternative 1 would involve the disturbance of 51 acres, 19 of which would be impervious surface, for the construction of 48 new Hayman style ECMs. Depth of construction is anticipated to vary between 2 to 5 feet below ground surface for road and facility construction. Vegetation is dense in the undeveloped space and would require clearance. Existing access roads within Alternative 1 would be removed and replaced, and new utilities would be constructed. No demolition of existing facilities would be required.

Analyses from the architectural survey in 2017 (Dixon et al., 2017) do not support a historic district made up of structures within MSA 1. In accordance with the *Program Comment for World War II and Cold War Era (1939 – 1974) Ammunition Storage Facilities* (Advisory Council on Historic Preservation, [Link to the program comment](issuu.com), 2017, p. 6).
Alternatives 1 and 2. In addition, only two architectural resources (Facilities 8631 and 8730) are located within Alternative 1. Both are ineligible, for listing in the NRHP, and these two facilities would not be demolished or modified. Therefore, no impacts would occur either to eligible architectural resources or to historic properties made up of either individual structures or a historic district.

Three archaeological sites found within the footprint of Alternative 1 (66-08-2101, 66-08-2102, 66-08-2922) are Latte Period ceramic scatters eligible for listing in the NRHP, and one (66-08-2103) is a Latte Period ceramic scatter ineligible for listing in the NRHP. These sites would be disturbed by vegetation clearance and the construction of the munitions storage facilities. Though Site 66-08-2103 is ineligible for listing in the NRHP, the provision of the Final Integrated Cultural Resource Management Plan (ICRMP) for Andersen AFB would be followed (Andersen AFB, 2003) in the event that inadvertent discoveries occur during construction. Sites 66-08-2100 (ineligible), 66-08-2101, and 66-08-2922 would have adverse effects mitigated through avoidance by altering plans to omit the igloo that coincides with that location and by altering the path of proposed utility lines. Site 66-08-2102, which falls under the footprint of three igloos, would have adverse effects mitigated through archaeological data recovery. A data recovery plan shall be submitted to the Guam State Historic Preservation Officer (SHPO) for approval and the work executed prior to the onset of construction. Human remains encountered during these excavations or in association with any of the project’s construction activities would trigger ICRMP Standard Operating Procedures and would require further consultation with the Guam SHPO. If archaeological resources are inadvertently discovered during ground-disturbing activities, then the ICRMP Standard Operating Procedures would be followed, as well as the provisions of the 36 CFR 800.13 Post Review Discovery.

The Air Force initiated consultation under Section 106 of NHPA in April 2018 (Andersen AFB, 2018). This consultation indicated that Guam Historic Properties Inventory sites 66-08-2101, 66-08-2102, and 66-08-2922 are eligible for the NRHP and that there would be no adverse effect to these sites if proposed mitigation measures are followed. The Guam SHPO concurred with the Section 106 request, with the provision that an approved archaeological data recovery plan be put in place (see Appendix D). Implementation of Alternative 1 would result in no adverse effect to historic properties, so impacts would be less than significant.

3.4.3.3 Alternative 2

Alternative 2 would involve the disturbance of 50 acres, 18 of which would be impervious surface, for the construction of 48 new Hayman style ECMs. Thirty existing ECMs were constructed in the 1950s and are not considered to be eligible for listing in the NRHP. These structures are also covered under the Program Comment for World War II and Cold War Era Ammunitions Storage Facilities (Advisory Council on Historic Preservation, 2006). Analyses from the architectural survey in 2017 (Dixon et al., 2017) do not support a historic district made up of structures within MSA 1. Therefore, no impacts would occur to historic properties made up of either individual structures or a historic district. No eligible archaeological sites are located within the Alternative 2 footprint. One eligible archaeological site (66-08-2921) is located adjacent to Alternative 2, but outside of the construction footprint, and would be avoided. Implementation of Alternative 2 would result in no adverse effects to archaeological sites.
Therefore, implementation of Alternative 2 would not result in a significant direct impact to historic properties consisting of archaeological resources, architectural properties, or TCPs.

3.5 Biological Resources

Biological resources include native and naturalized plant and animal species and the habitats in which they occur. Plant associations are referred to generally as vegetation, and animal species are referred to generally as wildlife. Habitat can be defined as the resources and conditions present in an area that support a plant or animal.

Within this EA, biological resources are divided into two major categories: (1) terrestrial vegetation and (2) terrestrial wildlife. Special-status species, including threatened and endangered species, are discussed within the corresponding sections.

3.5.1 Regulatory Setting

Special-status species, for the purposes of this assessment, are those species listed as threatened or endangered under the Federal ESA and Guam ESA, and species afforded federal protection under the Migratory Bird Treaty Act (MBTA) (Title 16 U.S.C. section 703).

The purpose of the federal ESA is to conserve the ecosystems on which threatened and endangered species depend and to conserve and recover listed species. Section 7 of the federal ESA requires action proponents to consult with the U.S. Fish and Wildlife Service (USFWS) or National Oceanic and Atmospheric Administration (NOAA) Fisheries to ensure that their actions do not jeopardize the continued existence of federally listed threatened and endangered species, or result in the destruction or adverse modification of designated critical habitat. Andersen AFB has prepared a Biological Assessment (BA) as part of a request for formal consultation under Section 7 of the ESA (Appendix C).

This document also supports Department of Defense’s compliance with section 102 of NEPA mandating that appropriate consideration be given to environmental resources impacted by the preferred alternative presented in this EA.

The Guam National Wildlife Refuge (NWR) was established in 1993 by a Memorandum of Understanding between the USFWS, Navy, USAF, and GovGuam (GovGuam et al., 1993). Cooperative Agreements were signed in 1994 to establish the Overlay Refuge and define the management, administrative roles, and responsibilities (DON and USFWS, 1994; Air Force and USFWS, 1994). The 1994 Cooperative Agreements provide a commitment by the Navy, Air Force, and USFWS for a coordinated program centered on the protection of threatened and endangered species and other native flora and fauna, maintenance of native ecosystems, and the conservation of native biological diversity in cooperation with Guam Department of Agriculture, Division of Aquatic and Wildlife Resources (DAWR), recognizing that the primary purpose of lands within the Overlay Refuge is to support the national defense missions of the Navy and Air Force. Excess military land at Ritidian Point was then transferred to USFWS under the federal excess property regulations for inclusion in the Guam NWR as the Ritidian Unit.

The Guam NWR is comprised of three units: the Ritidian Unit, the Andersen AFB Overlay Unit, and the Navy Overlay Unit. The Ritidian Unit is located on the northern tip of Guam and encompasses 1,217 acres, including 385 acres of terrestrial lands and 832 acres of submerged lands (USFWS, 2009). The Andersen AFB and Navy overlay units are collectively referred to as Overlay Refuge lands and total 21,693 acres. The Andersen AFB Overlay Unit covers approximately 10,159 acres and the Navy Overlay Unit covers approximately 11,534 acres (see Figure 3-1).
Figure 3-1  Overlay Refuge Lands and Critical Habitat – Northern Guam
In 2004, the USFWS designated 376 acres of land as critical habitat under the ESA for the Guam Micronesian kingfisher (Todiramphus cinnamominus), Mariana crow (Corvus kubaryi), and Mariana fruit bat (Pteropus mariannus mariannus) on the Ritidian Unit of the Guam NWR (USFWS, 2004). Overlay Refuge lands were excluded from this designation in northern and southern Guam. Air Force lands were excluded under section 4(a)(3) of the ESA based on the Air Force’s 2003 INRMP for Andersen AFB. The DON lands were excluded under section 4(b)(2) of the ESA based on a determination by the Secretary of the Interior that the benefits of excluding these lands, including benefits to national security and existing management plans and conservation efforts, outweighed the benefits of designating them as critical habitat. The 376 terrestrial acres of the Guam NWR (Ritidian Unit) is the only designated critical habitat on Guam.

Birds, both migratory and most native resident species, are protected under the MBTA, and their conservation by federal agencies is mandated by EO 13186, Responsibilities of Federal Agencies to Protect Migratory Birds. Under the MBTA (Title 16 U.S.C. section 703), it is unlawful by any means or in any manner, to pursue, hunt, take, capture, kill, attempt to take, capture, or kill, [or] possess migratory birds or their nests or eggs at any time, unless permitted by regulation.

The 2003 National Defense Authorization Act (50 CFR 21) gave the Secretary of the Interior authority to prescribe regulations to exempt the Armed Forces from incidentally taking migratory birds during authorized military readiness activities. In this Act, congress defined military readiness activities as all training and operations of the armed forces that relate to combat and the adequate and realistic testing of military equipment, vehicles, weapons, and sensors for proper operation and suitability for combat use. Military readiness activities do not include: (a) routine operation of installation support functions such as administrative offices, military exchanges, water treatment facilities, schools, housing, storage facilities, and morale, welfare, and recreation activities; (b) the operation of industrial activities; and (c) the construction or demolition of facilities used for a purpose described in a or b (50 CFR 21). The 2003 National Defense Authorization Act includes a requirement that the DOD must confer with the USFWS while developing and implementing appropriate conservation measures to minimize or mitigate the adverse effects of a military readiness activity, if the activity is predicted to have a significant adverse effect on a population of migratory birds. The proposed action addressed in this EA, however, is not a military readiness activity. Migratory bird conservation relative to military activities not necessary for military readiness is addressed separately in a 2006 Memorandum of Understanding developed in accordance with EO 13186.

### Affected Environment

The following paragraphs provide a description of the existing conditions for each of the categories under biological resources at Andersen AFB MSA I. Threatened and endangered species are discussed within the corresponding sections. The action area is defined as all areas that may be affected directly or indirectly and not merely the immediate area involved in the action. It encompasses the geographic extent of environmental changes (i.e., the physical, chemical and biotic effects) that may result directly and indirectly from the Proposed Action. The action area is the area within which the action is likely to produce stressors that have direct or indirect effects to ESA-listed species.

Navy-funded endangered plant surveys were conducted from November 2016 to January 2017 in the entire MSA with focus on the action area. The plant survey targeted ESA-listed plants as well as *Maytenus thompsonii*, the host plant for the endangered and extirpated Mariana wandering butterfly (*Vagrans egistina*), and *Procris pedunculata* and *Elatostema calcareum*, the host plants for the Mariana...
eight-spot butterfly (*Hypolimnas octocula marianensis*). ESA-listed plants and *Maytenus thompsonii*
were flagged and GPS points of their locations were collected. Health of plants was documented and
plant life stage (adult or seedling) was noted. Neither *Procris pedunculata* nor *Elatostema calcarum*
were observed.

Biologists conducted fauna surveys for species listed under federal ESA, the Guam ESA, and MBTA in the
Alternative 2 action area in December 2016 (DON, 2017b). Target species included federal and Guam
ESA-listed reptiles and tree snails, federal ESA-listed butterflies, associated tree snail and butterfly host
plants, and birds listed under the MBTA. Observations during the November 2016 to January 2017 plant
survey in the Alternative 1 action area and other existing data were used to characterize wildlife in that
location. Although fauna surveys were not conducted in the Alternative 1 action area, this action area is
similar in habitat and adjacent to the Alternative 2 action area and have the same forest composition.
These two locations are also contiguous; the Alternative 1 action area, however, contains native
limestone forest while the Alternative 2 action area does not and is much more fragmented than habitat
in the Alternative 1 action area.

3.5.2.1 Terrestrial Vegetation

Overview

The action area on Andersen AFB consists of old Hayman style munition storage bunkers surrounded by
maintained grassy fields and other forested vegetation. The Alternative 1 action area consists of
Limestone Degraded Forest, *Vitex* Forest, Developed land, and a very small portion of Coconut Forest,
and the Alternative 2 action area consists of *Vitex* Forest and Developed Land (Figure 3-2). However,
surveys conducted within the action areas found that the forested vegetation consists of fragmented,
degraded limestone forest, with small patches of native limestone forest restricted to areas of tower
karst. These two dominant forest types found within the action area are described below. Feral pigs (*Sus
scrofa*) and Philippine deer (*Rusa marianna*) have highly impacted the forest understory, leaving little to
no vegetation, and rooting by pigs has further produced large areas of rutted topsoil.

MSA I is located at the edge of the northern Guam limestone plateau. The original native limestone
vegetation was largely composed of *Artocarpus mariannensis*, *Pandanus tectorius*, and *Ficus* spp.,
among others. The plateau has historically been impacted by extensive agricultural and military use,
which began in the early 1800s, continued during WW II, and continues today (Mueller-Dombois and
Fosberg, 1998). Vegetation mapping was conducted on Andersen AFB lands in 2015, which relied on a
combination of desktop mapping, aerial imagery, and ground-truthing (DON, 2016). Based on the results
of this recent vegetation mapping, the project area is composed of 10.4 acres of *Vitex* forest and 38.9
acres of developed land (Figure 3-2).

Plants common to limestone degraded forests include *Artocarpus mariannensis*, *Artocarpus altilis*,
ironwood (*Casuarina equisetifolia*), *Pandanus tectorius*, *Ochrosia oppositifolia*, *Scaevola sericea*,
*Morinda citrifolia*, *Hibiscus tiliaceus*, *Elaeocarpus joga*, *Ficus prolixa*, *Aglaia mariannensis*, *Guamia
mariannae*, and *Cycas micronesica*. Native terrestrial ferns are present in the forest understory and
include tongue fern (*Pyrrrosia lanceolata*), shoestring fern (*Vittaria incurvata*), galak (*Pteris tripartita*),
scaly sword fern (*Nephrolepis hirsutula*), and crested elk horn fern (*Polypodium punctatum*) (36
CES/CEVN, 2003). The canopy found in the limestone degraded forests within the two alternative action
areas varies from full closure to intermediate with some rock outcrops.
Figure 3-2
Vegetation Communities within the Project Area
Numerous non-native plant species have become established throughout Guam, including Andersen AFB, and are displacing native plant species. Invasive non-native species are characterized by rapid growth and rapid seed production. Disturbed areas in MSA I are colonized by introduced species such as bittervine (*Mikania micrantha*), *Momordica charantia*, and wild passion flower (*Passiflora suberosa*). Introduced weedy herbs such as *Chromolaena odorata*, comb bushmint (*Hyptis pectinata*), light blue snakeweed (*Stachytarpheta jamaicensis*), tropical whiteweed (*Ageratum conyzoides*), and romerillo (*Bidens alba*) are frequent as well (36 CES/CEVN, 2003). *Vitex parviflora* is a large, non-native tree that dominates much of the canopy in the project area, displacing native species that normally colonize limestone soils.

The plant surveys conducted in MSA I found native and degraded limestone forest vegetation types within the Alternative 1 project area (shown in Figure 2 of Appendix F [DON, 2017a]). The native limestone forest was described as generally dense forest dominated by *Guamia mariannae*, *Aglaia mariannensis*, *Eugenia reinwardtiana*, *Eugenia thompsonii*, and *Macaranga thompsonii*. The upper canopy occasionally consisted of natives such as *Ficus prolixa*, *Artocarpus mariannensis*, *Intsia bijuga*, *Elaeocarpus joga* and *Tristisropis obtusangula*, while the mid-canopy often consisted of natives such as *Premna serratifolia*, *Cynometra ramiflora*, and *Psychotria mariana*. Other native trees occasionally encountered within the Alternative 1 project area included *Guettarda speciosa*, *Dendrocnide latifolia*, *Polyscias grandifolia*, *Drypetes dolichocarpa* and *Maytenus thompsonii*. The degraded limestone forest contained many of the same species as found in native limestone forest, but was described as having a slightly more open canopy cover and was dominated by native trees that are commonly found in disturbed areas (*Guamia mariannae*, *Hibiscus tiliaceus*, and *Ochrosia oppositifolia*). Seven federally and Guam-listed plant species have the potential to occur within the MSA and project area (Table 3-6), but only *Cycas micronesica* and *Tabernaemontana rotensis* were observed within the Alternative 1 project area (Appendix C) (Figure 3-3) (DON, 2017a).

Degraded limestone forest and mixed scrub community were the two vegetation types found within the Alternative 2 project area (DON, 2017a, see Appendix F). Mixed scrub community was described as open and disturbed habitat dominated by the shrubs *Cestrum diurnum* and *Wikstroemia elliptica*. No native limestone forest was found within this area. Seven federally and Guam-listed plant species have the potential to occur within the MSA and the Alternative 2 project area (see Table 3-6), but only *Cycas micronesica* was observed within the project area (Appendix C) (Figure 3-3). Unlike the Alternative 1 project area, *Tabernaemontana rotensis* was not found in the Alternative 2 project area (DON, 2017a, b). Many *Cycus micronesica* found in the Alternative 2 project area were in poor condition, either ravaged by scale and / or found dead (DON, 2017b). While the ESA-listed butterfly host plants *Procris pedunculata* and *Elatostema calcareum* were not seen in the project area, several *Maytenus thompsonii*, the host for the Mariana wandering butterfly, were found to occur within the project area (Figure 3-4).
Figure 3-3
Population Counts of Federally Threatened Plant Species Found in the Project Area
Figure 3-4
Population counts of *Maytenus thompsonii* found on the MSA
<table>
<thead>
<tr>
<th>Common Name/Chamorro Name(1)</th>
<th>Scientific Name</th>
<th>Federal Status(2)</th>
<th>GovGuam Status(3)</th>
<th>Status of Project Area Population(2, 4, 5)</th>
<th>Habitat(2, 4, 6, 7)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Plants</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fire tree/hayun lago</td>
<td><em>Serianthes nelsonii</em></td>
<td>E</td>
<td>E</td>
<td>Not present.</td>
<td>Native limestone and ravine forest; edge species.</td>
</tr>
<tr>
<td>None/siboyas halumtanu</td>
<td><em>Bulbophyllum guamense</em></td>
<td>T</td>
<td>--</td>
<td>Not present.</td>
<td>Native forests, especially along cliffs and slopes. Epiphytic.</td>
</tr>
<tr>
<td>None/none</td>
<td><em>Tuberolabium guamense</em></td>
<td>T</td>
<td>--</td>
<td>Not present.</td>
<td>Native forests. Epiphytic.</td>
</tr>
<tr>
<td>None/none</td>
<td><em>Dendrobium guamense</em></td>
<td>T</td>
<td>--</td>
<td>Not present.</td>
<td>Native forests. Epiphytic and lythohytic.</td>
</tr>
<tr>
<td>None/Ufa halumtano</td>
<td><em>Heritiera longipetiolata</em></td>
<td>E</td>
<td>E</td>
<td>Not present.</td>
<td>Limestone cliffs and plateaus.</td>
</tr>
<tr>
<td><strong>Cycad/fadang</strong></td>
<td><em>Cycas micronesica</em></td>
<td>T</td>
<td>T</td>
<td>7,863 individuals occur throughout the entire MSA(8) (724 in Alternative 1, 55 in Alternative 2).</td>
<td>Clay, sand, and limestone soils.</td>
</tr>
<tr>
<td>None/none</td>
<td><em>Tabernaemontana rotensis</em></td>
<td>T</td>
<td>T</td>
<td>542 individuals occur throughout the entire MSA(8) (83 in Alternative 1, 0 in Alternative 2).</td>
<td>Limestone forests.</td>
</tr>
<tr>
<td><strong>Mammals</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mariana fruit bat/fanihi</td>
<td><em>Pteropus mariannus mariannus</em></td>
<td>T</td>
<td>E</td>
<td>Few individuals known to transit over project area.</td>
<td>Limestone forest, coastal forest, and coconut plantations. Critical habitat on the Ritidian Unit of the Guam NWR. No critical habitat has been designated on DoD lands.</td>
</tr>
<tr>
<td><strong>Birds</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guam rail/ko'ko'</td>
<td><em>Gallirallus owstoni</em></td>
<td>E</td>
<td>--</td>
<td>Not observed during fauna survey, no longer known to exist in the wild in Guam.</td>
<td>In captivity on Guam, small introduced population on Cocos, introduced population on Rota.</td>
</tr>
<tr>
<td>Mariana crow/aga</td>
<td><em>Corvus kubaryi</em></td>
<td>E</td>
<td>--</td>
<td>Not observed during fauna survey, no longer known to exist in the wild in Guam.</td>
<td>Critical habitat on the Ritidian Unit of the Guam NWR. No critical habitat has been designated on DoD lands.</td>
</tr>
<tr>
<td>Common Name/ Chamorro Name(1)</td>
<td>Scientific Name</td>
<td>Federal Status(2)</td>
<td>GovGuam Status(3)</td>
<td>Status of Project Area Population(2, 4, 5)</td>
<td>Habitat(2, 4, 6, 7)</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-----------------</td>
<td>------------------</td>
<td>------------------</td>
<td>------------------------------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>Micronesian starling/såli</td>
<td>Aplonis opaca</td>
<td>--</td>
<td>E</td>
<td>Primarily occurs in urban areas, Andersen AFB, and Cocos Island.</td>
<td>Cavity nester; all habitats but prefers forest.</td>
</tr>
<tr>
<td>Reptiles</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moth skink/ gualie’ek kanton tási</td>
<td>Lipinia noctua</td>
<td>--</td>
<td>E</td>
<td>Very rare.</td>
<td>Native limestone forest.</td>
</tr>
<tr>
<td>Pacific slender-toed gecko/gualie’ek</td>
<td>Nactus pelagicus</td>
<td>--</td>
<td>E</td>
<td>Very rare.</td>
<td>Forest edge.</td>
</tr>
<tr>
<td>Invertebrates</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Humped tree snail/akaleha</td>
<td>Partula gibba</td>
<td>E</td>
<td>E</td>
<td>Very rare.</td>
<td>Coastal backstrand limestone forest.</td>
</tr>
<tr>
<td>Guam tree snail/akaleha</td>
<td>Partula radiolata</td>
<td>E</td>
<td>E</td>
<td>Very rare.</td>
<td>Coastal backstrand limestone forest.</td>
</tr>
<tr>
<td>Fragile tree snail/akaleha</td>
<td>Samoana fragilis</td>
<td>E</td>
<td>E</td>
<td>Very rare.</td>
<td>Coastal backstrand limestone forest.</td>
</tr>
<tr>
<td>Mariana eight-spot butterfly/ababbang</td>
<td>Hypolimnas octocula marianensis</td>
<td>E</td>
<td>--</td>
<td>Very rare.</td>
<td>Coastal backstrand limestone forest.</td>
</tr>
</tbody>
</table>

