

CHAPTER 10.

TERRESTRIAL BIOLOGICAL RESOURCES

10.1 INTRODUCTION

This chapter contains a description of the potential environmental consequences to terrestrial biological resources associated with implementation of the action alternatives within the region of influence (ROI). For a description of the affected environment for all resources, refer to the respective chapter of Volume 2 (Marine Corps Relocation – Guam). The locations described in that Volume include the ROI for the Army Air and Missile Defense Task Force (AMDTF) component of the proposed action, and the chapters are presented in the same order as the resource areas contained in this Volume.

10.2 ENVIRONMENTAL CONSEQUENCES

10.2.1 Approach to Analysis

10.2.1.1 Methodology

Biological resource issues and concerns include the potential direct, indirect, and cumulative impacts of the proposed action and alternatives during the construction and operation phases. Impacts may be either temporary or permanent. Direct and indirect impacts are distinguished as follows.

Direct impacts are associated with proposed construction activities (e.g., ground-disturbing activities) and operations (e.g., noise and lighting). Potential types of direct impacts include, but are not limited to:

- Loss of habitat due to vegetation removal during construction.
- Temporary loss of habitat during construction from noise, lighting, and human activity.
- Potential loss of habitat due to disturbance of species in areas surrounding operations from noise, lighting, and human activity.
- Injury or mortality to wildlife or special-status species caused by the action that occur at the same time and place as the action.

Indirect impacts are caused by or result from project-related activities, are usually later in time, and are reasonably foreseeable (e.g., increased likelihood of non-native, invasive species moving into the area after disturbance). Potential indirect impacts include, but are not limited to:

- All disturbances from human activity, noise, and lighting that would potentially impact unoccupied recovery habitat for special-status species.
- Introduction of new non-native, invasive species or increased dispersal of existing invasive species on Guam.
- Dispersal of existing non-native, invasive species from Guam to the Commonwealth of the Northern Mariana Islands (CNMI), Hawaii, or other destinations.
- Adverse effects from pollutants that are released from construction or military operations.
- Increased threats from feral animals.

General principles used to evaluate impacts are:

- The extent, if any, that the action would permanently lessen ecological habitat qualities that Endangered Species Act (ESA)-listed species depend upon, and which partly determines the species' prospects for conservation and recovery.
- The extent, if any, that the action would diminish population sizes, distribution, or habitat of regionally important native plant or animal species.
- The extent, if any, that the action would be likely to jeopardize the continued existence of any ESA-listed species.
- The extent, if any, that the action would be inconsistent with the goals of U.S. Fish and Wildlife Service (USFWS) recovery plans, Navy and Air Force Integrated Natural Resources Management Plans (INRMPs), or the Guam Comprehensive Wildlife Conservation Strategy (CWCS).

10.2.1.2 Determination of Significance

Significance of impacts to vegetation, wildlife, and special-status species were determined using guidelines in the previous section. Special-status species are defined as ESA- and Guam-listed species and species that are designated candidates for ESA listing. Specific significance criteria are discussed below. If significant impacts are determined, then mitigation may be proposed to offset the impacts.

Vegetation

Impacts would be determined significant if any primary limestone forest (mature forest dominated by native species) would be cleared, unless determined to be very minor in the context of the surrounding forest areas. Any loss of this forest vegetation community would be considered significant because of the large historical and continuing losses of this forest type on Guam. Loss of wetland or mangrove vegetation would also be considered potentially significant. Note that impacts to vegetation types other than primary limestone forest could also be determined significant if these areas were habitat for protected wildlife or special-status species (as evaluated below).

Wildlife

Impacts would be determined significant if native wildlife species are present and the proposed project would result in more than minimal changes in population sizes or distributions of regionally important native animal species. These wildlife species include those designated as Species of Greatest Conservation Need by the Guam Division of Aquatic and Wildlife Resources [GDAWR] in the Guam CWCS (2006; excluding special-status species which are addressed separately below). Invasive species impacts that exceed the criteria specified above are evaluated. Historical impacts from non-native, invasive species have been severe, particularly from the brown tree snake (BTS) (see discussion in Volume 2). Although the proposed action would not result in additional impacts from BTS on Guam, the concern is that the BTS would be inadvertently introduced to other islands throughout the Pacific. This concern is addressed comprehensively for all actions proposed in this EIS with proposed mitigation measures described in Section 10.2.7.