Sources: (1) Chamorro names are from USFWS, 2015a and GovGuam, 2009; (2) USFWS, 2015a; (3) Government of Guam, 2009; (4) Guam Department of Agriculture DAWR, 2015; (5) JRM, 2013; (6) DON, 2015b; (7) Raulerson and Rinehart, 1991; (8) DON, 2017a.

### Summary of Occurrence of ESA-Listed Plant Species

The occurrence of ESA-listed plant species within the MSA is summarized below (DON, 2018b):

- **Cycas micronesica** (threatened). On Guam, there are approximately 516,000 individuals that occur from the shoreline to limestone cliffs (USFWS, 2015b). Vegetation surveys in support of this project identified 7,863 *Cycas micronesica* within the MSA. Approximately 724 *Cycas micronesica* are located within the Alternative 1 action area (UOG, 2017), and 55 *Cycas micronesica* are located within the Alternative 2 action area. Locations of the trees are identified in Figure 3.1. Trees varied in heath with some having damage to the crown and others being healthy.

- **Tabernaemontana rotensis** (threatened). There are seven known locations of this species on Guam and Rota, totaling 22,375 individuals. There are 9 known individuals in one location on Rota, and 6 locations on Guam where the species occur, equaling a range-wide total of 22,384 individuals (DON, 2017a). Vegetation surveys in support of this project identified 542 *Tabernaemontana rotensis* within the MSA, including 83 plants in the Alternative 1 action area (0 individuals were identified in the Alternative 2 action area). Both seedlings (44 plants) and mature plants (39 plants) were found in the Alternative 1 action area (UOG, 2017).

#### 3.5.2.2 Terrestrial Wildlife

Wildlife includes all animal species (i.e., mammals, reptiles, birds, and invertebrates) focusing on the species and habitat features of greatest importance or interest.
Mammals

Mariana fruit bat or fanihi (Pteropus mariannus mariannus) is the only native mammal species that occurs on Andersen AFB (DON, 2015b; DON, 2017d). As a result of overhunting, habitat loss, and predation by the brown treesnake (Boiga irregularis), fruit bat population numbers have significantly decreased since the 1930s (DON, 2017c).

Introduced feral ungulates, such as the Philippine deer and feral pig, have altered the island’s natural ecosystems. Feral ungulates impact native vegetation by grazing and rooting, which (1) kills or clears vegetation, (2) prevents native vegetation recolonization, (3) spreads the seeds of introduced plant species, and (4) disturbs soils. A small herd of deer was seen moving through the forest during surveys conducted in the action area. Three introduced rat species (Rattus norvegicus, Rattus rattus, and Rattus exulans) inhabit the base. The introduced and native skinks and geckos, as well as the potentially recent introduction of frog species, sustain the high brown treesnake population levels. Rodents also have a very detrimental effect on island birds and affect native ecosystems in their consumption of native tree seeds, thus reducing native plant recruitment.

While only a few small mammal surveys have been conducted on Andersen AFB, it is likely that the musk shrew (Suncus murinus) occurs within the MSA (Wiles 2005; Wiewel et al. 2009). Feral populations of domesticated animals such as dogs (Canis lupus familiaris) and cats (Felis catus) occur on Andersen AFB and have the potential to occur within the MSA. (NAVFAC Marianas 2017a). Dogs are opportunistic feeders and feral cats destroyed an experimental population of Guam rail within the MSA (NAVFAC 15 Marianas 2013).

Reptiles and Amphibians

Table 3-7 summarizes reptiles and amphibians at Andersen AFB. The brown treesnake was inadvertently introduced to Guam shortly after WW II, probably in ship cargo. They are a major nocturnal predator of native birds and reptiles on Guam and are thought to be responsible for the near total extinction of the island’s forest-dwelling avifauna, as well as severe reductions or extirpation of native reptile species (USFWS, 1990a; Wiles et al., 2003).

Wildlife surveys conducted in the project area for Alternative 2 at Andersen AFB in December 2016 did not detect any listed wildlife species (DON, 2017b). Two species of skinks and three species of gecko were observed:

- non-native curious skink (Carlia fusca)
- native Pacific blue-tailed skink (Emoia caeruleocauda)
- native mutilating gecko (Gehyra mutilata)
- native mourning gecko (Lepidodactylus lugubrus)
- non-native house gecko (Hemidactylus frenatus)

The non-native Brahminy blind snake (Indotyphlops braminus) (DON, 2017b) and the naturalized Pacific monitor lizard (Varanus indicus) were also observed.

Birds

Table 3-8 shows bird species recorded at Andersen AFB. Although the forests of Andersen AFB once supported the federally and Guam-listed endangered Mariana crow, Guam Micronesian kingfisher, and Guam rail (Gallirallus owstoni), avian populations on Guam were significantly affected by the introduction of the brown treesnake. While the Mariana crow was extirpated from Guam, the Guam rail...
and the Guam Micronesian kingfisher were extirpated from the wild (DON, 2015b). Captive-bred Guam rail have been introduced to Cocos Island, immediately southwest of Guam, and the CNMI island of Rota (JRM, 2013).

Table 3-7  Reptiles and Amphibians at Andersen AFB

<table>
<thead>
<tr>
<th>Common Name/Chamorro Name</th>
<th>Scientific Name</th>
<th>Residence Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brown treesnake/Kolepbla</td>
<td>Boiga irregularis</td>
<td>Non-native</td>
</tr>
<tr>
<td>Marine toad or Cane toad/Kairo</td>
<td>Rhinella (=Bufo) marina</td>
<td>Non-native</td>
</tr>
<tr>
<td>Curious skink/Gualiek halumtano</td>
<td>Carlia ailanalai</td>
<td>Non-native</td>
</tr>
<tr>
<td>Green turtle/Haggan</td>
<td>Chelonia mydas</td>
<td>Native</td>
</tr>
<tr>
<td>Greenhouse frog/Kairo</td>
<td>Eleutherodactylus planirostris</td>
<td>Non-native</td>
</tr>
<tr>
<td>Pacific blue-tailed skink/Gualiek halumtano</td>
<td>Emoia caeruleocauda</td>
<td>Native</td>
</tr>
<tr>
<td>Hawksbill turtle/Haggan karai</td>
<td>Eretmochelys imbricata</td>
<td>Native</td>
</tr>
<tr>
<td>Mutilating gecko/Achiak</td>
<td>Gehyra mutilata</td>
<td>Native</td>
</tr>
<tr>
<td>House gecko/Achiak</td>
<td>Hemidactylus frenatus</td>
<td>Non-native</td>
</tr>
<tr>
<td>Mourning gecko/Achiak</td>
<td>Lepidodactylus lugubris</td>
<td>Native</td>
</tr>
<tr>
<td>Moth skink/Gualiek halumtano</td>
<td>Lipinia noctua</td>
<td>Native</td>
</tr>
<tr>
<td>Brahminy blind snake/Ulo attilong</td>
<td>Ramphotyphlops braminus</td>
<td>Non-native</td>
</tr>
<tr>
<td>Monitor lizard/Hilitai</td>
<td>Varanus indicus</td>
<td>Naturalized</td>
</tr>
</tbody>
</table>

Notes: 1 Common and scientific names based on Gill and Donsker (2017). Chamorro names from GovGuam (2009), Liske-Clark (2015), Topping et al. (1975), and USFWS (2015a).

Source: DON (2010).

No federal or Guam ESA-listed birds were observed during recent surveys of the Alternative 2 project area (DON, 2017b). Three non-native resident bird species (black drongo \([\text{Dicrurus macrocerus}]\), island collared dove \([\text{Streptopelia bitorquata}]\) and black francolin \([\text{Francolinus francolinus}]\) and three MBTA-listed species (Pacific golden plover \([\text{Pluvialis fulva}]\), Pacific reef heron \([\text{Egretta sacra}]\), and yellow bittern \([\text{Ixobrychus sinensis}]\) were recorded (DON, 2017b). White-throated ground dove \((\text{Gallicolumba xanthonura})\) have also been sighted occasionally in the project areas (DON, 2017e).

Invertebrates

Despite the presence of several native tree snail host plants, no native tree snails were observed in the project area. Non-native tree snails observed included the Asian land snail \((\text{Satsuma} \text{ sp.})\) and tropical American lined tree snail \((\text{Drymaeus multilineatus})\), as well as weathered white shells of the giant African snail \((\text{Achatina fulica})\) and the invasive predator rosy wolf snail \((\text{Euglandina rosea})\). Also seen was the invasive flatworm \((\text{Platydemus manokwari})\), a known predator of native tree snails on Guam (DON, 2017b).
## Bird Species Recorded on Andersen AFB

<table>
<thead>
<tr>
<th>Common Name/Chamorro Name¹</th>
<th>Species</th>
<th>Residence Status</th>
<th>Listed under MBTA?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Micronesian starling/Sali</td>
<td>Aplonis opaca</td>
<td>Uncommon native breeding resident</td>
<td>N</td>
</tr>
<tr>
<td>Yellow bittern/Kakkkak</td>
<td>ixobrychus sinesis</td>
<td>Common native breeding resident</td>
<td>Y</td>
</tr>
<tr>
<td>Ruddy turnstone/Dulili</td>
<td>Arenaria interpes</td>
<td>Common non-breeding visitor</td>
<td>Y</td>
</tr>
<tr>
<td>Tattler spp.²</td>
<td>Tringa spp.</td>
<td>Common non-breeding visitor</td>
<td>Y</td>
</tr>
<tr>
<td>Wood sandpiper/Dulili</td>
<td>Tringa glareola</td>
<td>Common non-breeding visitor</td>
<td>Y</td>
</tr>
<tr>
<td>Sharp-tailed sandpiper/Dulili</td>
<td>Calidris acuminata</td>
<td>Common non-breeding visitor</td>
<td>Y</td>
</tr>
<tr>
<td>Pacific golden plover/Dulili</td>
<td>Pluvialis fulva</td>
<td>Common non-breeding visitor</td>
<td>Y</td>
</tr>
<tr>
<td>White tern/Chunge</td>
<td>Gygis alba</td>
<td>Common breeding resident</td>
<td>Y</td>
</tr>
<tr>
<td>Eastern cattle heron/Chuchuko</td>
<td>Bubulcus coromandus</td>
<td>Common non-breeding visitor</td>
<td>Y</td>
</tr>
<tr>
<td>Pacific reef heron, reef egret/Chuchuko atilong³</td>
<td>Egretta sacra</td>
<td>Uncommon non-breeding resident</td>
<td>Y</td>
</tr>
<tr>
<td>Little egret/Chuchuko</td>
<td>Egretta garzetta</td>
<td>Uncommon non-breeding visitor</td>
<td>Y</td>
</tr>
<tr>
<td>Whimbrel/Kalalang</td>
<td>Numenius phaeopus</td>
<td>Uncommon non-breeding visitor</td>
<td>Y</td>
</tr>
<tr>
<td>Black-winged stilt/None</td>
<td>Himantopus himantopus</td>
<td>Uncommon non-breeding visitor</td>
<td>Y</td>
</tr>
<tr>
<td>Ruff/None</td>
<td>Calidris pugnax</td>
<td>Uncommon non-breeding visitor</td>
<td>Y</td>
</tr>
<tr>
<td>Island collared dove/Palumat</td>
<td>Streptopelia bitorquata</td>
<td>Common introduced breeding resident</td>
<td>N</td>
</tr>
<tr>
<td>Black drongo/Salin Taiwan</td>
<td>Passer montanus</td>
<td>Common introduced breeding resident</td>
<td>N</td>
</tr>
<tr>
<td>Great frigate bird/Payaya</td>
<td>Fregata minor</td>
<td>Occasional non-breeding resident</td>
<td>Y</td>
</tr>
<tr>
<td>Black francolin/None</td>
<td>Francolinus francolinus</td>
<td>Common introduced breeding resident</td>
<td>N</td>
</tr>
</tbody>
</table>

**Notes:**

¹ Common and scientific names based on Gill and Donsker (2017). Chamorro names from GovGuam (2009), Liske-Clark (2015), Topping et al. (1975), and USFWS (2015a).

² Wandering and grey tattlers were combined into one category since they are undistinguishable from each other in non-breeding plumage.

³ The Pacific reef egret is uncommon.

**Sources:** NAVFAC Marianas 2013b; DON 2015a.

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1. The coconut rhinoceros beetle (*Oryctes rhinoceros*) was first detected on Guam in the Tumon Bay area in 2007 and spread island-wide by 2010 (DON, 2019). This large scarab beetle is a serious pest to palm trees, including coconut and betelnut, and screwpine trees. The little fire ant was confirmed on Guam in November 2011 (DON, 2011). However, it is not yet known to occur on Andersen AFB.

2. Although *Maytenus thompsonii*, the host plant for the endangered and extirpated Mariana wandering butterfly (*Vagrans egistina*) was observed during project surveys, no Mariana wandering butterflies, larvae, or pupae were observed during surveys conducted in December 2016 (see Figure 3-4) (DON, 2017b). Neither the Mariana eight-spot butterfly nor its host plants (*Procris pedunculata* and *Elatostema calcaratum*) were observed during surveys of the Alternative 2 action area. The non-native black citrus swallowtail (*Papilio polytes*) and common eggfly (*Hypolimnas bolina*) were abundant in the project area (DON, 2017b).
Summary of ESA-listed Wildlife Species

The ESA-listed wildlife species are summarized below from the DON (2018) Biological Assessment:

- **Mariana Fruit Bat** (*Pteropus mariannus mariannus*) (threatened). The Guam population of the Mariana fruit bat was listed as endangered in August 1984 (USFWS, 1984) and critical habitat was designated. A Revised Recovery Plan was completed for the species in 2009 (USFWS, 2009) and in 2005, the USFWS down-listed it from endangered to threatened. This decision was based on research indicating that *Pteropus mariannus* is not a subspecies endemic to Guam but is instead endemic to the Mariana archipelago (USFWS, 2005). The Mariana fruit bat is medium-sized compared to other fruit bats, weighing 11.6-20.3 ounces (330-577 grams) and with a wingspan of 34-42 inches (86-107 centimeters); males are slightly larger than females. The underside is black to brown with interspersed gray hair creating a grizzled appearance. The shoulders and sides of the neck are bright golden brown, but may be paler in some individuals. The head varies from brown to dark brown (DON, 2017c).

- **Mariana Crow** (*Corvus kubaryi*) (endangered). The Mariana crow was federally listed as endangered on August 27, 1984 and was considered extirpated from Guam in 2011 (USFWS, 2013). Critical Habitat for the species has been designated on Guam and Rota (USFWS, 2004). At the time of listing, only a small remnant population survived at the northern end of Guam. Andersen AFB hosted a translocation, captive recovery, and release program for the Mariana crow in an area of large scale brown tree snake control within the MSA. Thirty-one Mariana crows have been released since 1997 but none have survived. In 2010, 10 crows were released in the forests on the northern cliffs Andersen AFB (JRM, 2013). A single banded male was observed in July 2011 and last heard in August 2011 (SWCA, 2012). The next closest population of crows is approximately 56 miles away on the island of Rota (USFWS, 2015b). Surveys on this island in 2013 counted 46 pairs during the breeding season (Kroner, 2014).

- **Guam Rail** (*Gallirallus owstoni*) (endangered). The Guam rail was believed to have been extirpated from the wild on Guam by 1987 (Wiles et al., 1995). The rail persists in captivity on Guam and in twelve U.S. mainland zoos (USFWS, 2015b). Critical habitat for the species has not been designated. Guam rails were experimentally introduced to Andersen AFB at Northwest Field and Area 50 in 1998 and in 2003, but this population did not survive reintroductiobn; 80 percent died from feral cat predation and the release area was too small to support the population (DON, 2013). A population of breeding rails has become established on the island of Cocos (off of the southern coast of Guam) under the Safe Harbors Agreement permitted under Section 10(a)(1)(A) of the ESA. The rails are actively monitored to learn more about their survivorship, breeding behavior, habitat preferences and nesting success (USFWS, 2014).

- **Humped Tree Snail** (*Partula gibba*). The humped tree snail is the least common of the three ESA-listed tree snail species on Guam. At the time of listing in 2015, the population of humped tree snails on Guam was estimated at approximately 100 individuals. The humped tree snail is only found at Haputo Beach (Lindstrom & Benedict, 2014). While population decline of humped tree snails has been reported on most islands of the CNMI, population estimates for the archipelago have not been calculated (CNMI DLNR, 2015). In 2008, no humped tree snails were found on Rota, Tinian, or Aguiguan, potentially due to habitat loss related to extensive deforestation and agriculture (Smith et al., 2008; Hadfield, 2010).
- **Guam Tree Snail** (*Partula radiolata*). Prior to WW II the Guam tree snail existed everywhere suitable vegetation occurred (USFWS, 2015a). In 1925, Guam tree snails were found at 37 of 39 sites across the island, and 2,278 individuals were collected. In 1989, the Guam population was resurveyed at 34 of the original 39 sites, and only 9 of the sites still supported snails. The surveys found snails at 7 of 13 new sites surveyed (USFWS, 2015a). At the time of listing in 2015, there were no more than 26 colonies of Guam tree snails, with between 10 and 150 individuals per colony (USFWS, 2015a) and it is believed that the population has declined since. Guam tree snails were sighted in November 2016 in Andersen AFB South. Surveys in the same area by USDA Wildlife Services personnel reported three live snails in 2016, and DON personnel returned to the locations where these snails were sighted and confirmed presence of 35 live snails. In February 2017, a total of 38 live snails were documented at Andersen South (Olmsted, 2017, personal communication). Ritidian Point was the site of a targeted search on July 17, 2013, where 20 Guam tree snails were documented (but many more observed). Most of the Guam tree snails on Andersen are found at Tarague basin (DON, 2018b).