Migratory Birds

For migratory birds, the Migratory Bird Treaty Act (MBTA) prohibits the taking, killing, or possession of migratory birds, with an exemption for military readiness activities (as defined in federal regulations), provided they do not result in a significant adverse effect on a population of a migratory bird species. 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 Code of Federal Regulations [CFR] Part 21).

The Department of Defense (DoD) must consult with the USFWS if it is determined that a military readiness activity would have a significant adverse effect on a population of a migratory bird species. An activity has a significant adverse effect if, over a reasonable period of time, it diminishes the capacity of a population of a migratory bird species to maintain genetic diversity, to reproduce, and to function effectively in its native ecosystem.

Migratory bird conservation relative to non-military readiness activities is addressed separately in a Memorandum of Understanding developed in accordance with Executive Order (EO) 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds*. The Memorandum of Understanding between the DoD and USFWS was signed in July 2006 and DoD responsibilities included, but are not limited to: (1) incorporating conservation measures addressed in regional or state bird conservation plans and INRMPs; (2) managing military lands and activities other than military readiness in a manner that supports migratory bird conservation; and (3) avoiding or minimizing impacts to migratory birds, including incidental take and the pollution or detrimental alteration of the environments used by migratory birds.

The following species that occur on Guam are considered non-migratory birds and are not covered under the MBTA: black francolin, black drongo, Eurasian tree sparrow, island-collard dove (previously known as Philippine turtle dove), common pigeon, and king quail.

Special-Status Species

The presence of special-status species in the project areas was described in Volume 2. Background information is presented in the species profiles in Appendix G. Impacts would be determined significant if special-status species are present in the project area and any project action is likely to result in harassment or harm of an individual, population or species. Impacts to ESA-listed species would include vegetation clearing of designated undeveloped Overlay Refuge habitat or identified recovery habitat, unless it is determined that the removal of habitat or other affect is minor when considering all the remaining habitat and quality of habitat available to that species and considering USFWS recovery plan goals. Significant indirect impacts would also include disturbing ESA- and Guam-listed species due to noise, lighting, or human activity. If unoccupied but recovery habitat is affected by operational noise, lighting, or human activity, impacts would be considered indirect and would be determined significant unless the area affected is considered minor when considering all the remaining habitat and quality of habitat available to that species.

The baseline area for Overlay Refuge on Guam is 21,690 acres (ac) (8,778 hectares [ha]) according to USFWS (2008) with slight modifications made to correspond to the present Naval Computer and Telecommunications Station (NCTS)-Former Federal Aviation Administration parcel boundary (see Figure 10.1-2 in Volume 2). The area of identified recovery habitat on Guam is 28,655 ac (11,596 ha) for the Mariana fruit bat and Guam Micronesian kingfisher, 27,124 ac (10,977 ha) for the Mariana crow, 49,564 ac (20,058 ha) for the Guam rail, and 11,668 ac (4,722 ha) for the *Serianthes* tree (USFWS 2010).

For ESA-listed species, federal agencies are required to ensure that their actions do not jeopardize the continued existence of an endangered or threatened species or its critical habitat. Analyses of potential impacts are based on review of plans for the proposed action and the available current and historical distributional data for each species. In accordance with consultation requirements under section 7 of the ESA, a Biological Assessment (BA) has been prepared by the Navy to analyze the potential impacts on ESA-listed and critical habitat under the jurisdiction of the USFWS.

The Biological Opinion (BO) issued by the USFWS after their review of the BA, will be the final determination of impacts to ESA-listed species that are being evaluated in this EIS. The BO may provide an Incidental Take Statement that will list the amount or extent of take anticipated. Based on that take the BO will specify Terms and Conditions that the action proponent must comply with to be exempt from the prohibitions of section 9 of the ESA. These are non-discretionary requirements. The BO may also specify Conservation Recommendations that are discretionary proponent activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

10.2.1.3 Issues Identified During Public Scoping Process

Terrestrial biological resource issues identified during the public scoping process that are applicable to the proposed action include:

- Activities associated with the military expansion (i.e., construction, expansion, renovation, and military training activities) may result in habitat loss and physical disturbance of federally listed endangered species and other federal trust species.
- Potential for harm to fragile ecosystems on Guam and in the CNMI from the introduction of non-native, invasive species due to increased traffic among the islands from the movement of personnel and materials. Such species include the BTS, flatworms, various insects, and some plants. The EIS should outline inspection and sanitary procedures to prevent this movement.
- Existing control and containment activities at air and sea ports for BTS are insufficient to deal with the risk associated with the increased cargo and personnel movement from Guam to other vulnerable destinations. The issue “of utmost concern” is BTS interdiction and an effective, enforceable, and fail-proof procedure for inspecting all military cargo, personnel, and equipment entering the CNMI must be instituted. The Navy must assure funding to sustain a 100% inspection rate of all cargo, vehicles, munitions, and household goods. Guam Regulation Protocols 505 and 506 should be incorporated into a BTS control plan to be included as part of the EIS.
- Potential impact on flora and fauna from placement of facilities at Navy Barrigada.

10.2.2 Headquarters/Housing Alternatives

10.2.2.1 Headquarters/Housing Alternative 1 (Preferred Alternative)

North

NCTS Finegayan

Construction. Under Alternative 1, the Army AMDTF and housing would be co-located with the proposed Marine Corps Main Cantonment at NCTS Finegayan. These impacts are addressed in Volume 2, Alternative 2, along with associated figures, as part of the proposed Marine Corps Cantonment and are not separated. Impacts to wildlife would be less than significant. Impacts to special-status species would be significant.

Operation. Under Alternative 1, the Army AMDTF and housing would be co-located with the proposed Marine Corps cantonment at NCTS Finegayan. These impacts are addressed in Volume 2, Alternative 2 as part of the proposed Marine Corps cantonment and are not separated. Impacts to special status species would be significant but would be mitigated to less than significant.

South Finegayan

Construction. Under Alternative 1, the Army AMDTF and housing would be co-located with the proposed Marine Corps cantonment at South Finegayan. These impacts are addressed in Volume 2, Alternative 2, along with associated figures, as part of the proposed Marine Corps cantonment and are not separated. Impacts to all terrestrial biological resources would be less than significant.

Operation. Under Alternative 1, the Army AMDTF and housing would be co-located with the proposed Marine Corps cantonment at South Finegayan. These impacts are addressed in Volume 2, Alternative 2 as part of the proposed Marine Corps cantonment and are not separated. Impacts to all terrestrial biological resources would be less than significant.

Central

Construction and Operation. Under Alternative 1, no construction activities for the AMDTF would occur at Navy and Air Force Barrigada. Therefore, there would be no terrestrial biology impacts from construction or operation.

Alternative 1 Proposed Mitigation Measures

Mitigation measures proposed for Alternative 1 would be the same as those described in Volume 2, Chapter 10 under Alternative 1.

10.2.2.2 Headquarters/Housing Alternative 2

North

NCTS Finegayan

Under Alternative 2, the Army AMDTF would be located at Navy Barrigada. There would be no impacts at NCTS Finegayan.

South Finegayan

Under Alternative 2, the Army AMDTF would be co-located with the proposed Marine Corps Main Cantonment at Navy Barrigada. There would be no impacts at South Finegayan.

Central*Navy Barrigada – Construction*

Vegetation. A total of 376 ac (152 ha) of three vegetation types would be removed during proposed construction activities at Navy Barrigada (Table 10.2-1 and Figure 10.2-1a). Approximately 153 ac (62 ha) of primary limestone forest (never completely cleared) would be removed. The limestone forest at Navy Barrigada is dominated by native species including *Neisosperma oppositifolia* (fago), *Guamia mariannae* (pai pai), *Aglaia mariannensis* (mapunyo), scattered *Cycas circinalis* (federiko), and some large native breadfruit. There is degradation of this forest as indicated by the presence of a significant, although not dominant, non-native, invasive component including vitex, limeberry, tangantangan, and papaya, particularly around the perimeter of the forested area. There is light to moderate ungulate damage of the understory. Removal of this limestone forest, assuming it is a primary limestone forest that has never been cleared, would result in a significant impact to vegetation.