- **Fragile Tree Snail** (*Samoana fragilis*) (endangered). No live native tree snails, bleached or fresh shells or fragments thereof were observed during the surveys in support of this project. Survey protocols used the methodology described in the Federal Candidate Species Surveys on Guam prepared by (NAVFAC Marianas 2013a). The current habitat would not provide recolonization conditions for the fragile tree snail because of the overwhelming presence of Euglandina and carnivorous flatworm (DON, 2017b). Surveys for native tree snails were not done in the Alternative 1 action area, but were conducted in the adjacent Alternative 2 action area. Despite not observing any native tree snails in the Alternative 2 action area, two non-native arboreal tree gastropods were observed: the East Asian bradybaenidae (*Satsuma sp.*) and the tropical American bulimulidae (*Drymaeus multilineatus*). This suggests conditions may be suitable for tree snails in the MSA. However, there were sightings of the predatory flatworm (*Platydemus manokwari*). These flatworms prey on Partulid tree snails and pose a threat to the native Guam tree snails. A continuous swath of dead African giant snail shells suggests that any snail moving along the ground would be at risk of predation by flatworms. The current habitat would not provide recolonization conditions for native Partulid tree snail (DON, 2017b).

### 3.5.2.3 Recovery Habitat

“Recovery habitat” is a term that was defined in the 2010 Navy Biological Opinion (BO) by the USFWS to mean “habitat that is currently suitable to support the recovery of listed species (USFWS, 2010).” Recovery habitat for species extirpated in the wild is mentioned and is consistent with other consultations with the USFWS. The USFWS has mapped habitat across Guam for species extirpated from the wild and labeled these lands as recovery habitat. Although this term has no legal basis, these habitats could host the reintroduction of extirpated species once threats have been removed or sufficiently managed. Habitat protection for these species is important for their eventual recovery.

Andersen AFB acknowledges the need to conserve recovery habitat for listed species and has assessed impacts to identified areas by the amount of suitable habitat available for the species. Suitable habitat comprises areas that could provide foraging, nesting, roosting, or other functions for one or more life stages of a recovered species. Such habitat would include native forest or areas free of predators.

Recovery habitat for the Guam Micronesian kingfisher does not occur within MSA I and is therefore not within the action area. No impact to Guam Micronesian kingfisher recovery habitat is anticipated as a result of the proposed project.
The USFWS estimated approximately 13,962 and 10,957 acres of potential Mariana crow habitat in northern and southern Guam, respectively, or a total of 24,919 acres (USFWS, 2015b). Based on an assessment of habitat on Guam, a minimum of 7,463 acres of appropriate habitat on northern Guam and 7,166 acres in southern Guam would be needed to recover the species on the island. A total of 23.9 acres of recovery habitat for the Mariana crow currently exists within Alternative 1 action area and 10.6 acres within Alternative 2 action area.

The USFWS identified a total of 29,308 acres of Mariana fruit bat recovery habitat on Guam. Although the amount of habitat necessary for recovery of the species has not been determined (USFWS, 2010), there are 28.7 acres of fruit bat recovery habitat in the Alternative 1 action area and 10.6 acres within Alternative 2 action area.

The USFWS identified approximately 24,698 acres and 24,886 acres of Guam rail recovery habitat in northern and southern Guam, respectively, or a total of 49,584 acres. There are 22.6 acres of recovery habitat within the Alternative 1 action area and 25.7 acres within the Alternative 2 action area.

### 3.5.3 Environmental Consequences

This analysis focuses on wildlife and vegetation types that are important to the function of the ecosystem or are protected under federal or state law or statute. This section presents an analysis of potential direct and indirect effects from implementation of the Proposed Action. Direct effects are the direct or immediate effects on the species or its habitat. Indirect effects are those that are caused by the Proposed Action and would manifest themselves at a later time, but which are still reasonably certain to occur. All direct and indirect project effects have been further classified and evaluated based on their anticipated longevity (i.e., temporary or permanent effects).

As they relate to the federally listed species and suitable habitat considered in this EA, direct and indirect effects from proposed activities within the action area have been evaluated herein based upon: (1) an understanding of the methods and equipment that would be used during construction and operation of facilities, (2) knowledge of the potential for such methods and equipment to disturb the natural resources on which the subject species depend, and (3) awareness of the types of effects that have resulted from similar actions in the past.

#### 3.5.3.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change to biological resources. Therefore, no significant impacts to biological resources would occur with implementation of the No Action Alternative.

#### 3.5.3.2 Alternative 1

Alternative 1 would involve the disturbance of 51 acres, 19 of which would be impervious surface, for the construction of 48 new Hayman style ECMs. During site preparation, surface vegetation would be cleared and grubbed (i.e., roots and stumps extracted), and the ground would be excavated for the storage unit flooring. Ground disturbance during construction would include site grading to establish positive drainage control and a perimeter mound to control runoff. Existing access roads within Alternative 1 would be removed and replaced, and new utilities would be constructed, impacting an additional 3.5 acres of pervious surface. Vegetation in this area and in parts of the degraded limestone forest is dense and would require clearance, with approximately 12 acres of currently undisturbed land listed as native limestone forest.
Vegetation

Short-term adverse effects (during construction) and long-term adverse effects (those lasting into post-construction phase) would be expected. Though parts of Alternative 1 would take place in areas that have been previously modified, the native and degraded limestone forest habitat is considered to be of high habitat value since it contains federally and Guam-listed plant species and provides habitat suitable for listed animal species. Loss of this habitat would result in adverse effects to protected species that are known to inhabit the proposed area of construction.

Alternative 1 would involve the construction of 48 igloos north and west of Phase I along 5th, 6th, 7th, and 8th streets (all north of C Avenue) (Figure 3-2). A maximum of 56.1 acres of vegetation would be removed for Alternative 1 construction (less than 0.5 percent of the total vegetated area of the Guam NWR overlay). Based on data collected during the plant surveys (Appendix F) (DON, 2017a), it is anticipated that up to 83 of the federally threatened *Tabernaemontana rotensis* and 724 of the federally threatened *Cycas micronesica*, as well as 76 *Maytenus thompsonii* trees associated with the federally listed Mariana wandering butterfly, would be removed during construction under Alternative 1 (see Figures 3-3 and 3-4). The removal represents 0.13 percent of the *Cycas micronesica* population on Guam (based on an estimated 516,000 *Cycas micronesica* estimated to occur on Guam) (USFWS, 2015c). Range wide, this loss represents less than one percent (~0.08 percent) of the population (USFWS, 2015c). The removal represents less than one percent (0.36 percent) of the *Tabernaemontana rotensis* population on Guam. Habitat loss, fragmentation, and degradation are of concern to the species, as is the scale infestation that impacts tree health. Past land management practices and the introduction of invasive species has contributed towards forest degradation. This holds true for the Andersen AFB MSA and proposed project site, where historical use of the MSA has significantly lowered the quality of habitat for *Cycas micronesica* and *Tabernaemontana rotensis*.

Trees that are identified in the Native Forest Birds of Guam and Rota Recovery Plan (USFWS, 1990a) and the Guam Mariana Fruit Bat and Little Mariana Fruit Bat Recovery Plan (USFWS, 1990b) as trees associated with protected species that could be removed include *Aglaia mariannensis*, *Ficus microcarpa*, and *Ficus prolixa*. Removal of native vegetation in the area designated for Alternative 1 construction would have a direct adverse effect on the habitat used by Guam’s endangered species by reducing forest habitat available for roosting and foraging.

The Alternative 1 action may affect, and is likely to adversely affect, *Cycas micronesica* and *Tabernaemontana rotensis*. Incorporation of all BMPs and conservation measures discussed below would reduce the impacts to threatened and endangered species so that significant impacts would not adversely affect the continued existence of the species.

Terrestrial Wildlife

Terrestrial wildlife has not been recently surveyed in the area located within Alternative 1. This site would be disturbed by vegetation clearance and the construction of the munitions storage facilities. Proposed construction activities would remove vegetative habitat, as previously discussed. Wildlife habitat is fragmented due to previous modifications. Construction under Alternative 1 would result in moderate impacts to terrestrial wildlife as a result of the loss of native limestone forest habitat. This native limestone forest makes the Alternative 1 project area better suited to maintaining native wildlife since this native habitat often provides foraging and sheltering conditions important to the survival of native wildlife. Non-native plants may or may not provide this same benefit, and often allow the establishment of non-native wildlife.
Short-term minor adverse effects to wildlife would be expected as a result of construction activity and noise. Ground disturbance and noise from vehicle use or construction is likely to temporarily flush any foraging or resting native birds and fruit bats. As discussed in Section 3.6.2, however, the ambient noise environment is characterized by aircraft overflights, so wildlife are accustomed to noise-generating activities in the Alternative 1 action area. Following construction, no adverse effects as a result of increased noise would be expected.

Management of natural resources on Andersen AFB is covered under the Joint Region Marianas Integrated Natural Resources Management Plan (DON, 2013), which is currently undergoing a revision (DON, 2019). Components of this plan and the updated revised plan include controlling introduced wildlife species on Andersen AFB for the benefit of native species, particularly protected species. Andersen AFB has depredation programs in place within the MSA and will continue to manage feral ungulates in the area.

Although no Mariana fruit bats have been seen roosting within MSA I, they have been known to occur in the Andersen AFB area and to transit over the project area. Adverse effects on this species would be expected primarily as a result of construction activity and noise and secondarily as a result of habitat removal. All of the current Vitex and limestone forest within the project footprint is considered fruit bat habitat that is poor quality due to past historical impacts and ongoing operations. The impact to 28.7 acres of suitable habitat represents less than 0.09 percent of suitable habitat lost (USFWS 2010). The overall remaining 29,279 acres of bat suitable habitat is large enough to support the remaining population of Mariana fruit bats on Guam, and would not reduce the likelihood for recovery of the species. To date, the recovery plan for the species has not been updated to reflect the criteria for determining habitat suitability for recovery of the species. However, habitat loss and degradation is considered one of the highest threats to fruit bats on Guam.

Noise levels associated with the construction of the 48 new ECM would cause short-term impacts to the species. Typical construction noise is associated with the construction equipment and increased truck and vehicle access to the location. Construction of the ECMs will be done using concrete casting and heavy construction equipment. Construction noise will impact the action area and be heard in the adjacent forest. It is anticipated that Mariana fruit bats would avoid the action area and adjacent sites during construction because of noise disturbance.

Based on these effects, the action may affect, and is likely to adversely affect, the Mariana fruit bat in the form of disturbing foraging bats according to ESA take definitions. However, a number of BMPs and conservation measures are part of the Proposed Action and are designed to avoid disturbance of bats during construction. Andersen AFB will conduct pre-construction surveys to determine if Mariana fruit bats are present in the project site before construction. If bats are present, construction will be delayed until they have left the site. After construction, noise disturbance will result from ongoing operations at the MSA. As stated above, the impact to suitable habitat represents less than 0.09 percent of suitable habitat lost (USFWS 2010); the overall remaining bat suitable habitat is large enough to support the remaining population of Mariana fruit bats on Guam, and would not reduce the likelihood for recovery of the species. The USAF shared these analyses and conclusions during formal consultation with the USFWS under Section 7 of the Endangered Species Act regarding the Preferred Alternative (Appendix C). The USAF will continue to coordinate with the USFWS during this consultation period.

The Guam rail is now extirpated from Guam, so this species would not be directly impacted by Alternative 1; impacts to their recovery habitat, however, could reduce the likelihood for recovery of the
species. While a total of 22.6 acres of Guam rail habitat would be lost in the Alternative 1 action area, 21.7 acres would be restored through the creation of grassy buffer areas around the ECMs, which would be suitable Guam rail habitat; consequently, only 0.9 of 49,584 acres of recovery habitat available for the Guam Rail on Guam would be lost in the Alternative 1 action area following construction. The overall remaining 49,583 acres of suitable habitat is an area large enough to support a population of Guam rail on Guam. Additionally, there is no projected date for Guam rail reintroduction on Andersen AFB or suppression of the brown treesnake to support reintroduction. Until the Guam rail is successfully reintroduced, no impacts are anticipated from construction and operational activities. Based on these effects, implementation of the Alternative 1 action may affect, but is not likely to adversely affect, the Guam rail.

The Mariana crow is now extirpated from Guam, and this species would not be directly impacted by Alternative 1; impacts to their recovery habitat, however, could reduce the likelihood for recovery of the species. Only 23.9 of 13,962 acres of recovery habitat available for the Mariana crow in Northern Guam occur in the Alternative 1 action area. The overall remaining 13,938 acres of suitable habitat is an area large enough to support a population of Mariana crow on Guam. The opportunity for reintroduction of this extirpated species on Guam is uncertain at this time, and is primarily dependent on the eradication or significant suppression of the brown treesnake. Currently, there is neither a plan nor projected dates for reintroduction of the Mariana crow on Guam. The loss of habitat does not impact the continued survival of the species as it does not currently occur in the wild on the island. Based on the potential effects to the Mariana crow from habitat loss due to construction, implementation of the Alternative 1 action may affect, but is not likely to adversely affect, the Mariana crow.

Native Partulid tree snails have not been found in the adjacent Alternative 2 action area, and none are expected to occur in the 51-acre Alternative 1 action area; favorable vegetation for Partulid tree snails has, however, been identified. Much of this vegetation is common in degraded limestone forest present across Guam. The current forest has gone through significant changes from agriculture and forest destruction from the war and development of the MSA, thus limiting the possibilities for snails to be established in the area. The action area has also been documented to support the predatory flatworm (*Platydemus manokwari*), a significant threat to Partulid tree snails. Deer and pigs also occur in the areas and are known to degrade native forest.

The proposed action is likely to adversely affect habitat for the Partulid tree snails that may occur in the Alternative 1 action area through the construction of the ECMs; however, the proposed action will have no effect on listed Partulid tree snails. Incorporation of all BMPs and conservation measures discussed below would lessen the severity of habitat impacts.

### Best Management Practices and Conservation Measures

*Best Management Practices*

Andersen AFB has identified BMPs and designed conservation measures to avoid or minimize impacts to ESA-listed species. These BMPs are typically process improvement activities and are described below.

1. **Contractor Education Program.** The Contractor Education Program ensures that contracted construction personnel are informed of the biological resources in the project area including invasive species, avoidance measures, and reporting requirements. Information about *Cycas micronesica*, *Tabernaemontana rotensis*, and Mariana fruit bats will be included in the contractor education program to ensure construction personnel are aware of the species and the need to avoid inadvertent impacts.
2. **Mariana Fruit Bat** (*Pteropus mariannus mariannus*). This minimization procedure will reduce the likelihood of Mariana fruit bat disturbance. One week prior to, and again during the first week of forest clearing, a biologist will conduct a survey of the project site to determine if Mariana fruit bats are present. If a fruit bat is present within 492 feet of the project site, the work in that area will be postponed until the bat has left the area of its own volition. Monthly monitoring of Mariana fruit bats will be conducted in the project area to determine site use. If a fruit bat moves into the project footprint while work is ongoing (i.e., the fruit bat selected the site with ongoing noise and activity), work may continue to proceed. Night time construction is not anticipated; however, if necessary, lighting would be hooded and directed away from forested habitat.

3. **Biosecurity.** The little fire ant (LFA) (*Wasmannia auropunctata*) represents a serious threat to native invertebrate and vertebrate species; however, it is not yet known to occur on Andersen AFB. A quarantine regulation for the coconut rhinoceros beetle has been imposed by the Guam Department of Agriculture that prohibits transport of green waste from within a prescribed quarantine zone without inspection or treatment (DON, 2019). These and other biosecurity measures will be implemented to prevent the spread of invasive species. This will be done in accordance with the Regional Biosecurity Plan for Micronesia and Hawaii (DON, 2015c).

Guam rail and Guam Micronesian kingfisher were not observed during the fauna survey (see Appendix C) and are no longer known to exist in MSA I. With the minimization measures described for reducing and compensating for loss of habitat, Alternative 1 could potentially have minor adverse effects on the future plans for releasing captive-bred Guam rail and Guam Micronesian kingfisher in MSA I.

USAF will continue to consult with USFWS to make the final determination of effect.

**Conservation Measures**

The following conservation measures are specific to the action and promote the continued existence of *Cycas micronesica*, *Tabernaemontana rotensis*, and Partulid tree snails. These conservation measures are meant to off-set the effects of forest clearing and removal of plants in the construction site. A summary of these conservation measures is presented below, and a detailed list is presented in the Biological Assessment submitted to the USFWS (Appendix C):

1. **Reconnaissance Surveys, Salvage, and Translocation.** Andersen AFB will conduct pre-construction surveys for ESA-listed plants and snails prior to habitat disturbance for species that cannot be avoided in the construction footprint. Plants and snails will be translocated to Tarague Basin or other approved restoration site by the USFWS.

   a) **Specific information for *Cycas micronesica***. All *Cycas micronesica* identified within the project footprint would be impacted by the Proposed Action. Salvaging adult trees or pups will be determined by an authorized biologist. Trees may be evaluated for survivorship, uprooted, treated for Asian cycad scale, and transplanted to a suitable habitat (Marler, 2012). Cycads may also have basal suckers (cycad pups) that can be detached from the parent tree and are considered duplicates of the parent tree. Andersen AFB will collect as many possible cycad pups salvageable for translocation. Maintenance including watering, weeding, pest removal and plant protection will be conducted. Monitoring will be done monthly or more frequently depending on the conditions of the plants to determine growth and status of the plants.
b) **Specific information for Tabernaemontana rotensis.** All *Tabernaemontana rotensis* identified within the project footprint will be impacted by the Proposed Action. Viable seeds will be collected by a biologist to propagate new individuals in a USFWS-approved native plant nursery on Guam. Maintenance including watering, weeding, pest removal and plant protection will be conducted. Monitoring will be done monthly or more frequently depending on the conditions of the plants to determine growth and health status.

c) **Specific information for Partulid Tree Snail Species.** Andersen AFB proposes to conduct pre-construction surveys for federally listed snails. If found, a biologist will translocate them to suitable habitat with appropriate native vegetation within the Tarague Basin or other site approved by USFWS. Their protection would be further ensured by translocating them to an ungulate-proofed enclosure at the Conservation Area. Translocation techniques will be used to reduce the likelihood of snail predation. Placing translocated tree snails higher than 3 feet above ground level on trees will reduce the chances of flatworm and *Euglandina rosea* predation.

d) **Specific information for MBTA Species.** One week prior to vegetation removal, the USAF will search the site for nesting MBTA birds. If an active nest is present, vegetation clearing will be kept 100 feet (30 meters) away until birds have fledged or abandoned the nest on their own accord.

2. **Annual Reporting of Propagation/Translocation Activities.** Andersen AFB will submit an annual report to the USFWS one year after the Biological Opinion is issued and each year thereafter until the project and associated conservation measures are complete. The biologists will record observations of each species during the reconnaissance surveys. The report will summarize the type of activities (e.g., health status of plants, propagation, translocation, etc.) conducted on each species and the status of relocation efforts.