Table 10.2-1. Impacts to Vegetation at Navy Barrigada with Implementation of Alternative 2 (ac [ha])

<i>Vegetation Type</i>	<i>Primary Limestone Forest</i>	<i>Vitex-Closed Canopy</i>	<i>Shrub/Grasslands</i>	<i>Developed Land</i>
Navy Barrigada	153 (62)	0	80 (32)	143 (58)

An indirect impact may occur from clearing the large forested area because of changes in evapotranspiration. Evapotranspiration would likely decrease from removal of the forest which would result in additional infiltration of rainwater and groundwater recharge and decreased moisture levels in the air. With respect to groundwater recharge, the construction of buildings and parking lots would reduce the recharge rate. The overall effect on recharge is unclear but terrestrial biological resources in the remaining uncleared areas would be unlikely to be affected. With respect to moisture levels in the air, the impact is likely to be localized to the forested area removed and would not have a significant effect on any other area with sensitive biological resources. Overall, the impacts from changed evapotranspiration would be less than significant.

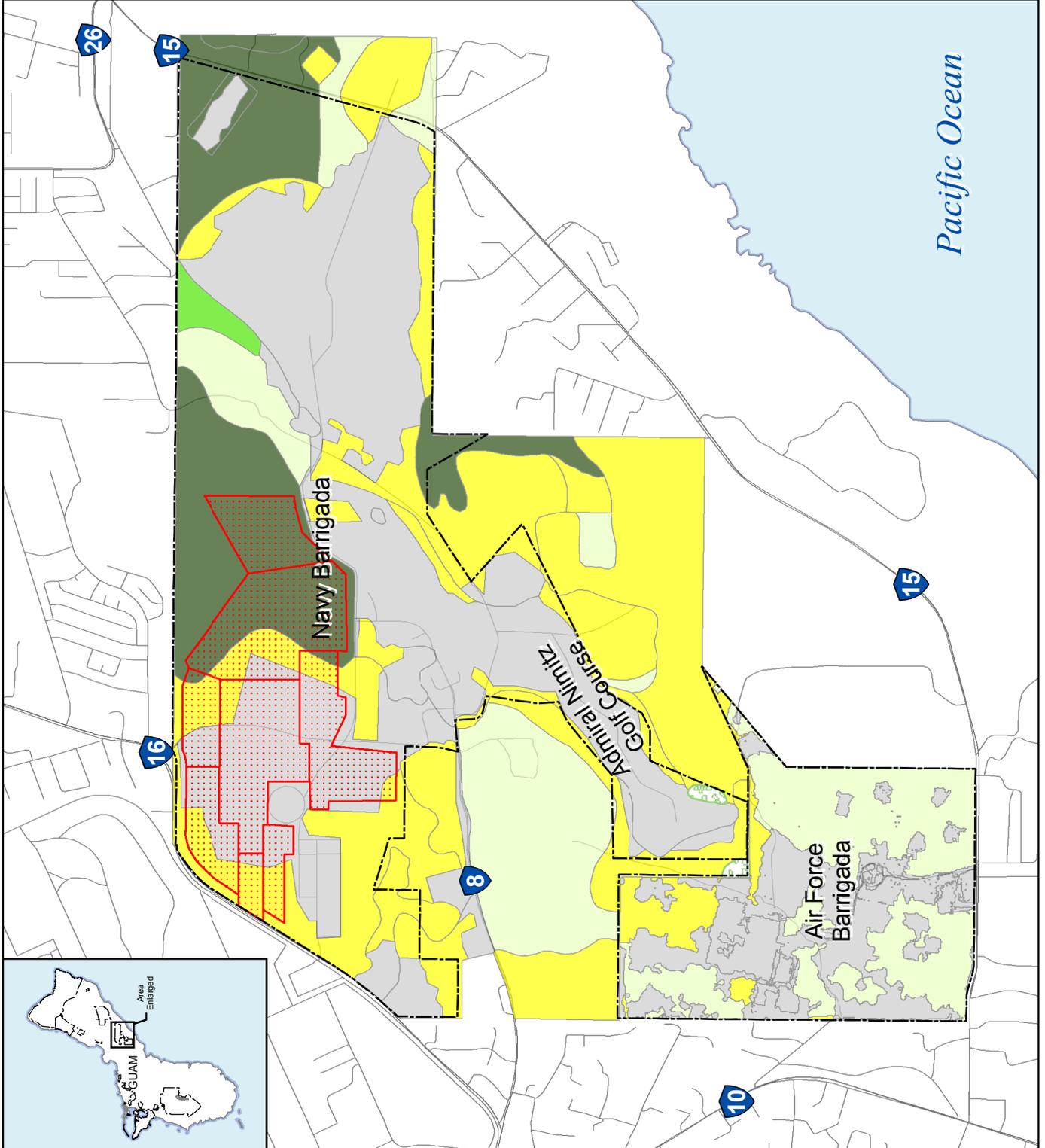
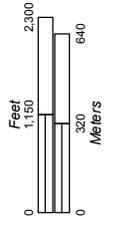
Wildlife. Wildlife species that currently occur at Barrigada include native and non-native, invasive species such as the Pacific golden plover, yellow bittern, island collared dove, cattle egret, black francolin, Eurasian tree sparrow, blue-tailed skink, mutilating gecko, and mourning gecko. All these species are common on Guam. Proposed construction activities would displace wildlife from habitat in the proposed project areas. Smaller, less mobile species, and those seeking refuge in burrows, could inadvertently be killed during construction activities; however, long-term, significant impacts to populations of such species would not result because these species are abundant in surrounding areas and would rapidly repopulate suitable portions of the affected area. There would be no significant diminished population sizes or significant changes in distributions of migratory birds or regionally important native animal species. Therefore, impacts to wildlife would be less than significant.

Construction activities would generate noise. Only a few, widespread migratory bird species are present that would be affected. They would move away from the construction areas; however, there are other areas of habitat nearby. Therefore, indirect impacts to wildlife from construction would be less than significant.

Figure 10.2-1a
 Vegetation Impacts,
 Headquarters/Housing
 Alternative 2 –
 Navy and Air Force
 Barrigada

- Legend**
- Military Installation
 - Route Number
 - Army Housing Alternative 2
 - Vegetation
 - Tangantangan
 - Limestone Forest
 - Limestone Forest - Disturbed
 - Developed
 - Shrub/Grasslands
 - Wetland Vegetation

Sources: COMNAVMIARIANAS
 2001; USFS, 2006
 (modified by TEC Inc)



Special-Status Species

MARIANA FRUIT BAT. The Mariana fruit bat has been reported historically and is occasionally seen in the area. No recovery habitat has been identified by USFWS in this region. Impacts would be less than significant.

GUAM RAIL. Except for an experimental, non-essential population that has been introduced to Rota, the rail survives only in captivity at this time and does not occur in the wild on Guam. Proposed construction activities would include the loss of shrub/grassland habitat that is potential foraging and nesting habitat for the Guam rail. A total of 243 ac (98 ha) of recovery habitat would be removed for construction of all facilities at Navy Barrigada. Numerous proposed mitigation measures (described in Volume 2, Chapter 10, Section 10.2.2.6) would be implemented to improve the likelihood that this species could eventually be reintroduced successfully to recovery habitat on Guam. Based on these measures and the presence of large areas of recovery habitat for the species throughout much of Guam, the proposed construction at Navy Barrigada would result in a less than significant impact to the species.

GUAM TREE SNAIL. Proposed construction activities would impact the Guam tree snail. The Guam tree snail, an ESA candidate species, was documented in the limestone forest on one transect during site-specific surveys in 2008 in support of this EIS (Figure 10.2-1b). The distribution and numbers of tree snails at the site are unknown. Proposed construction activities would remove primary limestone forest, the habitat of the Guam tree snail, and would result in direct mortality of individuals. Proposed mitigation would include the relocation of snails to another suitable location in consultation with USFWS and Guam DAWR. With implementation of this proposed mitigation, impacts would be less than significant.

Navy Barrigada – Operation

Vegetation. There would be less than significant impacts to vegetation because operations would not remove any additional forest and most of the surrounding primary limestone forest would have been removed during construction.

Wildlife. There would be no direct impacts to wildlife since operations would occur in previously cleared areas. However, operational activities would generate noise throughout the area. Migratory bird species or other native wildlife that would otherwise use the area are common throughout Guam and are generalists that can utilize numerous habitats that are abundant throughout Guam. Therefore, noise and activity from operations associated with the proposed action would be less than significant.

Special-Status Species. There would be no direct impacts on special-status species. The only special-status species that might occasionally use the area and be affected indirectly is the Mariana fruit bat. However, based on historical records this would be very infrequently. Impacts to special-status species would be less than significant.