3.5.3.3 **Alternative 2**

Alternative 2 would involve the disturbance of 50 acres, 18 of which would be impervious surface, for the construction of 48 new Hayman style ECMs. During site preparation, surface vegetation would be cleared and grubbed (i.e., roots and stumps extracted), and the ground would be excavated for the storage unit flooring. Ground disturbance during construction would include site grading to establish positive drainage control and a perimeter mound to control runoff. Thirty existing ECMs are in a developed area and would be demolished as part of this action. Existing access roads within Alternative 2 would require minor patches, and new utilities would be constructed, impacting an additional 2 acres of pervious surface.

Types of impacts, such as tree trimming and vegetation clearing, would be similar under Alternative 2 as under Alternative 1, but the area impacted under Alternative 2 would be smaller (20.3 acres of pervious surface for Alternative 2 compared to 21.6 acres of pervious surface for Alternative 1). In addition, the impacts to terrestrial biological resources would be reduced since the habitat in Alternative 2 includes no native limestone forest and is much more fragmented than the habitat in Alternative 1.

**Vegetation**

Short-term adverse effects (during construction) and long-term moderate adverse effects (effects lasting into post-construction phase) would be expected. Though Alternative 2 would take place in areas that have been previously modified, areas of the Mixed Limestone Forest/Secondary habitat is considered to
be of high habitat value. Clearing of this habitat would result in adverse effects on protected species that are known to inhabit the proposed area of construction.

A maximum of 49.5 acres of vegetation would be removed for Alternative 2 construction (less than 0.5 percent of the total vegetated area of the GNWR overlay). Based on data collected during the plant surveys (Appendix F) (DON, 2017a), it is anticipated that none of the federally threatened Tabernaemontana rotensis and 55 of the federally threatened Cycas micronesica, as well as 12 Maytenus thompsonii trees associated with the federally listed Mariana wandering butterfly, would be removed during construction under Alternative 2 (see Figures 3-3 and 3-4). The removal represents 0.13 percent of the Cycas micronesica population on Guam (based on an estimated 516,000 Cycas micronesica estimated to occur on Guam) (USFWS, 2015c). Range-wide, this loss represents less than one percent (~0.08 percent) of the population (USFWS, 2015c). Habitat loss, fragmentation, and degradation are of concern to the species, as is the scale infestation that impacts tree health. Past land management practices and the introduction of invasive species have contributed towards forest degradation. This holds true for the Andersen AFB MSA and proposed project site, where historical use of the MSA has significantly lowered the quality of habitat for Cycas micronesica and Tabernaemontana rotensis.

Effects on trees that are federally protected or associated with protected species under Alternative 2 are similar to those described for Alternative 1. The number and density of protected species found within the Alternative 2 project area are fewer, however, and the habitat is much more fragmented. Therefore, the impacts to vegetation would be less than those in Alternative 1. Native trees that could be removed under Alternative 2 include Aglaia mariannensis, Elaeocarpus joga, and Ficus prolixa. Removal of native vegetation in the proposed area for Alternative 2 construction would have a direct adverse effect on the habitat used by Guam’s endangered species.

The Alternative 2 action may affect, but is not likely to adversely affect, Tabernaemontana rotensis since no individuals are located in the action area. The Alternative 2 action may affect, but is not likely to adversely affect, Cycas micronesica, but the impact would be smaller than in Alternative 1 since the habitat is more fragmented and fewer cycads were found in the Alternative 2 action area. Implementation of the proposed BMPs and conservation measures discussed below would lessen the severity of impacts to Alternative 2 action area.

Terrestrial Wildlife

Minor adverse effects to wildlife species would be expected. Proposed construction activities would remove vegetative habitat, as previously discussed; wildlife habitat is fragmented, however, due to previous modifications and fragmentation. Construction under Alternative 2 would result in effects similar to those described under Alternative 1; the effects resulting from loss of habitat, however, would be less adverse because the habitat found in Alternative 1 consists of native and degraded limestone forest, which is of higher quality than the fragmented degraded limestone forest and mixed scrub community found in Alternative 2.

Short-term minor adverse effects on wildlife would be expected as a result of construction activity and noise. Ground disturbance and noise from vehicle use or construction is likely to temporarily flush any foraging or resting native birds and fruit bats. As discussed in Section 3.6.2, however, the ambient noise environment is characterized by aircraft overflights, so wildlife are accustomed to noise-generating activities in the Alternative 2 action area. Following construction, no adverse effects as a result of increased noise would be expected.
Management of natural resources on Andersen AFB is covered under the Joint Region Marianas Integrated Natural Resources Management Plan (DON, 2013), which is currently undergoing a revision (DON, 2019). Components of this plan and the updated revised plan include controlling introduced wildlife species on Andersen AFB for the benefit of native species, particularly protected species. Andersen AFB has depredation programs in place within the MSA and will continue to manage feral ungulates in the area.

Although no Mariana fruit bats have been seen roosting within MSA I, they have been known to occur in the Andersen AFB area and transit over the project area. Adverse effects under Alternative 2 would be similar to Alternative 1; the effects resulting from loss of habitat, however, would be less adverse because the habitat found in Alternative 1 consists of higher quality habitat better suited for the Mariana fruit bat.

Minimization measures associated with protected species habitat would reduce and compensate for adverse effects but not eliminate them altogether. To reduce the potential for adverse effects resulting from construction activity or noise, the following minimization measures described below would be implemented.

The Guam rail is now extirpated from Guam, so this species would not be directly impacted by Alternative 2; however, impacts to recovery habitat could reduce the likelihood for recovery of the species. While a total of 25.7 acres of Guam rail habitat would be lost in the Alternative 2 action area, some acres would be restored through the creation of grassy buffer areas around the ECMs, which would be suitable Guam rail habitat; consequently, less than 25.7 of 49,584 acres of recovery habitat available for the Guam Rail on Guam would be lost in the Alternative 2 action area following construction. The overall minimum remaining 49,568 acres of suitable habitat is an area large enough to support a population of Guam rail on Guam. Additionally, there is no projected date for Guam rail reintroduction on Andersen AFB or suppression of the brown treesnake to support reintroduction. Until the Guam rail is successfully reintroduced, no impacts are anticipated from construction and operational activities. Based on these effects, implementation of the Alternative 2 action may affect, but is not likely to adversely affect, the Guam rail.

The Mariana crow is now extirpated from Guam, so this species would not be directly impacted by Alternative 2; however, impacts to recovery habitat could reduce the likelihood for recovery of the species. Only 10.6 of 13,962 acres of recovery habitat available for the Mariana crow in Northern Guam occur in the Alternative 2 action area. The overall remaining 13,951 acres of suitable habitat is an area large enough to support a population of Mariana crow on Guam. The opportunity for reintroduction of this extirpated species on Guam is uncertain at this time, and is primarily dependent on the eradication or significant suppression of the brown treesnake. There is currently neither a plan nor projected dates for reintroduction of the Mariana crow on Guam. The loss of habitat does not impact the continued survival of the species as it does not currently survive in the wild on Guam. Based on the potential effects to the Mariana crow from habitat loss due to construction, implementation of the Alternative 2 action may affect, but is not likely to adversely affect, the Mariana crow.

Native Partulid tree snails have not been found in the Alternative 2 action area; however, favorable vegetation for Partulid tree snails has been identified. Much of this vegetation is common in degraded limestone forest present across Guam. The current forest has gone through significant changes from agriculture and forest destruction from the war and development of the MSA, thus limiting the possibilities of snails to be established in the area. The action area has also been documented to support
the predatory flatworm (*Platydemus manokwari*), a significant threat to Partulid tree snails. Deer and pigs also occur in the areas and are known to degrade native forest.

**Best Management Practices and Conservation Measures**

BMPs and conservation measures identified for Alternative 1 also apply for Alternative 2.

3.6 **Noise**

This discussion of noise includes the types or sources of noise and the associated sensitive receptors in the human environment. Noise in relation to biological resources and wildlife species is discussed in the Biological Resources section.

Sound is a physical phenomenon consisting of minute vibrations that travel through a medium, such as air or water, and are sensed by the human ear. Sound is all around us. The perception and evaluation of sound involves three basic physical characteristics:

- **Intensity** – the acoustic energy, which is expressed in terms of sound pressure, in decibels (dB)
- **Frequency** – the number of cycles per second the air vibrates, in Hertz
- **Duration** – the length of time the sound can be detected

Noise is defined as unwanted or annoying sound that interferes with or disrupts normal human activities. Although continuous and extended exposure to high noise levels (e.g., through occupational exposure) can cause hearing loss, the principal human response to noise is annoyance. The response of different individuals to similar noise events is diverse and is influenced by the type of noise, perceived importance of the noise, its appropriateness in the setting, time of day, type of activity during which the noise occurs, and sensitivity of the individual. While aircraft are not the only sources of noise in an urban or suburban environment, they are readily identified by their noise output and are given special attention in this EA.

3.6.1 **Basics of Sound and A-Weighted Sound Level**

The loudest sounds that can be detected comfortably by the human ear have intensities that are a trillion times higher than those of sounds that can barely be detected. This vast range means that using a linear scale to represent sound intensity is not feasible. The dB is a logarithmic unit used to represent the intensity of a sound, also referred to as the sound level. All sounds have a spectral content, which means their magnitude or level changes with frequency, where frequency is measured in cycles per second, or Hertz. To mimic the human ear’s non-linear sensitivity and perception of different frequencies of sound, the spectral content is weighted. For example, environmental noise measurements are usually on an “A-weighted” scale that filters out very low and very high frequencies in order to replicate human sensitivity. It is common to add the “A” to the measurement unit in order to identify that the measurement has been made with this filtering process (dBA). In this document, the dB unit refers to A-weighted sound levels. Table 3-8 provides a comparison of how the human ear perceives changes in loudness on the logarithmic scale.
3-47

**Affected Environment and Environmental Consequences**

<table>
<thead>
<tr>
<th>Change</th>
<th>Change in Perceived Loudness</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 dB</td>
<td>Barely perceptible</td>
</tr>
<tr>
<td>5 dB</td>
<td>Quite noticeable</td>
</tr>
<tr>
<td>10 dB</td>
<td>Dramatic – twice or half as loud</td>
</tr>
<tr>
<td>20 dB</td>
<td>Striking – fourfold change</td>
</tr>
</tbody>
</table>

Key: dB = decibel.

Table 3-8  Subjective Responses to Changes in A-Weighted Decibels

Figure 3-5 (Cowan, 1994) provides a chart of A-weighted sound levels from typical noise sources. Some noise sources (e.g., air conditioner, vacuum cleaner) are continuous sounds that maintain a constant sound level for some period of time. Other sources (e.g., automobile, heavy truck) are the maximum sound produced during an event like a vehicle pass-by. Other sounds (e.g., urban daytime, urban nighttime) are averages taken over extended periods of time. A variety of noise metrics have been developed to describe noise over different time periods, as discussed below.

Noise levels from aircraft operations that exceed background noise levels at an airfield typically occur beneath main approach and departure corridors, in local air traffic patterns around the airfield, and in areas immediately adjacent to parking ramps and aircraft staging areas. As aircraft in flight gain altitude, their noise contributions drop to lower levels, often becoming indistinguishable from the background noise.

### 3.6.2 Noise Metrics

A metric is a system for measuring or quantifying a particular characteristic of a subject. Since noise is a complex physical phenomenon, different noise metrics help to quantify the noise environment. The noise metrics used in this EA are described in summary format below. While the Day-Night Average Sound Level (DNL) and Community Noise Equivalent Level (CNEL) noise metrics are the most commonly used tools for analyzing noise generated at an airfield, the DOD has been developing additional metrics (and analysis techniques). These supplemental metrics and analysis tools provide more detailed noise exposure information for the decision process and improve the discussion regarding noise exposure. The DOD Noise Working Group product, *Improving Aviation Noise Planning, Analysis and Public Communication with Supplemental Metrics* (DOD Noise Working Group, 2009) was used to determine the appropriate metrics and analysis tools for this EA.

#### 3.6.2.1 Day-Night Average Sound Level

The DNL metric is the energy-averaged sound level measured over a 24-hour period, with a 10-dB penalty assigned to noise events occurring between 10 p.m. and 7 a.m. (acoustic night). DNL values are average quantities, mathematically representing the continuous sound level that would be present if all of the variations in sound level that occur over a 24-hour period were averaged to have the same total sound energy. The DNL metric quantifies the total sound energy received and is therefore a cumulative measure, but it does not provide specific information on the number of noise events or the individual sound levels that occur during the 24-hour day. DNL is the standard noise metric used by the U.S. Department of Housing and Urban Development, Federal Aviation Administration, USEPA, and DOD. Studies of community annoyance in response to numerous types of environmental noise show that DNL correlates well with impact assessments; there is a consistent relationship between DNL and the level of annoyance. Most people are exposed to sound levels of 50 to 55 DNL or higher on a daily basis.
Research has indicated that about 87 percent of the population is not highly annoyed by outdoor sound levels below 65 dB DNL (Federal Interagency Committee on Urban Noise, 1980). Therefore, the 65 dB DNL noise contour is used to help determine compatibility of military aircraft operations with local land use, particularly for land use associated with airfields.

Building construction, modification, and demolition work can cause noise emissions well above ambient sound levels. A variety of sounds come from cranes, cement mixers, welding, hammering, boring, and other work processes. Table 3-9 lists noise levels associated with common types of construction equipment that might be used to build various buildings and other structures. Construction equipment usually exceeds the ambient sound levels by 20 to 25 dBA in an urban environment and up to 30 to 35 dBA in a quiet suburban neighborhood.
### Table 3-9 Predicted Noise Levels for Construction Equipment

<table>
<thead>
<tr>
<th>Construction Category and Equipment</th>
<th>Predicted Noise Level at 50 feet (dBA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clearing and Grading</td>
<td></td>
</tr>
<tr>
<td>Bulldozer</td>
<td>80</td>
</tr>
<tr>
<td>Grader</td>
<td>80–93</td>
</tr>
<tr>
<td>Truck</td>
<td>83–94</td>
</tr>
<tr>
<td>Roller</td>
<td>73–75</td>
</tr>
<tr>
<td>Excavation</td>
<td></td>
</tr>
<tr>
<td>Backhoe</td>
<td>72–93</td>
</tr>
<tr>
<td>Jackhammer</td>
<td>81–98</td>
</tr>
<tr>
<td>Building Construction</td>
<td></td>
</tr>
<tr>
<td>Concrete mixer</td>
<td>74–88</td>
</tr>
<tr>
<td>Welding generator</td>
<td>71–82</td>
</tr>
<tr>
<td>Pile driver</td>
<td>91–105</td>
</tr>
<tr>
<td>Crane</td>
<td>75–87</td>
</tr>
<tr>
<td>Paver</td>
<td>86–88</td>
</tr>
</tbody>
</table>


#### 3.6.2.2 Community Noise Equivalent Level

CNEL is a noise metric adopted as a standard by the state of California. The CNEL metric is similar to the DNL metric and is also an energy-averaged sound level measurement. DNL and CNEL provide average noise levels taking into consideration and applying penalties for annoyance from intrusive events that occur during evening and nighttime hours. Both DNL and CNEL are measures of cumulative noise exposure over a 24-hour period, with adjustments to reflect the added intrusiveness of noise during certain times of the day. However, while DNL considers one adjustment period, CNEL reflects two adjustment periods. DNL includes a single adjustment period for night, in which each aircraft noise event at night (defined as 10 p.m. to 7 a.m.) is counted 10 times. CNEL adds a second adjustment period where each aircraft noise event in the evening (defined as 7 p.m. to 10 p.m.) is counted three times. The nighttime adjustment is equivalent to increasing the noise levels during that time interval by 10 dB. Similarly, the evening adjustment increases the noise levels by approximately 5 dB.

#### 3.6.2.3 Equivalent Sound Level

A cumulative noise metric useful in describing noise is the Equivalent Sound Level (Leq). Leq is the continuous sound level that would be present if all of the variations in sound level occurring over a specified time period were smoothed out as to contain the same total sound energy. The same calculation for a daily average time period such as DNL or CNEL but without the penalties is a 24-hour equivalent sound level, abbreviated Leq(24). Other typical time periods for Leq are 1 hour and 8 hours.

#### 3.6.2.4 Sound Exposure Level

The Sound Exposure Level (SEL) metric is a composite metric that represents both the intensity of a sound and its duration. Individual time-varying noise events (e.g., aircraft overflights) have two main characteristics: a sound level that changes throughout the event and a period of time during which the event is heard. SEL provides a measure of total sound energy of the entire acoustic event, but it does not directly represent the sound level heard at any given time. During an aircraft flyover, SEL captures the total sound energy from the beginning of the acoustic event to the point when the receiver no longer hears the sound. It then condenses that energy into a 1-second period of time and the metric...
represents the total sound exposure received. The SEL has proven to be a good metric to compare the relative exposure of transient sounds, such as aircraft overflights, and is the recommended metric for sleep disturbance analysis (DOD Noise Working Group, 2009). In this EA, SEL is used in aircraft comparison and sleep disturbance analyses.

3.6.2.5 Maximum Sound Level
The highest A-weighted sound level measured during a single event where the sound level changes value with time (e.g., an aircraft overflight) is called the maximum A-weighted sound level (Lmax). During an aircraft overflight, the noise level starts at the ambient or background noise level, rises to the maximum level as the aircraft flies closest to the observer, and returns to the background level as the aircraft recedes into the distance. Lmax defines the maximum sound level occurring for a fraction of a second. For aircraft noise, the “fraction of a second” over which the maximum level is defined is generally 1/8 second (American National Standards Institute, 1988). For sound from aircraft overflights, the SEL is usually greater than the Lmax because an individual overflight takes seconds and the Lmax occurs instantaneously. In this EA, Lmax is used in the analysis of aircraft comparison and speech interference.

3.6.2.6 Number of Events above a Threshold Level
The “Number of Events Above a Threshold Level” metric provides the total number of noise events that exceed a selected noise level threshold during a specified period of time (DOD Noise Working Group, 2009). In this EA, an Lmax threshold is selected to analyze speech interference and an SEL threshold is selected for analysis of sleep disturbance.

3.6.3 Noise Effects
An extensive amount of research has been conducted regarding noise effects including annoyance, speech interference, sleep disturbance, noise-induced hearing impairment, nonauditory health effects, performance effects, noise effects on children, effects on domestic animals and wildlife, property values, structures, terrain, and archaeological sites. These effects are summarized below.

3.6.3.1 Annoyance
As previously noted, the primary effect of aircraft noise on exposed communities is long-term annoyance, defined by USEPA as any negative subjective reaction on the part of an individual or group. The scientific community has adopted the use of long-term annoyance as a primary indicator of community response and there is a consistent relationship between DNL/CNEL and the level of community annoyance (Federal Interagency Committee on Noise, 1992).

3.6.3.2 Potential Hearing Loss
People living in high noise environments for an extended period of time (40 years) can be at risk for hearing loss called Noise Induced Permanent Threshold Shift (NIPTS). The NIPTS defines a permanent change in hearing level, or threshold, caused by exposure to noise (USEPA, 1982). According to USEPA (1974), changes in hearing level of less than 5 dB are generally not considered noticeable. There is no known evidence that an NIPTS of less than 5 dB is perceptible or has any practical significance for the individual affected. Furthermore, the variability in audiometric testing is generally assumed to be plus or minus 5 dB. The preponderance of available information on hearing loss risk is from the workplace with continuous exposure throughout the day for many years.
Based on a report by Ludlow and Sixsmith (1999), there were no major differences in audiometric test results between military personnel, who as children, had lived in or near installations where fast jet operations were based, and a similar group who had no such exposure as children. Hence, for the purposes of this EA, the limited data are considered applicable to the general population, including children, and are used to provide a conservative estimate of the risk of potential hearing loss.