Air Force Barrigada – Construction and Operation

Under Alternative 2, no construction activities for the AMDTF would occur at Air Force Barrigada. Therefore, there would be no terrestrial biology impacts from construction or operation.

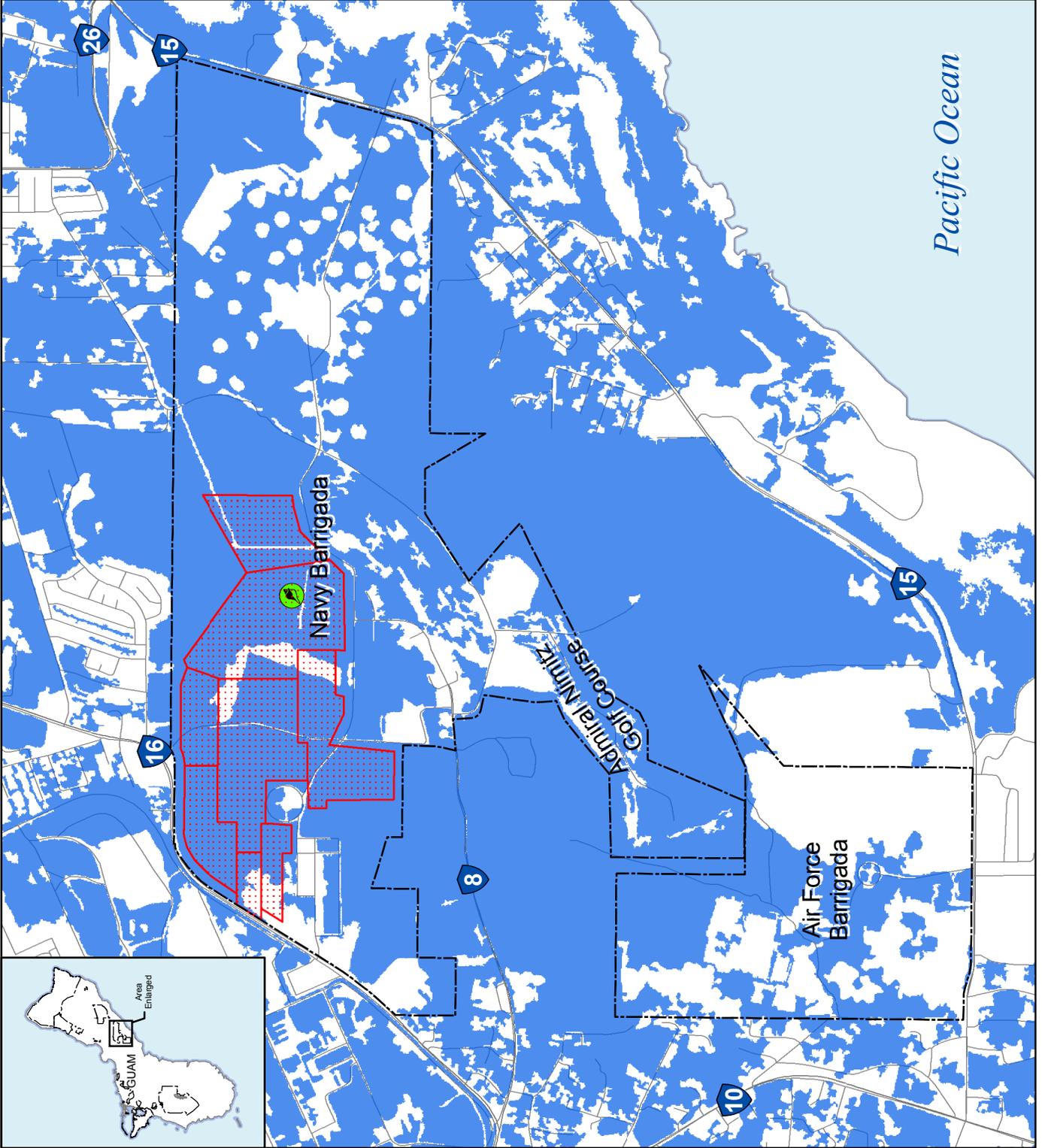
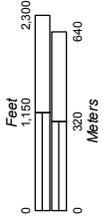
Figure 10.2-1b