DOD policy directive requires that hearing loss risk be estimated for the at-risk population, defined as the population exposed to DNL greater than or equal to 80 dB (DOD, 2009). However, it should be recognized that characterizing noise exposure in terms of DNL and CNEL overestimates hearing loss risk but suffices when nighttime operations are 5 percent or less than the total operations. When nighttime operations are greater than 5 percent, $L_{eq}(24)$ is recommended for calculating potential hearing loss since hearing loss is a physical phenomenon due to the sound level and independent of annoyance. Thus, the additional penalties applied by CNEL for evening and nighttime operations do not accurately portray the NIPTS.

**3.6.3.3 Speech Interference**

Speech interference associated with aircraft noise is a primary cause of annoyance for communities. Speech interference can cause disruption of routine activities, such as enjoyment of radio or television programs, telephone use, or family conversation, giving rise to frustration or irritation. In extreme cases, speech interference may cause fatigue and vocal strain to individuals who try to communicate over the noise. In this EA, speech interference is measured by the number of daily indoor events (from 7 a.m. to 10 p.m.) that exceed 50 dB $L_{max}$ at selected locations. This metric also accounts for noise level reduction provided by buildings with windows open or closed.

**3.6.3.4 Classroom Criteria and Noise Effects on Children**

Research suggests that environments with sustained high background noise can have variable effects, including effects on learning and cognitive abilities and various noise-related physiological changes. Research on the impacts of aircraft noise, and noise in general, on the cognitive abilities of school-aged children has received more attention in recent years. Several studies suggest that aircraft noise can affect the academic performance of school children. Physiological effects in children exposed to aircraft noise and the potential for health effects have been the focus of limited investigation (DOD Noise Working Group, 2009).

Analyses for school-aged children are similar to speech interference by using the indoor number of events exceeding 50 dB $L_{max}$, but also has the added restriction of using an outdoor equivalent noise level of 60 dB $L_{eq}(9$ hour). This represents a level that a person with normal hearing can clearly hear a speaker (teacher) speaking at a level of 50 dB indoors in a classroom setting.

**3.6.3.5 Sleep Disturbance**

The disturbance of sleep is a major concern for communities exposed to nighttime aircraft noise. In this EA, sleep disturbance uses the SEL noise metric and calculates the probability of awakening from single aircraft overflights. These are based upon the particular type of aircraft, flight profile, power setting, speed, and altitude relative to the receptor. The results are then presented as a percent probability of people awakening (USEPA, 1974).
3.6.3.6 Workplace Noise

In 1972, the National Institute for Occupational Safety and Health (NIOSH) published a criteria document with a recommended exposure limit of 85 dBA as an 8-hour time-weighted average. This exposure limit was reevaluated in 1998 when NIOSH made recommendations that went beyond conserving hearing by focusing on the prevention of occupational hearing loss. Following the reevaluation using a new risk assessment technique, NIOSH published another criteria document in 1998, which reaffirmed the 85 dB exposure limit (National Institute for Occupational Health and Safety, 1998).

3.6.4 Regulatory Setting

Under the Noise Control Act of 1972, the Occupational Safety and Health Administration (OSHA) established workplace standards for noise. The minimum requirement states that constant noise exposure must not exceed 90 dBA over an 8-hour period. The highest allowable sound level to which workers can be constantly exposed is 115 dBA and exposure to this level must not exceed 15 minutes within an 8-hour period. The standards limit instantaneous exposure, such as impact noise, to 140 dBA. If noise levels exceed these standards, employers are required to provide hearing protection equipment that will reduce sound levels to acceptable limits.

3.6.5 Affected Environment

The federal government supports conditions free from noise that threaten human health and welfare and the environment. Response to noise varies, depending on the type and characteristics of the noise, distance between the noise source and whoever hears it (the receptor), receptor sensitivity, and time of day. A noise-sensitive receptor is defined as a land use where people involved in indoor or outdoor activities may be subject to stress or considerable interference from noise. Such locations or facilities often include residential dwellings, hospitals, nursing homes, educational facilities, and libraries. Sensitive receptors may also include noise-sensitive cultural practices, some domestic animals, or certain wildlife species. The nearest sensitive receptors are private residences on Route 9 outside the boundary of Andersen AFB, which are located approximately 1.3 miles from the project site. These private residences are also outside the aircraft operations noise boundaries associated with operations at Andersen AFB (DON, 2015a). Potentially noise-sensitive wildlife species are discussed in Section 3.5.

3.6.5.1 Aircraft Noise

In the vicinity of Andersen AFB, noise contours extend off-base to the south and west, and there are populated areas currently within the noise contours up to 70 dB DNL as described in the 2013 Andersen AFB Air Installation Compatible Use Zone Study (DON, 2015a). Along the Andersen AFB boundary, noise levels range from approximately 65 to 75 dB DNL in line with the end of the runway and dropping back down to below 65 dB DNL near both on- and off-base housing east of the Route 15 family housing gate.

3.6.5.2 Installation Noise Environment

Many components may generate noise and warrant analysis as contributors to the total noise impact. Andersen AFB supports forces deploying throughout the Southwest Pacific and the Indian Ocean. Andersen AFB has two parallel runways, each approximately 2 miles long, as well as fuel and munitions storage facilities. Consequently, the noise environment around Andersen AFB is characterized by military aircraft.
3.6.6 Environmental Consequences

Analysis of potential noise impacts includes estimating likely noise levels from the Proposed Action and determining potential effects to sensitive receptor sites.

3.6.6.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change to baseline noise levels. Therefore, no significant impacts due to the noise environment would occur with implementation of the No Action Alternative.

3.6.6.2 Alternative 1

The study area for noise for Alternative 1 includes Andersen AFB MSA 1, Andersen AFB military family housing, and areas within 1 mile from MSA 1.

Short-term direct minor adverse effects would be expected. Construction activities would cause an increase in the surrounding noise levels in the project area. The noise levels from construction equipment would be louder than 50 to 55 dBA. Consequently, short-term direct minor adverse effects on the noise environment near the construction sites could result from the use of heavy equipment. Night time construction is not anticipated; however, construction equipment would be maintained to the manufacturers’ specifications to minimize noise impacts.

Since the construction site would be entirely on Andersen AFB property, and the majority of the island’s population resides several miles away from the proposed site, construction noise within MSA I would not be audible to residents on base or off base. Construction traffic on off-base roadways would be audible to residents. However, construction traffic would not increase substantially, so construction traffic noise would be similar to typical traffic noise levels. Therefore, the short-term increase in ambient noise levels from Alternative 1 would not cause significant adverse impacts on the surrounding populations. Potential construction noise effects on biological resources are presented as appropriate in Section 3.5.3.

Once the construction of the munitions storage igloos are completed, the ambient noise levels would return to their normal levels. No long-term effects would occur as a result of Alternative 1. Therefore, implementation of Alternative 1 would not result in significant impacts to the noise environment.

3.6.6.3 Alternative 2

Alternative 2 would construct the same 48 new ECMs, but in a different location. The only difference between Alternative 1 and Alternative 2 with respect to noise is the facility demolition activities that would occur prior to construction of new ECMs. Noise associated with facility demolition is consistent with noise associated with new construction, so this difference between alternatives would not result in a significant difference in the surrounding noise environment during construction. There is no operational difference between the alternatives following construction, so operational noise would be the same for each alternative. Therefore, implementation of Alternative 2 would not result in significant impacts to the noise environment.
3.7 Infrastructure

This section discusses infrastructure such as utilities (including potable water service, sanitary sewer service, storm water management, fire suppression, and electrical and communications service). Transportation systems and traffic are addressed separately in Section 3.8.

3.7.1 Regulatory Setting

Resource Conservation and Recovery Act (RCRA) 42 U.S.C. section 6902 et seq., Subtitle C regulates management and disposal of hazardous waste. Federal facilities must have programs in place to reduce the volume or quantity of their hazardous waste to the degree determined by the generator to be economically practicable. Additionally, the proposed method of treatment, storage, or disposal is the practicable method available to the generator that minimizes the present and future threat to human health and the environment. RCRA Subtitle D regulates management and disposal of municipal solid waste. Federal facilities must also comply with the requirements of RCRA Subtitle D, which include proper siting, construction, inspection, and closure of municipal solid waste landfills, as well as restrictions on the type and volume of waste that landfills may accept.

Antiterrorism Force Protection Standards have been adopted by the DOD through DOD Instruction 2000.16 dated October 2006. The standards require all DOD Components to adopt and adhere to common criteria and minimum construction standards to mitigate antiterrorism vulnerabilities and terrorist threats.

3.7.2 Affected Environment

The following discussions provide a description of the existing conditions for each of the categories under infrastructure at Andersen AFB MSA 1.

Potable Water

There is no potable water service within MSA 1.

Fire Suppression

A system of underground water lines provides water for fire suppression in the developed portions of MSA 1. Fire hydrants are positioned on nearly every block of the MSA where there are existing munitions storage facilities and other structures. Andersen AFB firefighters and munitions operations personnel use the underground water supply for fire suppression, in combination with firefighting vehicles and other equipment as needed should a fire occur as a result of an accidental munitions discharge. Immediate containment and suppression of fire is necessary to preclude the possibility of successive explosion.

Wastewater

There is no sanitary sewer service within MSA 1.

Stormwater

Drainage within MSA 1 is typically surface sheet flow. Culverts are minimal and they are normally placed at road intersections to convey runoff from the upslope side of the intersection to the downslope side, preventing erosion of the roadway (DON, 2018a).
Solid Waste Management

The USAF solid waste disposal facility includes a recycling center and a lined solid waste landfill. However, it is under closure and is no longer being used. The main landfill has surrounding areas that are capable of disposing construction and demolition debris, scrap metal, and wood and green waste (Grooms et al., 2008). Solid waste generated on the installation is disposed of in a permitted landfill. The solid waste management plan at Andersen AFB calls for diverting as much waste or refuse from the landfill as possible through recycling, reuse, or recovery.

Electrical Service

Andersen AFB receives electrical power through the Guam Power Authority. Under existing conditions, the primary voltage at Andersen AFB is 13,800V/7,970 volts. All electrical utility lines in MSA 1 are underground. In 2008, an underground primary electrical feeder was installed to serve the first 12 ECMs in Phase I as well as the future ECMs. This feeder extends from the east on the north side of 4th Street to a 4-way, pad-mounted 15-kilovolt (kV) switch near the intersection of 4th Street and C Avenue. From this switch, a radial feeder is extended to a new pad-mounted transformer located on the east side of ECM 8418. This transformer has a 13.8-kV primary and 480V/277V secondary. A standby generator is located in a building near the transformer.

Communications

Communications infrastructure was also expanded in the project area in 2008. An underground communications ductbank with 100-pair copper and 48-strand fiber optic cabling was installed to serve the first 12 ECMs in Phase I as well as the future ECMs. The fiber optic cable originates in Building 23028 and the copper cable originates in Building 25008. This cable is extended to MSA I where the copper cable is terminated in a splice case in CHH 123 and the fiber optic cable is terminated in a splice case in CHH 124. From these handholes, the cable is extended to the ECMs (refer to Figure 2-3).

3.7.3 Environmental Consequences

This section analyzes the magnitude of anticipated increases or decreases in public works infrastructure demands considering historic levels, existing management practices, and storage capacity, and evaluates potential impacts to public works infrastructure associated with implementation of the alternatives. Impacts are evaluated by whether they would result in the use of a substantial proportion of the remaining system capacity, reach or exceed the current capacity of the system, or require development of facilities and sources beyond those existing or currently planned.

3.7.3.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change to the existing infrastructure of MSA 1. Therefore, no significant impacts to utilities infrastructure would occur with implementation of the No Action Alternative.

3.7.3.2 Alternative 1

The study area for infrastructure for Alternative 1 is Andersen AFB. No potable water or sanitary sewer infrastructure would be constructed for Alternative 1, thus there would be no impacts to these two utilities with Alternative 1.
Affected Environment and Environmental Consequences

No fire suppression infrastructure would be constructed for Alternative 1. Existing fire suppression water lines would be located, marked, and avoided during construction, so there would be no impacts to fire suppression water supply lines in MSA 1 and the fire suppression system on Andersen AFB.

Stormwater systems would be constructed to manage stormwater drainage resulting from the increased impervious surfaces created by the ECMs. Shallow ground depressions would be constructed at the sides and rear of each ECM for stormwater collection and infiltration. Stormwater run-offs will be directed to a shallow grass swale that would serve as stormwater collection and infiltration area. The depressions and swales would meet the requirements of UFC 3-210-10, Low Impact Development. Thus, there would be no significant impact with respect to stormwater infrastructure. New access roads would be crowned to drain, and intersection culverts may be added or improved as needed.

Municipal solid waste resulting from construction activities would consist of a negligible amount of building materials, such as solid pieces of concrete and lumber. Municipal solid waste would be recycled to the maximum extent possible in accordance with Andersen AFB policies to avoid impacting the capacity of the waste disposal facility. Non-recyclable solid waste would be disposed of in a permitted landfill. Cleared vegetation would be transferred off base to a certified composter within two weeks of clearing to divert municipal solid waste from landfills. Due to the reduced volume of solid waste, implementation of Alternative 1 at Andersen AFB would have a negligible impact on permitted landfill capacity.

The proposed ECMs would have electrical outlets, light-emitting diode (LED) lighting, and exterior LED lighting. Primary power would require 13.8 kV, and secondary power would require 480 volts and 120/208 volts. The lighting for the ECMs would be hooded and directed not to shine on forest habitat. These additional demands for electricity would be negligible compared with total base usage. Alternative 1 would not significantly increase electricity demand at Andersen AFB.

Communications infrastructure was also expanded in the Alternative 1 project area in 2008. An underground communications ductbank with copper and fiber optic cabling was installed to serve the first 12 ECMs in Phase I as well as the ECMs proposed for Alternative 1. These communications lines would be located, marked, and avoided during construction activities. Sufficient communications infrastructure to support the Alternative 1 ECMs already exists and would not be extended during construction.

During the operational phase, the volume of municipal solid waste (green waste and other types of solid waste) associated with munitions handling and maintaining the Alternative 1 project area would be the same as they are for MSA 1 overall, i.e., no change from existing conditions.

Therefore, implementation of Alternative 1 would not result in significant impacts to infrastructure.

3.7.3.3 Alternative 2

The study area for infrastructure for Alternative 2 is Andersen AFB.

Alternative 2 would construct the same 48 new ECMs, but in a different location. Existing underground utility infrastructure in the Alternative 2 project area would be located, marked, and avoided during construction. As with Alternative 1, LED fixtures would be used to provide interior and exterior lighting. The exterior lighting for the ECMs would be hooded and directed not to shine on forest habitat. Construction and operation of the Alternative 2 ECMs would have the same impacts to potable water,
sanitary sewer, fire suppression, stormwater, electrical, and communications infrastructure as Alternative 1.

The only difference between Alternative 1 and Alternative 2 with respect to infrastructure is the amount and type of municipal solid waste that would result from the demolition activities. With Alternative 1, more vegetation would be removed, so there would be a larger volume of green waste to be mulched than with Alternative 2. Alternative 2 would generate less green waste and more concrete and asphalt debris than Alternative 1. However, with Alternative 2, concrete and asphalt debris would be reused/recycled for use in other construction projects to the maximum extent possible in accordance with Andersen AFB policies to avoid impacting the capacity of the waste disposal facility. Non-recyclable solid waste would be disposed of in a permitted landfill. Given green waste mulching and concrete and asphalt debris reuse and recycling, it is anticipated that implementation of Alternative 2 at Andersen AFB would not have a significant impact on the capacity of the Andersen AFB solid waste landfill. Therefore, implementation of Alternative 2 would not result in significant impacts to infrastructure.

3.8 Transportation

This discussion of transportation includes land routes with the means of moving passengers and goods. Traffic is commonly measured through average daily traffic and design capacity. These two measures are used to assign a roadway with a corresponding level of service (LOS). The LOS designation is a professional industry standard used to describe the operating conditions of a roadway segment or intersection. The LOS is defined on a scale of A to F that describes the range of operating conditions on a particular type of roadway facility. LOS A through LOS B indicates free flow travel. LOS C indicates stable traffic flow. LOS D indicates the beginning of traffic congestion. LOS E indicates the nearing of traffic breakdown conditions. LOS F indicates stop-and-go traffic conditions and represents unacceptable congestion and delay.

3.8.1 Regulatory Setting

EO 13834 encourages government agencies to meet energy and environmental performance statutory requirements in a manner that increases efficiency, optimizes performance, eliminates unnecessary use of resources, and protects the environment.

3.8.2 Affected Environment

Primary vehicular access to Andersen AFB is provided by Highway 1 (Marine Drive). The main gate is located at the junction of Highways 1 and 9 and has guarded entry. Traffic volumes entering and exiting the base are relatively low, but short delays are possible at the main gate because USAF personnel screen incoming vehicles. MSA I has serviced a grid of paved and unpaved two-lane roads. The primary entrance to MSA I is through a controlled gate near the intersection of B Avenue and 5th Street. MSA I is a secured area of the base; vehicles entering MSA I are screened at this location. The Guam climate (typhoons and earthquakes) can degrade pavement rapidly (Andersen AFB, 1998). The majority of the roads on Andersen AFB were constructed following the end of WW II and are generally in good condition.
Environmental Consequences

Impacts to ground traffic and transportation are analyzed by considering the possible changes to existing traffic conditions and the capacity of area roadways from proposed increases in construction traffic and munitions transport operations associated with the new ECMs.

3.8.3.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change to transportation. Therefore, no significant impacts would occur with implementation of the No Action Alternative.

3.8.3.2 Alternative 1

The study area for Alternative 1 is Andersen AFB and Highway 1 (Marine Drive).

The construction phase of Alternative 1 would involve delivery of materials to and removal of debris from construction sites. Potential increases in traffic volume associated with proposed construction activities would be temporary. Construction schedules would be coordinated with MSA operations to avoid impacting MSA activities. All road and lane closures would be coordinated with USAF prior to commencing construction activities and would be temporary; therefore, traffic delays or changes in LOS to roadway segments and intersections within Andersen AFB are anticipated to be minimal.

Outside Andersen AFB, construction equipment and associated trucks transporting material to and from the construction site would be directed to roads and streets that have minimum traffic volume.

Construction traffic would compose a small percentage of the total existing traffic and many of the vehicles would be driven to and kept onsite for the duration of construction activities, resulting in relatively few additional trips. Traffic delays or changes in LOS to Highway 1 and its intersections are also expected to be minimal.

Heavy vehicles frequently use base roads; therefore, the vehicles necessary for construction would not be expected to have an adverse impact on base roads. Roadway improvements in the project area are included as part of Alternative 1 construction.

Construction workers and construction-related vehicle trips would have different trip origins and destinations compared to the Air Force personnel and their dependents. Consequently, short-term and intermittent impacts may occur during construction in locations that would not be impacted after construction, when the new ECMs are in use. No significant increase in ordnance vehicle transport trips is anticipated to result from the increased munitions storage capacity that Alternative 1 would provide during the operational phase.

Therefore, implementation of Alternative 1 would not result in significant impacts to transportation.

3.8.3.3 Alternative 2

The study area for Alternative 2 is Andersen AFB and Highway 1 (Marine Drive).

Alternative 2 would construct the same 48 new ECMs as Alternative 1, as well as the demolition of 30 ECMs. This would result in higher volumes of construction materials and demolition debris for Alternative 2 and, consequently, a higher number of construction vehicle trips. Despite the higher volume of anticipated construction traffic, the Alternative 2 project area is adjacent to the Alternative 1 project area, so construction vehicles and workers would access the Alternative 2 site using the same Andersen AFB roads and off-base roadways as Alternative 1.
Construction schedules would be coordinated with MSA operations to avoid impacting MSA activities. All road and lane closures would be coordinated with USAF prior to commencing construction activities and would be temporary; therefore, traffic delays or changes in LOS to roadway segments and intersections within Andersen AFB are anticipated to be minimal with Alternative 2.

Alternative 2 would direct construction traffic outside Andersen AFB to roads and streets that carry minimum vehicles. Traffic delays or changes in LOS to Highway 1 and its and intersections are expected to be minimal.

Heavy military vehicles frequently use base roads; therefore, the vehicles necessary for construction would not be expected to have an adverse impact on base roads. Roadway improvements in the project area are included as part of Alternative 2 construction.

Construction workers and construction-related vehicle trips would have different trip origins and destinations compared to the Air Force personnel and their dependents. Consequently, short-term and intermittent impacts may occur during construction in locations that would not be impacted after construction, when the new ECMs are in use. No significant increase in ordnance vehicle transport trips is anticipated to result from the increased munitions storage capacity that Alternative 2 would provide during the operational phase.

Therefore, implementation of Alternative 2 would not result in significant impacts to transportation.

3.9 Public Health and Safety

This discussion of public health and safety includes consideration for any activities, occurrences, or operations that have the potential to affect the safety, well-being, or health of members of the public. A safe environment is one in which there is no, or optimally reduced, potential for death, serious bodily injury or illness, or property damage. The primary goal is to identify and avoid potential accidents or impacts on the general public. Public health and safety within the context of this EA includes information pertaining to community emergency services, construction activities, potential accidental explosives discharge, and operations following construction.

Community emergency services are organizations that ensure public safety and health by addressing different emergencies. The three main emergency service functions include police, fire and rescue service, and emergency medical service.

Public health and safety during construction, demolition, and renovation activities is generally associated with construction traffic, as well as the safety of personnel within or adjacent to the construction zones.

Operational safety may refer to the actual use of the facility or built-out proposed project, or training or testing activities and potential risks to inhabitants or users of adjacent or nearby land and water parcels. Safety measures are often implemented through designated safety zones, warning areas, or other types of designations.

3.9.1 Regulatory Setting

Explosive Safety Zones (ESZs) are required for areas where ordnance is stored or handled. ESZs are typically determined based upon the NEW of the ordnance to be stored or handled and the blast resistance properties of the magazine. Quantity-distance (QD) setback arcs that delineate the extents of each ESZ are determined. In accordance with Air Force Manual (AFMAN) 91-201, Explosives Safety
Standards, munitions storage igloos can only be constructed within a designated MSA that meets all the safety and explosives standards of AFMAN 91-201. Air Force Handbook 32-1081, Facility Requirements, defines storage igloos as the preferred facility to store munitions where moisture condensation is not a safety factor. Such facilities can be earth-covered, concrete, or steel-reinforced structures. Additional standards that must be considered for the storage of munitions in igloos are as follows:

- Technical Manual 5-1300, Structures to Resist the Effects of Accidental Explosives
- DOD Standard 6055.9-STD, DOD Ammunitions and Explosives Safety Standards

In addition, the Air Force follows strict guidance for the transport and handling of ordnance, to minimize the potential for accidental discharge of munitions. All munitions operations personnel are trained and certified in munitions handling. Munitions are transported and stored in a dis-armed state, and without fuses, to preclude inadvertent explosions. Should an accidental explosion occur, munitions operations personnel and Andersen AFB firefighting personnel are trained and have equipment on site to rapidly respond to the incident and immediately contain the explosion, and control and suppress fire that may occur as a result.

Unexploded ordnance (UXO) is any munitions, weapon delivery system, or ordnance item that contains explosives, propellants, and chemical agents. UXO consists of munitions that (1) are armed or otherwise prepared for action; (2) are launched, placed, fired, or released in a way that they cause hazards; or (3) remain unexploded either through malfunction or design. UXO presents both an immediate safety danger (from explosion) and a long-term health threat (from toxic contamination).

Construction site safety is largely a matter of adherence to regulatory requirements imposed for the benefit of employees and implementation of operational practices that reduce risks of illness, injury, death, and property damage. The health and safety of onsite military and civilian workers are safeguarded by numerous DOD and USAF regulations designed to comply with standards issued by OSHA and NIOSH. These standards specify the amount and type of training required for industrial workers, the use of protective equipment and clothing, engineering controls, and maximum exposure limits for workplace stressors.

### 3.9.2 Affected Environment

Munitions at Andersen AFB are presently being stored in earthen-covered igloos.

Guam’s history in WW II increases the potential of finding UXO within areas proposed for development. The project site is located in a moderate probability area for Munitions and Explosives of Concern (MEC). A Munitions and Explosives of Concern (MEC) investigation is required prior to the start of project activities. The MEC investigation must be preceded by an Explosives Safety Submission (ESS). The ESS must also be approved by the appropriate authorities before work begins (see DOD 6055.9 STD, DOD Ammunition and Explosives Safety Standards). The ESS is designed to provide an assessment of the explosives hazards likely to be encountered during the implementation of the MEC investigation and any resulting response action. All personnel working on site must complete MEC/UXO Awareness Training before starting work.
3.9.3 Environmental Consequences

The safety and environmental health analysis contained in the respective sections addresses issues related to the health and well-being of military personnel working in MSA 1, as well as military personnel and civilians living on or in the vicinity of Andersen AFB MSA 1. Specifically, this section provides information on potential UXO and MEC in the project area; construction site safety; and operational safety.

3.9.3.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change to public health and safety. Therefore, no significant impacts would occur with implementation of the No Action Alternative.

3.9.3.2 Alternative 1

The study area for Alternative 1 is Andersen AFB MSA 1. MSA 1 is a secure location within Andersen AFB that is only accessible to Andersen AFB munitions personnel. Construction areas would be fenced and appropriately marked with signs and placards to ensure that construction activities do not interfere or conflict with munitions operations. Outside Andersen AFB, construction equipment and associated trucks transporting material to and from the construction site would be directed to appropriate roads and streets to ensure traffic safety. During all phases of construction, safety standards required by OSHA and NIOSH would be followed. Workers would be required to wear protective gear such as ear protection from sound, steel-toed boots, hard hat, gloves, and other appropriate safety gear for the proposed igloo construction. No adverse safety effects related to traffic and construction site safety would be expected during the construction of the proposed ECMs.

The Alternative 1 construction site lies outside the portion of MSA 1 where munitions operations currently take place. As stated above, Andersen AFB munitions operations personnel would coordinate with the construction contractor to ensure that munitions handling activities do not conflict or take place concurrently (as feasible) with construction activities. In the unlikely event of an accidental explosion in MSA 1, munitions operations personnel and Andersen AFB firefighting personnel are trained and have equipment on site to rapidly respond to the incident and immediately contain the explosion, and control and suppress fire that may occur as a result. Therefore, no adverse safety effects related to explosives handling and fire are anticipated during the construction of the proposed ECMs.

The project site is located in a moderate probability area for MEC, so excavation for building foundations, roads, underground utilities, and other infrastructure could encounter UXO and MEC. Exposure to UXO and MEC could result in death or injury to workers. The general public would be excluded from the construction zones. To reduce the potential hazards related to the exposure to UXO and MEC, in accordance with DOD Directive 6055.9-STD (DOD Ammunition and Explosive Safety Standards), ESS documentation would be prepared that outlines specific measures that would be implemented to ensure the safety of workers and the public. Construction will require MEC screening for all excavation and earthwork. To ensure construction site safety, the Andersen AFB Explosive Ordnance Disposal Unit would be present to conduct MEC screening for all excavation and earthwork during all active groundbreaking and clearing activities. If UXO is found, exclusion zones will be required. UXO identified during construction of facilities that requires open detonation in-place would require an emergency permit from GEPA. UXO that is safe to transport would be taken to the Andersen AFB Hazardous Waste Management Facility - Andersen AFB Explosive Ordnance Disposal Permitted Facility.
to be safely detonated. BMPs that would be implemented include having qualified UXO personnel perform surveys to identify and remove potential MEC items prior to the initiation of ground-disturbing activities. Additional safety precautions would include providing UXO awareness training to construction personnel involved in grading and excavations prior to and during ground-disturbing activities that would occur in previously disturbed areas that have a high probability of UXO. Potential safety hazards from encounters with UXO would be minimized because UXO would be identified and removed prior to initiating construction activities and construction personnel would be trained as to the hazards associated with unexploded military munitions.

The construction of new ECMs in MSA I would meet all the safety requirements of the regulations and standards listed in Section 2.1.4. The new ECMs would be constructed in accordance with the highest strength classification for munitions storage igloos, the 7-bar rating. This rating would ensure more than adequate explosion safety for 500,000 pounds of NEW anticipated for each ECM. The 48 new ECMs would have vertical concrete walls, reinforced concrete floor and roof slabs, and blast resistant structural steel access doors. Thus, the design and construction of the new ECMs would minimize potential explosives safety hazards.

The ECMs would be situated in MSA I and would have the appropriate distance between ECMs and the required safety explosive QD of 3,969 feet for ECMs containing 500,000 pounds NEW with respect to the inhabited building distance. The closest inhabited building to the new ECMs would be outside the 3,969 feet QD (AFMAN 91-201). This would not affect any inhabited buildings or pose unacceptable safety risks.

The new ECMs would meet USAF safety standards for 7-bar construction. Following construction of the new ECMs, Andersen AFB munitions operations personnel would continue to transport munitions in MSA I according to all applicable DOD requirements. Therefore, implementation of Alternative 1 would not result in significant impacts to public health and safety.

3.9.3.3 Alternative 2

The study area for Alternative 2 is Andersen AFB MSA 1. Under Alternative 2, the same construction safety standards described for Alternative 1 would be followed. The same procedures would be followed to ensure that construction activities would not interfere or conflict with munitions operations. No adverse safety effects related to traffic and construction site safety would be expected during the construction of the proposed ECMs under Alternative 2.

The Alternative 2 construction site lies inside the portion of MSA 1 where munitions operations currently take place. All explosives would be removed and transported elsewhere for proper storage prior to the demolition of ECMs. As described for Alternative 1, Andersen AFB munitions operations personnel would coordinate with the construction contractor to ensure that munitions handling activities do not conflict or take place concurrently (as feasible) elsewhere in MSA 1 with construction activities. In the unlikely event of an accidental explosion in MSA 1, munitions operations personnel and Andersen AFB firefighting personnel are trained and have equipment on site to rapidly respond to the incident and immediately contain the explosion, and control and suppress fire that may occur as a result. Therefore, no adverse safety effects related to explosives handling and fire are anticipated during the construction of the proposed ECMs.

The Alternative 2 project area has the same potential for the presence of UXO and MEC. The same procedures described for Alternative 1 would be required for Alternative 2 to minimize potential safety hazards associated with UXO and MEC.
With Alternative 2, the construction of new ECMs in MSA I would meet all the safety requirements of the regulations and standards listed in Section 2.1.4. The new ECMs would be constructed in accordance with the highest strength classification for munitions storage igloos, the 7-bar rating. This rating would ensure more than adequate explosion safety for 500,000 pounds of NEW anticipated for each ECM. The 48 new ECMs would have vertical concrete walls, reinforced concrete floor and roof slabs, and blast resistant structural steel access doors. Thus, the design and construction of the new ECMs would minimize potential explosives safety hazards.

The ECMs would be situated in MSA I and would have the appropriate distance between ECMs and the required safety explosive QD of 3,969 feet for ECMs containing 500,000 pounds NEW with respect to the inhabited building distance. The closest inhabited building to the new ECMs would be outside the 3,969 feet QD (AFMAN 91-201). This would not affect any inhabited buildings or pose unacceptable safety risks.

The new ECMs would meet USAF safety standards for 7-bar construction. Following construction of the new ECMs, Andersen AFB munitions operations personnel would continue to transport munitions in MSA 1 according to all applicable DOD requirements. Therefore, implementation of Alternative 2 would not result in significant impacts to public health and safety.

3.10 Hazardous Materials and Wastes

This section discusses hazardous materials, hazardous waste, toxic substances, and contaminated sites.

3.10.1 Regulatory Setting

Hazardous materials are defined by 49 CFR section 171.8 as “hazardous substances, hazardous wastes, marine pollutants, elevated temperature materials, materials designated as hazardous in the Hazardous Materials Table, and materials that meet the defining criteria for hazard classes and divisions in 49 CFR part 173.” Transportation of hazardous materials is regulated by the U.S. Department of Transportation regulations.

Hazardous wastes are defined by the Resource Conservation and Recovery Act (RCRA), as amended by the Hazardous and Solid Waste Amendments, as: “a solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may (A) cause, or significantly contribute to, an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness; or (B) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed.” Certain types of hazardous wastes are subject to special management provisions intended to ease the management burden and facilitate the recycling of such materials. These are called universal wastes and their associated regulatory requirements are specified in 40 CFR part 273. Four types of waste are currently covered under the universal wastes regulations: hazardous waste batteries, hazardous waste pesticides that are either recalled or collected in waste pesticide collection programs, hazardous waste thermostats, and hazardous waste lamps, such as fluorescent light bulbs.

Special hazards are those substances that might pose a risk to human health and are addressed separately from other hazardous substances. Special hazards include asbestos-containing material (ACM), polychlorinated biphenyls (PCBs), lead-based paint (LBP), and radon gas. USEPA is given authority to regulate special hazard substances by the Toxic Substances Control Act. Asbestos is also regulated by USEPA under the CAA, and the Comprehensive Environmental Response, Compensation, and Liability Act.
The DOD established the Defense Environmental Restoration Program to facilitate thorough investigation and cleanup of contaminated sites on military installations (active installations, installations subject to Base Realignment and Closure, and formerly used defense sites). The Installation Restoration Program (IRP) and the Military Munitions Response Program are components of the Defense Environmental Restoration Program. The IRP requires each DOD installation to identify, investigate, and clean up hazardous waste disposal or release sites. The Military Munitions Response Program addresses nonoperational rangelands that are suspected or known to contain UXO, discarded military munitions, or munitions constituent contamination.

3.10.2 Affected Environment

To protect habitats and people from inadvertent and potentially harmful releases of hazardous substances, the DOD has required that all facilities develop and implement Hazardous Material Emergency Planning and Response Plans or Spill Prevention, Control, and Countermeasure Plans. These plans and programs, in addition to established legislation effectively form the “safety net” intended to protect the ecosystems on which most living organisms depend.

Air Force Policy Directive 32-70, Environmental Quality, establishes the policy that the USAF is committed to the following environmentally sound practices:

- Cleaning up environmental damage resulting from its past activities
- Meeting all environmental standards applicable to its present operations
- Planning its future activities to minimize environmental impacts
- Responsibly managing the irreplaceable natural and cultural resources it holds in public trust
- Eliminating pollution from its activities wherever possible

Air Force Policy Directive 32-70 and the Air Force Instruction (AFI) 32-7000 series incorporate the requirements of all federal regulations, other AFIs, and DOD Directives for the management of hazardous materials, hazardous wastes, and special hazards.

3.10.2.1 Hazardous Materials and Hazardous Waste

Andersen AFB has enacted programs to ensure adherence to federal environmental regulations regarding hazardous materials and waste management. Standards and procedures for emergency responses for fuel spills are contained in Andersen AFB’s Oil and Hazardous Substance Contingency Plan, which conforms to AFI 32-4002, Facility Hazardous Emergency Planning and Response; and federal laws and regulations.

3.10.2.2 Special Hazards (Asbestos-Containing Materials, Lead-Based Paint, Polychlorinated Biphenyls and Radon Gas)

Electrical transformers and other exterior electrical equipment in the project area were installed as part of construction and maintenance projects that began in 2006; thus, exterior electrical equipment in the project area is not likely to contain PCBs. There are no structures in the Alternative 1 project area where asbestos-containing materials and lead based paint could be present. However, it is possible that the 30 ECMs in the Alternative 2 project area may have PCBs in interior electrical equipment, as well asbestos-containing materials and lead based paint. Radon gas is a concern on Guam because of its relatively high natural levels. Radon gas originates from the natural decay of uranium and thorium in soil, rock, and
water. MSA I has a porous karst topography, which allows radon gas to easily rise to open air areas, and possibly leak into buildings or other enclosed structures.

### 3.10.2.3 Installation Restoration Program

On October 14, 1992, USEPA placed Andersen AFB on the National Priorities List. The USAF subsequently entered into a Federal Facility Agreement with USEPA and GEPA to coordinate the IRP effort at Andersen AFB.

There are 4 IRP sites near the Alternative 1 project area in MSA I (Figure 3-6). IRP Site 3, inside MSA I, is near the corner of 2nd Street and E Avenue, approximately 1,000 feet north of the Alternative 1 site boundary, but it is located at a lower elevation than Alternative 1 and thus would not affect surface water, groundwater, or soil conditions at Alternative 1. IRP Site 5, outside MSA 1 is about 1,680 feet northwest of the Alternative 1 site boundary. IRP Site 21, also outside MSA 1 is about 2,120 feet west of the Alternative 1 site boundary. Similar to IRP Site 3, Sites 5 and 21 are at lower elevations than Alternative 1, and would not affect conditions at the Alternative 1 project area.

### 3.10.3 Environmental Consequences

The hazardous materials and wastes analysis contained in the respective sections addresses issues related to the use and management of hazardous materials and wastes as well as the presence and management of specific cleanup sites at Andersen AFB.

#### 3.10.3.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change associated with hazardous materials and wastes. Therefore, no significant impacts would occur with implementation of the No Action Alternative.

#### 3.10.3.2 Alternative 1

The study area for Alternative 1 is MSA 1. Short-term localized minor adverse effects would be expected. Construction activities associated with Alternative 1 would require the use of certain hazardous materials such as paints, welding gases, solvents, preservatives, and sealants. Construction equipment that would be used contain fuel, lubricating oils, hydraulic fluid, and coolants that could be regulated hazardous substances if spilled or leaked on the construction site. During project activities, contractors would be required to minimize the potential for a release of hazardous substances from all construction equipment, including daily inspection of equipment to ensure that there are no discharges, maintaining appropriate spill containment material onsite, and storage of all fuels and other materials in appropriate containers. Equipment maintenance activities would not be conducted on the construction site.

It is anticipated that the quantity of products containing hazardous materials used during the construction activities would be minimal. Contractors would be responsible for the management of hazardous materials, which would be handled in accordance with federal regulations. Should a spill occur, the contractor would follow the Andersen AFB Oil and Hazardous Substance Contingency Plan.
Figure 3-6
IRP Sites

Affected Environment and Environmental Consequences
3-67

Affected Environment and Environmental Consequences

Hazardous wastes resulting from construction activities are expected to be minimal. Construction contractors would be required to manage and dispose all hazardous waste in compliance with all federal regulations and USAF requirements. Hazardous waste collection facilities on Andersen AFB are anticipated to have sufficient capacity to accept the waste resulting from Alternative 1 construction activities.

There are no IRP sites, contaminated soils, or known hazardous materials in or immediately adjacent to the Alternative 1 project area, so construction of Alternative 1 would not disturb contaminated soil or groundwater associated with IRP sites, or interfere with IRP site cleanup and monitoring activities. If contaminated soils were encountered, such material would be managed in accordance with federal guidelines and regulations.

New transformers, electrical switchgear, and lighting equipment installed for Alternative 1 would be specified to be non-PCB (DON, 2018a). No LBP or ACMs would be used in construction of the ECMs. Diesel fuel for the new back-up generator would be stored in a double-walled tank mounted on concrete pad, in accordance with all federal regulations and USAF requirements.

In recognition of the public health hazard presented by indoor radon, the U.S. Congress passed the Indoor Radon Abatement Act (IRAA) of 1988. In response to IRAA, the Navy created the Navy Radon Assessment and Mitigation Program (NAVRAMP) to manage radon at Navy/Marine Corps installations worldwide. Radon is a naturally occurring, odorless, colorless, radioactive gas that is released from rock, soil, and water as part of the natural decay of uranium. According to USEPA, long-term exposure to elevated indoor radon levels is the second leading cause of lung cancer in the U.S. and the number one cause among non-smokers. New Navy/Marine Corps construction projects, as well as certain types of renovation projects (particularly those involving housing and occupied facilities), may be subject to radon abatement measures. With respect to the Proposed Action, the only proposed construction is for munitions storage facilities and supporting infrastructure, which would not require radon abatement measures since the concern is over human health risks. The proposed construction included in the Proposed Action would comply with NAVRAMP as applicable. Potential long-term adverse effects associated with radon gas could occur if radon accumulated in the ECMs. However, radon would be monitored over time to ensure that no adverse effects would occur. The ECMs would be equipped with ventilation systems that would minimize accumulation of radon gas inside the structures.

Following construction, operations would consist of vehicles transporting ordnance primarily on paved surfaces to and from the ECMs. Andersen AFB personnel operating the vehicles would comply with the Andersen AFB Spill Prevention, Control, and Countermeasure Plan to avoid and minimize the impacts of accidental releases of fuel from the transport vehicles.

Given compliance with federal, GEPA and USAF hazardous materials and waste management regulations and requirements during construction, exclusion of LBP, ACMs, and PCBs from new construction, and compliance with the Andersen AFB Spill Prevention, Control, and Countermeasure Plan during operations, implementation of Alternative 1 would not result in significant impacts with respect to hazardous materials and hazardous waste.

3.10.3.3 Alternative 2

The study area for Alternative 2 is MSA 1. The 30 existing ECMs were constructed in the 1950s, thus, it is possible that they may contain LBP, ACMs, and PCBs. Maintenance records for these ECMs would be reviewed, and if necessary, surveys for LBP, ACMs, and PCBs would be conducted prior to demolition. If
any of these hazardous materials are determined to be present in the 30 existing ECMs, prior to
demolition they would be removed/abated by licensed technicians according to all applicable federal,
GEPA, and USAF requirements, and properly disposed as hazardous waste.

There are no IRP sites or contaminated soils, in or immediately adjacent to the Alternative 2 project area,
so construction of Alternative 2 would not disturb contaminated soil or groundwater associated with IRP
sites, or interfere with IRP site cleanup and monitoring activities. If contaminated soils were
encountered, such material would be managed in accordance with federal guidelines and regulations.
The only difference between Alternative 1 and Alternative 2 with regard to hazardous materials and
wastes is the potential need to identify, abate/remove, and properly dispose LBP, ACMs, and PCBs in the
existing ECMs to be demolished. Otherwise, the same construction activities would take place with
Alternative 2 as those described for Alternative 1. Construction contractors would be required to
manage and dispose all hazardous waste in compliance with all federal Resource Conservation and
Recovery Act regulations and DOD requirements. Hazardous waste collection facilities on Andersen AFB
are anticipated to have sufficient capacity to accept the waste resulting from Alternative 2 demolition
and construction activities, including any LBP, ACMs, and PCBs that may be removed from the existing
ECMs.

New transformers, electrical switchgear, and lighting equipment installed for Alternative 2 would be
specified to be non-PCB (DON, 2018a). No LBP or ACMs would be used in construction of the ECMs.
Diesel fuel for the new back-up generator would be stored in a double-walled tank mounted on concrete
pad, in accordance with all federal regulations and USAF requirements.

If radon is identified as a potential concern during design of the project, suitable measure could be
implemented to ensure it is not a safety hazard during construction or during operations. Potential long-
term adverse effects associated with radon gas could occur if radon accumulated in the ECMs. However,
radon would be monitored over time to ensure that no adverse effects would occur. The ECMs would be
equipped with ventilation systems that would minimize accumulation of radon gas inside the structures.

Following construction, operations would consist of vehicles transporting ordnance primarily on paved
surfaces to and from the ECMs. Andersen AFB personnel operating the vehicles would comply with the
Andersen AFB Spill Prevention, Control, and Countermeasure Plan to avoid and minimize the impacts of
accidental releases of fuel from the transport vehicles.

Given compliance with federal and USAF hazardous materials and waste management regulations and
requirements during construction, exclusion of LBP, ACMs, and PCBs from new construction, and
compliance with the Andersen AFB Spill Prevention, Control, and Countermeasure Plan during
operations, implementation of Alternative 2 would not result in significant impacts with respect to
hazardous materials and hazardous wastes.

3.11 Summary of Potential Impacts to Resources and Impact Avoidance and Minimization

A summary of the potential impacts associated with each of the action alternatives and the No Action
Alternative and impact avoidance and minimization measures are presented in Table 3-10.
### Table 3-10 Summary of Potential Impacts to Resource Areas

<table>
<thead>
<tr>
<th>Resource Area</th>
<th>No Action Alternative</th>
<th>Alternative 1</th>
<th>Alternative 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Quality</td>
<td>No Significant Impacts</td>
<td>No Significant Impacts</td>
<td>No Significant Impacts</td>
</tr>
<tr>
<td>Water Resources</td>
<td>No Significant Impacts</td>
<td>No Significant Impacts</td>
<td>No Significant Impacts</td>
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<tr>
<td>Geological Resources</td>
<td>No Significant Impacts</td>
<td>No Significant Impacts</td>
<td>No Significant Impacts</td>
</tr>
<tr>
<td>Cultural Resources</td>
<td>No Significant Impacts</td>
<td>No Significant Impacts</td>
<td>No Significant Impacts</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Guam Historic Properties Inventory sites 66-08-2101, 66-08-2102, and 66-08-2922 are eligible for the NRHP; there would be no adverse effect to these sites if a data recovery plan is implemented.</td>
<td></td>
</tr>
<tr>
<td>Biological Resources</td>
<td>No Significant Impacts</td>
<td>Less than Significant Impacts</td>
<td>Less than Significant Impacts</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BMPs and conservation measures include Contractor Education Program (Cycas micronesica, Tabernaemontana rotensis, and Mariana fruit bats), pre-construction surveys and hooded lighting (Mariana fruit bats), biosecurity protocols (invasive species), pre-construction surveys and salvage/translocation for ESA-listed plants and snails (Partulid tree snails), and annual reporting to adaptively manage ESA-listed species. These procedures will be executed to minimize impacts to a level where they are not significant to the environment and species existence.</td>
<td></td>
</tr>
<tr>
<td>Noise</td>
<td>No Significant Impacts</td>
<td>No Significant Impacts</td>
<td>No Significant Impacts</td>
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<tr>
<td>Infrastructure</td>
<td>No Significant Impacts</td>
<td>No Significant Impacts</td>
<td>No Significant Impacts</td>
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<tr>
<td>Transportation</td>
<td>No Significant Impacts</td>
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<tr>
<td>Public Health and Safety</td>
<td>No Significant Impacts</td>
<td>No Significant Impacts</td>
<td>No Significant Impacts</td>
</tr>
<tr>
<td>Hazardous Materials and Wastes</td>
<td>No Significant Impacts</td>
<td>No Significant Impacts</td>
<td>No Significant Impacts</td>
</tr>
</tbody>
</table>
4 Cumulative Impacts

This section (1) defines cumulative impacts; (2) describes past, present, and reasonably foreseeable future actions relevant to cumulative impacts; (3) analyzes the incremental interaction the proposed action may have with other actions; and (4) evaluates cumulative impacts potentially resulting from these interactions.

4.1 Definition of Cumulative Impacts

The approach taken in the analysis of cumulative impacts follows the objectives of the National Environmental Policy Act (NEPA), Council on Environmental Quality (CEQ) regulations, and CEQ guidance. Cumulative impacts are defined in 40 Code of Federal Regulations (CFR) section 1508.7 as “the impact on the environment that results from the incremental impact of the action when added to the other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.”

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

In addition, CEQ and the U.S. Environmental Protection Agency (USEPA) have published guidance addressing implementation of cumulative impact analyses—Guidance on the Consideration of Past Actions in Cumulative Effects Analysis (CEQ, 2005) and Consideration of Cumulative Impacts in EPA Review of NEPA Documents (USEPA, 1999). CEQ guidance entitled Considering Cumulative Impacts Under NEPA (CEQ, 1997) states that cumulative impact analyses should “…determine the magnitude and significance of the environmental consequences of the proposed action in the context of the cumulative impacts of other past, present, and future actions…identify significant cumulative impacts...[and]...focus on truly meaningful impacts.”

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

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

The scope of the cumulative impacts analysis involves both the geographic extent of the effects and the time frame in which the effects could be expected to occur. For this EA, the study area delimits the geographic extent of the cumulative impacts analysis. In general, the study area will include those areas previously identified in Chapter 3 for the respective resource areas. The time frame for cumulative impacts centers on the timing of the proposed action.

Another factor influencing the scope of cumulative impacts analysis involves identifying other actions to consider. Beyond determining that the geographic scope and time frame for the actions interrelate to the proposed action, the analysis employs the measure of “reasonably foreseeable” to include or exclude other actions. For the purposes of this analysis, public documents prepared by federal, state, and local government agencies form the primary sources of information regarding reasonably foreseeable actions. Documents used to identify other actions include notices of intent for Environmental Impact Statements (EISs) and EAs, management plans, land use plans, and other planning related studies.

4.3 Past, Present, and Reasonably Foreseeable Actions

This section will focus on past, present, and reasonably foreseeable future projects at and near the Proposed Action locale. In determining which projects to include in the cumulative impacts analysis, a preliminary determination was made regarding the past, present, or reasonably foreseeable action. Specifically, using the first fundamental question included in Section 4.1, it was determined if a relationship exists such that the affected resource areas of the Proposed Action might interact with the affected resource area of a past, present, or reasonably foreseeable action. If no such potential relationship exists, the project was not carried forward into the cumulative impacts analysis. In accordance with CEQ guidance (CEQ, 2005), these actions considered but excluded from further cumulative effects analysis are not catalogued here as the intent is to focus the analysis on the meaningful actions relevant to informed decision-making. Projects included in this cumulative impacts analysis are listed in Table 4-1 and briefly described in the following subsections.

<table>
<thead>
<tr>
<th>Table 4-1 Cumulative Action Evaluation</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Action</td>
<td>Level of NEPA Analysis Completed</td>
</tr>
<tr>
<td>Establishment and Operation of an Intelligence, Surveillance, Reconnaissance, and Strike Intelligence, Surveillance, Reconnaissance (ISR)/Strike) Capability (pending full implementation)</td>
<td>EIS</td>
</tr>
<tr>
<td>Construction of 12 munitions storage igloos in FY2008</td>
<td>EA</td>
</tr>
<tr>
<td>Guam and Commonwealth of the Northern Mariana Islands Military Relocation (2012 Roadmap Adjustments)</td>
<td>Supplemental EIS</td>
</tr>
<tr>
<td>Two Marine Operation Locations: Sites 15B-4 and 15B-g</td>
<td>Supplemental EIS</td>
</tr>
<tr>
<td>Marine Corps Earth-covered Magazines</td>
<td>Supplemental EIS</td>
</tr>
<tr>
<td>Terminal High-Altitude Area Defense (THAAD) Permanent Stationing In Guam</td>
<td>EA</td>
</tr>
<tr>
<td>Chemical Applications for Control of Brown Treesnakes</td>
<td>EA</td>
</tr>
</tbody>
</table>
4.3.2 Past Actions

The 2005 EA addressed the full proposed action identified at that time (i.e., 60 munitions storage igloos within the MSA), and Phase 1 (12 igloos) was implemented following completion of that EA. However, plans for the remaining 48 igloos were subsequently revised, requiring development of revised alternatives to be addressed in this EA. Therefore, Phase 1 is considered a past action for this cumulative impacts analysis.

Establishment and Operation of an Intelligence, Surveillance, Reconnaissance, and Strike (ISR/Strike) Capability. This project would involve the establishment of ISR/strike; and aerial refueling capabilities at Andersen Air Force Base (AFB), as part of the Pacific Command’s Global Strike Task Force Initiative. Specific components of this action include 3 Global Hawk unmanned aerial ISR aircraft, 12 aerial refueling aircraft, 4 Global Hawk RQ-4 unmanned aerial vehicles (Global Hawk), and support personnel at Andersen AFB. Additionally, 48 fighter and 6 bomber aircraft and support personnel would rotate to Andersen AFB from installations in the 50 states. Approximately 3,000 additional military, civilian, and contractor personnel would be required to support this action. Facility construction, addition, and alteration projects would occur to support the establishment and operation of the ISR/Strike capability. The Final EIS was published in November 2006 (71 Federal Register 67864) and a Record of Decision (ROD) was signed on January 12, 2007 (72 Federal Register 2871).

4.3.3 Present and Reasonably Foreseeable Actions

Guam and Commonwealth of the Northern Mariana Islands (CNMI) Military Relocation (2012 Roadmap Adjustments): In September 2010, the Department of the Navy (DON) signed a ROD regarding the 2010 Final EIS for the Guam and CNMI Military Relocation. In April 2012, the U.S.-Japan Security Consultative Committee jointly announced an adjustment to the previous plans for the Guam military relocation. In accordance with these “2012 Roadmap Adjustments,” the Department of Defense adopted a new force posture in the Pacific providing for a materially smaller and reconfigured Marine Corps force on Guam. The DON prepared a Final Supplemental Environmental Impact Statement (SEIS) for the purpose of supplementing portions of the 2010 Final EIS regarding the establishment on Guam of a live-fire training range complex (LFTRC), a cantonment area, a family housing area, and associated infrastructure to support the relocation of a substantially reduced number of Marines and dependents than was previously analyzed. The Final SEIS analyzes the potential environmental impacts of five action alternatives for the cantonment/family housing component of the proposed action and five action alternatives for the LFTRC component, plus a No Action Alternative. The DON’s preferred alternative is to construct and operate the proposed cantonment at the Naval Base Guam (NBG), Telecommunications Site at Finegayan (hereinafter “Finegayan”), the proposed family housing on Andersen AFB, and the proposed LFTRC at Northwest Field (NWF) on Andersen AFB.

Two Marine Operation Locations: Sites 15B-4 and 15B-g in Munitions Storage Area (MSA) 1 have been identified as potential Marine operating locations and are sited for up to 250,000 pounds of hazard class/division (HC/D) 1.1 munitions. The proposed Marine operating locations have an approximate inter-magazine distance (IMD) of 680 feet that would impose siting constraints due to their explosives safety spacing requirements on the Proposed Action.

Marine Corps Earth-covered Magazines (ECMs): Three potential structure designs and location for six new ECMs for Marine Corps hazard class/division 1.1 munitions have been created with a total storage capacity of 110,500 pounds of NEW. Depending on a final decision for the location, number, and structure type, these facilities may have an effect on siting new munitions storage facilities. However, a
preferred site and type of structure for this request has not been determined, and explosives safety
distances for these facilities have not been considered a current constraint.

Terminal High-Altitude Area Defense (THAAD) Permanent Stationing in Guam: The U.S. Army proposes
to maintain its THAAD ballistic missile defense battery in Guam permanently at its current temporary
location on NWF of Andersen AFB near the northern end of the island. As a secondary, connected
action to the expeditionary deployment and proposed permanent stationing of the THAAD battery in
Guam, the U.S. Army also proposes to expand the NWF cargo drop zone training area that was
cumbered by THAAD operations. The THAAD Permanent Stationing in Guam also includes expansion of
the Andersen AFB hazardous waste storage area to accommodate new hazardous waste volume
associated with the THAAD operations. An EA was completed for this proposed project in March 2017 and
the public comment period for the draft Finding of No Significant Impact ended on April 17, 2017.

Chemical Applications for Control of Brown Treesnakes: This project involves use of chemicals to help
minimize and control the brown treesnake population on Guam. The method used would be the aerial
application of acetaminophen-treated baits.

The following two projects have been proposed for MSA 1, but as of 2017 are not considered reasonably
foreseeable.

Multiple Tactical Air-Munitions Rapid Response (TARRP) Facilities: Proposed TARRP facilities have been
sited near the study area. Their proposed locations and explosives safety distance requirements limit the
potential locations for new Hayman ECMs within the study area. Up to four aboveground magazines,
two operations pads, a wood shop, an equipment storage facility, and a T-2 facility are proposed within
MSA I. The proposed TARRP facilities have the following IMD:

- Aboveground magazines have an approximate IMD of 680 feet
- Operations pads have an approximate IMD of 694 feet
- The T-2 pad has an approximate IMD of 694 feet

Munitions Inspection Facility: A new munitions inspections and surveillance facility is proposed in the
southeast corner of MSA I. The proposed facilities also impose siting constraints due to their explosives
safety spacing requirements.

4.4 Cumulative Impact Analysis

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

4.4.1 Air Quality

Cumulatively, short-term minor adverse effects on air quality would occur for all projects and the
Proposed Action. Air emissions from construction equipment and activities would be short-term and
would last only during active construction. Andersen AFB is in attainment for all criteria pollutants.
Overall impacts on air quality during the operational phases of all projects, including the Proposed Action, would be not be significant. Therefore, there would be no significant impacts to air quality.

### 4.4.2 Water Resources

According to completed NEPA documentation, the Guam and CNMI Military Relocation (2012 Roadmap Adjustments) and the THAAD Permanent Stationing in Guam include requirements to obtain permits and prepare SWPPPs and EPPs to avoid and minimize impacts to water resources during construction and operations. It is assumed that the other two present and reasonably foreseeable projects (Two Marine Operation Locations: Sites 15B-4 and 15B-g Six Marine Corps Earth-covered Magazines) would comply with federal guidance and regulations and include similar water resource protection measures. Therefore, implementation of the Proposed Action in combination with other present and reasonably foreseeable projects would not result in significant impacts to water resources.

### 4.4.3 Geological Resources

According to completed NEPA documentation, the Guam and CNMI Military Relocation (2012 Roadmap Adjustments) include requirements to obtain permits and prepare SWPPPs and EPPs to avoid and minimize impacts to geological resources during construction and operations. Impacts to geological resources with the proposed THAAD Permanent Stationing in Guam project would be minimal because clearing and construction activities would be limited to surface disturbances and shallow excavations, include implementation of standard erosion control BMPs, and comply with applicable building standards for seismic risks and sinkholes associated with limestone karst. It is assumed that the other two present and reasonably foreseeable projects (Two Marine Operation Locations: Sites 15B-4 and 15B-g Six Marine Corps Earth-covered Magazines) would comply with federal regulations and include similar soil, bedrock, and seismic hazard protection measures. Therefore, implementation of the Proposed Action in combination with other present and reasonably foreseeable projects would not result in significant impacts to geological resources.

### 4.4.4 Cultural Resources

Potential impacts to cultural resources could occur for the additional projects and the Proposed Action. Navy will conduct appropriate consultations with Guam SHPO. Additionally, should any cultural resources be uncovered during any construction, all findings would be handled in accordance with the Final ICRMP for Andersen AFB (Andersen AFB, 2003) and consultation with the SHPO.

### 4.4.5 Biological Resources

Increased air traffic disturbance on Andersen AFB as a result of Intelligence, Surveillance, Reconnaissance, and Strike Capability (ISR/Strike) action is likely to disturb and adversely affect the Mariana fruit bat colony at Pati Point. To mitigate the impacts to fruit bats, an ungulate exclosure and habitat improvements are planned. Construction for the Guam and CNMI Military Relocation (2012 Roadmap Adjustments) LFTRC would be within NWF but away from proposed action area. The USFWS determined that the action is not likely to appreciably reduce the survival and recovery of the Mariana eight-spot butterfly, *Dendrobium guamense*, *Tuberolabium guamense*, *Tabernaemontana rotensis*, *Heritiera longipetiolata*, *Cycas micronesica*, and *Bulbophyllum*. Impacts to biological resources with the proposed THAAD Permanent Stationing in Guam project would be minimal because clearing and construction activities would be limited to surface disturbances and shallow excavations. It is assumed that the other two present and reasonably foreseeable projects (Two Marine Operation Locations: Sites
1 15B-4 and 15B-g Six Marine Corps Earth-covered Magazines) would comply with federal regulations and
2 include similar soil, bedrock, and seismic hazard protection measures. Aerial application of
3 acetaminophen for Brown treesnake control in the Habitat Management Unit would occur on Andersen
4 AFB. DOD determined that the action may affect, but would not be likely to adversely affect Cycas
5 micronesica, Bulbophyllum guamense, Tabernaemontana rotensis, Tuberolabium guamense, Partula
6 gibba, Partula radiolata, and Samoana fragilis. DOD determined that the action is likely to adversely
7 affect the Mariana fruit bat. Therefore, implementation of the Proposed Action in combination with
8 other present and reasonably foreseeable projects may result in some adverse impacts to biological
9 resources, in particular, to the Mariana fruit bat.

10 **4.4.6 Noise**
11 Construction for the Guam and CNMI Military Relocation (2012 Roadmap Adjustments) LFTRC would be
12 within NWF and away from any sensitive human receptors. Construction areas along the access road to
13 the LFTRC would be approximately 0.25 mile from the nearest receptors, a distance that is far enough
14 from the source of temporary construction noise that there would be minimal noise effects on
15 receptors. The LFTRC would be located at the remote northern tip of the Guam. Noise from LFTRC
16 operations would not be audible in inhabited areas on or off Andersen AFB. Noise from the THAAD
17 Permanent Stationing in Guam construction activities would not be discernable over ambient noise
18 levels. Thus, there would be no significant noise impacts from temporary site preparation and
19 construction activities associated with this project. The THAAD operating location is about two miles
20 from the nearest inhabited areas, so noise associated with THAAD operations would be not perceptible
21 to sensitive receptors. The Proposed Action would have a temporary increase in ambient noise levels
22 during construction that would not cause significant adverse impacts on the surrounding populations.
23 Following construction of the Proposed Action, the ambient noise levels would return to their normal
24 levels. No long-term noise impacts effects would occur as a result of the Proposed Action. The other two
25 present and reasonably foreseeable projects (Two Marine Operation Locations: Sites 15B-4 and 15B-g
26 Six Marine Corps Earth-covered Magazines) are located near the Proposed Action within MSA 1 and
27 would involve similar types of construction activities and construction noise. Thus, it is assumed that
28 these two projects would have noise impacts similar to those described for the Proposed Action, i.e.,
29 short-term increases in ambient noise levels that would not cause significant impacts on surrounding
30 populations, followed by a return to normal ambient noise levels. Therefore, implementation of the
31 Proposed Action in combination with other present and reasonably foreseeable projects would not
32 result in significant noise impacts.

33 **4.4.7 Infrastructure**
34 Installation of new or modifications to existing electrical and potable water supply, sanitary
35 sewer/portable latrines, storm drainage, and communications systems are included as part of the Guam
36 and CNMI Military Relocation (2012 Roadmap Adjustments) and the THAAD Permanent Stationing in
37 Guam projects. It is assumed that the other two present and reasonably foreseeable projects (Two
38 Marine Operation Locations: Sites 15B-4 and 15B-g Six Marine Corps Earth-covered Magazines) would
39 include electrical and telecommunications utilities if needed and implement standard construction
40 measures to avoid damage to any existing utilities in their respective project areas. There would be no
41 adverse effects on infrastructure associated with the Proposed Action. Therefore, implementation of the
42 Proposed Action in combination with other present and reasonably foreseeable projects would not
43 result in significant impacts to infrastructure.
4.4.8 Transportation

The Guam and CNMI Military Relocation (2012 Roadmap Adjustments) project would result in potential short-term traffic delays on Andersen AFB roadways during the construction phase. The delays would be minimized with appropriate construction work zone traffic management strategies and BMPs. This project includes a new Andersen AFB main gate and new Commercial Vehicle/Tactical Vehicle Gate on Route 3A to relieve congestion at the existing main gate at the junction of Highways 1 and 9. However, there would still be multiple significant impacts to traffic on off-base roadways and intersections associated with the operational phase of the Guam and CNMI Military Relocation (2012 Roadmap Adjustments) project. The project includes potential mitigation measures to minimize these impacts. The THAAD Permanent Stationing in Guam would have minimal short-term traffic localized traffic delays during construction. Following construction, the THAAD mission would include the existing workforce of 200 military personnel, and an additional small workforce comprising more military personnel and no more than 50 contract workers at any one time. Thus, the increase in vehicle trips that the THAAD Permanent Stationing would add would not cause major increases to on base or off base roadway use. The Proposed Action would cause temporary, minimal traffic delays during the construction phase, which would cease upon completion of construction. The other two present and reasonably foreseeable projects (Two Marine Operation Locations: Sites 15B-4 and 15B-g Six Marine Corps Earth-covered Magazines) are located near the Proposed Action within MSA 1 and would involve similar types of construction activities. Thus, it is assumed that these two projects would have traffic impacts similar to those described for the Proposed Action, i.e., short-term increases traffic delays that would cease upon completion of construction. Impacts to transportation associated with the Proposed Action would be negligible in comparison to those from the Guam and CNMI Military Relocation (2012 Roadmap Adjustments). However, the project includes widening two segments of Route 1, three segments of Route 3, and one segment of Route 28 as mitigation. Additional traffic mitigation for this project includes improvements at two intersections on Route 3 and at nine intersections on Route 1. Therefore, implementation of the Proposed Action, in combination with other present and reasonably foreseeable projects would not result in significant impacts to transportation.

4.4.9 Public Health and Safety

According to completed NEPA documentation, the construction and operational phases of the Guam and CNMI Military Relocation (2012 Roadmap Adjustments) and the THAAD Permanent Stationing in Guam would have no significant impacts to public health and safety. For the reasons described in Section 3.9 of this EA, the Proposed Action is not anticipated to result in significant impacts to public health and safety. It is assumed that the other two present and reasonably foreseeable projects (Two Marine Operation Locations: Sites 15B-4 and 15B-g Six Marine Corps Earth-covered Magazines) would incorporate Occupational Safety and Health Administration worker health and safety protection, and UXO/MEC avoidance measures similar to those included in the Proposed Action. Therefore, implementation of the Proposed Action in combination with other present and reasonably foreseeable projects would not result in significant impacts to public health and safety for all projects and the Proposed Action.

4.4.10 Hazardous Materials and Wastes

According to completed NEPA documentation, the Guam and CNMI Military Relocation (2012 Roadmap Adjustments) and THAAD Permanent Stationing in Guam would not disturb or interfere with investigation/cleanup activities at IRP sites within MSA 1 and NWF. Construction activities for these two...
projects would involve the use of fuels, hydraulic fuels, and solvents, similar to the Proposed Action. However, similar to the Proposed Action these two reasonably foreseeable projects are required to comply with federal regulations for the storage, management, and disposal of hazardous materials and waste. The Guam and CNMI Military Relocation (2012 Roadmap Adjustments) and the THAAD Permanent Stationing in Guam include multiple plans, BMPs, and procedures to avoid and minimize potential hazardous materials and hazardous waste impacts during construction and operations. It is assumed that the other two present and reasonably foreseeable projects (Two Marine Operation Locations: Sites 15B-4 and 15B-g Six Marine Corps Earth-covered Magazines) would not disturb IRP sites, and would comply with federal regulations and include hazardous materials and waste impact minimization measures. Therefore, implementation of the Proposed Action in combination with other present and reasonably foreseeable projects would not result in significant impacts with respect to hazardous materials and waste for all projects and the Proposed Action.
5 Other Considerations Required by NEPA

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

In accordance with 40 Code of Federal Regulations (CFR) section 1502.16(c), analysis of environmental consequences shall include discussion of possible conflicts between the Proposed Action and the objectives of federal, regional, state, and local land use plans, policies, and controls. Table 5-1 identifies the principal federal laws and regulations that are applicable to the Proposed Action, and describes briefly how compliance with these laws and regulations would be accomplished.

5.2 Irreversible or Irretrievable Commitments of Resources

Resources that are irreversibly or irretrievably committed to a project are those that are used on a long-term or permanent basis. This includes the use of non-renewable resources such as metal and fuel, and natural or cultural resources. These resources are irretrievable in that they would be used for this project when they could have been used for other purposes. Human labor is also considered an irretrievable resource. Another impact that falls under this category is the unavoidable destruction of natural resources that could limit the range of potential uses of that particular environment.

The irreversible environmental changes that would result from implementation of the Proposed Action involve the consumption of energy resources, biological habitat, and human resources. The use of these resources is considered to be permanent. For the Proposed Action, consumption of energy and human resources are not significant. The potential loss of low-quality non-native biological habitat would be an irreversible and irretrievable commitment of resources. Irreversible and irretrievable resource commitments are related to the use of non-renewable resources and the effects that use of these resources will have on future generations. Irreversible effects primarily result from use or destruction of a specific resource that cannot be replaced within a reasonable timeframe (e.g., energy and minerals).

5.3 Unavoidable Adverse Impacts

While some aspects of the Proposed Action would result in adverse effects, most of the anticipated environmental effects are associated with construction and would be short-term. Construction activities would comply with federal regulations and ordinances, including BMPs, which would reduce the potential for adverse effects. However, this Environmental Assessment (EA) has determined that the alternatives considered may result in significant impacts to natural resources. The loss of high-value native and low-value non-native biological habitat would be considered unavoidable adverse impacts.

5.4 Relationship between Short-Term Use of the Environment and Long-Term Productivity

NEPA requires an analysis of the relationship between a project’s short-term impacts on the environment and the effects that these impacts may have on the maintenance and enhancement of the long-term productivity of the affected environment. Impacts that narrow the range of beneficial uses of the environment are of particular concern. This refers to the possibility that choosing one development site reduces future flexibility in pursuing other options, or that using a parcel of land or other resources often eliminates the possibility of other uses at that site.
### Table 5-1: Principal Federal Laws Applicable to the Proposed Action

<table>
<thead>
<tr>
<th>Federal, State, Local, and Regional Land Use Plans, Policies, and Controls</th>
<th>Status of Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Environmental Policy Act (NEPA); Council on Environmental Quality NEPA implementing regulations; Navy procedures for Implementing NEPA</td>
<td>Complies (EA prepared)</td>
</tr>
<tr>
<td>Clean Air Act</td>
<td>Complies (does not exceed <em>de minimis</em> levels)</td>
</tr>
<tr>
<td>Clean Water Act</td>
<td>Complies</td>
</tr>
<tr>
<td>Rivers and Harbors Act</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Coastal Zone Management Act</td>
<td>Complies (pending Coastal Consistency review)</td>
</tr>
<tr>
<td>National Historic Preservation Act</td>
<td>Complies (based on consultation with Guam SHPO, see Section 3.4)</td>
</tr>
<tr>
<td>Archaeological and Historic Preservation Act</td>
<td>Complies (based on consultation with Guam SHPO, see Section 3.4)</td>
</tr>
<tr>
<td>Archaeological Resources Protection Act</td>
<td>Complies (based on consultation with Guam SHPO, see Section 3.4)</td>
</tr>
<tr>
<td>Endangered Species Act</td>
<td>Complies (pending Section 7 ESA consultation, see Section 3.5)</td>
</tr>
<tr>
<td>Magnuson-Stevens Fishery Conservation and Management Reauthorization Act</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Marine Mammal Protection Act</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Migratory Bird Treaty Act</td>
<td>Complies</td>
</tr>
<tr>
<td>Bald and Golden Eagle Protection Act</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Comprehensive Environmental Response and Liability Act</td>
<td>Complies</td>
</tr>
<tr>
<td>Emergency Planning and Community Right-to-Know Act</td>
<td>Complies</td>
</tr>
<tr>
<td>Federal Insecticide, Fungicide, and Rodenticide Act</td>
<td>Complies</td>
</tr>
<tr>
<td>Resource Conservation and Recovery Act</td>
<td>Complies</td>
</tr>
<tr>
<td>Toxic Substances Control Act</td>
<td>Complies</td>
</tr>
<tr>
<td>Farmland Protection Policy Act</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Executive Order (EO) 11988, Floodplain Management</td>
<td>Complies</td>
</tr>
<tr>
<td>EO 12088, Federal Compliance with Pollution Control Standards</td>
<td>Complies</td>
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<tr>
<td>EO 12114, Environmental Effects Abroad of Major Federal Actions (Department of Navy implementing regulation 32 CFR part 287)</td>
<td>Not applicable</td>
</tr>
<tr>
<td>EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations</td>
<td>Complies</td>
</tr>
<tr>
<td>EO 13045, Protection of Children from Environmental Health Risks and Safety Risks</td>
<td>Complies</td>
</tr>
<tr>
<td>EO 13089, Coral Reef Protection</td>
<td>Not applicable</td>
</tr>
<tr>
<td>EO 13175, Consultation and Coordination with Indian Tribal Governments</td>
<td>Not applicable</td>
</tr>
<tr>
<td>EO 13834, Efficient Federal Operations</td>
<td>Complies</td>
</tr>
</tbody>
</table>
For the Proposed Action, construction-related effects are minor and would not result in loss of long-term productivity. The long-term use of MSA I will continue to be for munitions storage and operations. The Proposed Action has the potential to result in long-term adverse effects on sensitive species habitat and potentially to sensitive archaeological and historic resources. However, the mitigation measures identified in this EA would support the long-term use of MSA I military operations and biological habitat. The construction and operation of proposed ECMs would not significantly impact the long-term natural resource productivity of the area. Therefore, the Proposed Action would not result in any impacts that would significantly reduce environmental productivity or permanently narrow the range of beneficial uses of the environment.
6 References


DON. (2015b). Tree snail observations at Sasa Valley Fuel Farm. Personal communication via email to P. Wenninger, NAVFAC Marianas, NBG Main Base, Guam from D. Janeke, Biologist, HDR Inc., San Diego, CA.


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References


USFWS. (2013). Endangered and Threatened Wildlife and Plants; Review of Native Species That are Candidates for Listing as Endangered or Threatened; Annual Notice of Findings on Resubmitted Petitions; Annual Description of Progress on Listing Actions; Notice of Review. Federal Register 78:70104-70162.


USFWS. (2015c). Letter to the Department of the Navy. Endangered and Threatened Wildlife and Plants; Endangered Status for 16 Species and Threatened Status for 7 Species in Micronesia; Final Rule. Federal Register, 80, 190.


7 List of Preparers

This EA was prepared collaboratively between the Navy and contractor preparers.

U.S. Department of the Navy

Justin Fujimoto (Naval Facilities Engineering Command [NAVFAC] Pacific)
Responsible for: Biology

Jeffrey Laitila (NAVFAC IEPD)
Responsible for: EA

Paula Hartzell (NAVFAC IEPD)
Responsible for: Natural Resources

Devan Kawakami-Wong (NAVFAC Pacific)
Responsible for: EA

Richard Olmo (NAVFAC IEPD)
Responsible for: Cultural Resources

Mark Petersen (AFIMSC Det 2/CEB [PACDET])
Responsible for: Planning

Coral Rasmussen (NAVFAC Pacific)
Responsible for: Cultural Resources

Jackie Sanehira (NAVFAC Pacific)
Responsible for: Cultural Resources

Thomas A. Spriggs (NAVFAC IEPD)
Responsible for: EA

Alan Suwa (NAVFAC Pacific)
Responsible for: Project Management

Jim Watkins (NAVFAC IEPD)
Responsible for: Biology

Contractors

Cristina Ailes (Cardno)
B.S. Ecology & Environmental Science, B.A. International Studies
Years of Experience: 11
Responsible for: Technical Editing

Peer Amble (Cardno)
B.A., Geography
Years of Experience: 27
Responsible for: Project Management and QA/QC

Margaret Bach (Cardno)
B.A., Geology
Years of Experience: 25
Responsible for: EA Resources
List of Preparers

1. Kevin Butterbaugh (AECOM)
   MLA, Landscape Architecture
   Years of Experience: 28
   Responsible for: Planning

2. Jackie Clark (Cardno)
   B.S. Business Administration
   Years of Experience: 8
   Responsible for: Technical Editing

3. Christine Davis (Cardno)
   M.S., Environmental Management
   Years of Experience: 18
   Responsible for: Technical Review and Air Quality

4. Megan Desillier (Cardno)
   M.A., Marine and Environmental Affairs
   Years of Experience: 2
   Responsible for: Air Quality

5. Boyd Dixon, PhD, RPA (Cardno)
   PhD, Anthropology
   Years of Experience: 45
   Responsible for: Cultural Resources (Archaeological Resource Survey/Testing)

6. Jessica Dougherty, RPA (Cardno)
   M.S., Anthropology
   Years of Experience: 10
   Responsible for: Cultural Resources

7. John Ford (Cardno)
   M.S., Zoology
   Years of Experience: 36
   Responsible for: Biological Resources

8. Brenden Holland (Cardno)
   Ph.D., Oceanography
   Years of Experience: 20
   Responsible for: Biological Resources

9. Wes Ishizu (AECOM)
   Responsible for: Planning

10. Robert Jones (Cardno)
    M.A., Anthropology
    Years of Experience: 12
    Responsible for: Cultural Resources
List of Preparers

1 Trina Meiser (AECOM)
2 M.A., Historic Preservation Planning
3 Years of Experience: 16
4 Responsible for: Cultural Resources (Historic Structures/Districts)

5 Isla Nelson (Cardno)
6 B.A., Anthropology
7 Years of Experience: 17
8 Responsible for: Cultural Resources

9 Paul Radley (Cardno)
10 PhD, Wildlife Ecology
11 Years of Experience: 25
12 Responsible for: Biological Resources

13 Teresa Rudolph (Cardno)
14 M.A., Anthropology
15 Years of Experience: 40
16 Responsible for: Cultural Resources

17 Rachel Shaak, AICP LEED AP (Cardno)
18 M. Div., M.A., Ancient History and Hebrew
19 Years of Experience: 16
20 Responsible for: EA Management, Chapters 1 & 2

21 Lorraine Shaughnessy (Cardno)
22 M.S., Biology
23 Years of Experience: 11
24 Responsible for: Biological Resources

25 Chris Stoll (AECOM)
26 M.A., Urban and Regional Planning
27 Years of Experience: 15
28 Responsible for: Planning

29 Kimberly Wilson (Cardno)
30 High School Diploma
31 Years of Experience: 21
32 Responsible for: Technical Editing
8 Distribution List

The Draft EA was distributed to the agencies listed below.

8.1 Department of Defense

4 Andersen Air Force Base (AFB), Guam
5 Chief of Naval Operations, N45
6 Commonwealth of the Northern Mariana Islands Joint Region Marianas (JRM) Coordination Office
7 Naval Facilities Engineering Command (NAVFAC) Marianas, Guam
8 NAVFAC Headquarters
9 NAVFAC Pacific
10 Pacific Air Forces (PACAF)

8.2 Government Agencies

12 Guam Bureau of Statistics and Plans
13 Guam Department of Parks and Recreation, Historic Resources Division
14 Guam Division of Aquatic and Wildlife Resources (DAWR)
15 U.S. Fish and Wildlife Service (USFWS)

8.3 Libraries

17 Dededo Public Library
18 Nieves M. Flores Memorial Library
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