Special-Status
Species Impacts,
Headquarters/Housing
Alternative 2 –
Navy and Air Force
Barrigada

Legend

-  Military Installation
-  Route Number
-  Army Housing Alternative 2
-  Tree Snail
-  Guam Rail Recovery Habitat

Sources: COMNAVMIARIANAS
2001; USFS 2006
(modified by, TEC Inc);
NAVFAC Pacific, 2010;
USFWS 2010



Alternative 2 Proposed Mitigation Measures

A plan to translocate Guam tree snails to another site on DoD lands would be developed and implemented after approval by the USFWS and Guam DAWR. Additional proposed mitigation using compensatory measures described in Volume 2, Chapter 10 for Alternative 1 would be implemented to compensate for the destruction of primary limestone forest, which is habitat for the Guam tree snail. Specific BTS interdiction and control measures would be implemented as described in Volume 2, Chapter 10, Alternative 1.

10.2.2.3 Headquarters/Housing Alternative 3

North

NCTS Finegayan

Construction. Under Alternative 3, the Army AMDTF headquarters would be co-located with the proposed Marine Corps Main Cantonment at NCTS Finegayan and housing co-located with the Marine Corps at Navy and Air Force Barrigada. These impacts are addressed in Volume 2 as part of the proposed Marine Corps Main Cantonment and are not separated. These impacts and associated figures are shown in Volume 2. Impacts to wildlife would be significant but would be mitigated to less than significant. Impacts to special-status species would be significant.

Operation. Under Alternative 3, the Army facilities would be co-located with the Marine Corps. These impacts are addressed in Volume 2 as part of the proposed Marine Corps cantonment and are not separated. Impacts to special status species would be significant but would be mitigated to less than significant.

South Finegayan

Construction. Under Alternative 3, the Army housing would be co-located with the Marine Corps housing at Navy and Air Force Barrigada. These impacts are addressed in Volume 2 as part of the Marine Corps action and cannot be separated. These impacts and associated figures are shown in Volume 2. Impacts to all terrestrial biological resources would be less than significant.

Operation. Under Alternative 3, the Army facilities would be co-located with the Marine Corps. These impacts are addressed in Volume 2, Alternative 2 as part of the proposed Marine Corps cantonment and are not separated. Impacts to all terrestrial biological resources would be less than significant.

Central

Navy Barrigada

Under Alternative 3, the Army housing would be co-located with the Marine Corps housing at Navy Barrigada. These impacts are addressed in Volume 2 Alternative 3, along with associated figures, as part of the Marine Corps action and cannot be separated. Impacts to vegetation would be significant. Impacts to special-status species would be significant but would be mitigated to less than significant.

Air Force Barrigada

Under Alternative 3, the Army housing would be co-located with the Marine Corps housing at Air Force Barrigada. These impacts are addressed in Volume 2 Alternative 3, along with associated figures, as part of the Marine Corps action and cannot be separated. All impacts to terrestrial biological resources would be less than significant.

Alternative 3. Proposed Mitigation Measures

Mitigation measures proposed for Alternative 3 would be the same as those described in Volume 2, Chapter 10 for Alternative 3.

10.2.3 Munitions Storage Alternatives

10.2.3.1 Munitions Storage Alternative 1 (Preferred Alternative)

Construction

Vegetation

A total of 2.3 ac (0.9 ha) of disturbed limestone forest (classified as *Vitex*-closed canopy) would be removed during proposed munitions facility construction activities (Table 10.2-2 and Figure 10.2-2). Impacts to vegetation would be less than significant because no primary limestone forest would be removed. The vegetation to be removed also serves as potential habitat for special-status species and that impact is addressed separately below.

Table 10.2-2. Impacts to Vegetation at Andersen AFB with Implementation of Munitions Storage Alternative 1 (ac [ha])

<i>Area</i>	<i>Vitex-Closed Canopy</i>	<i>Developed Land</i>
Munitions Storage Area	2.3 (0.9)	3.9 (1.6)

Wildlife

Few migratory birds are present in the project area. The only native migratory bird species likely to be present in the project construction area, based on surveys conducted in support of this EIS and other studies, are the yellow bittern and possibly the Pacific golden plover in open areas; both species are ubiquitous throughout Guam. The loss of woody vegetation would result in the loss of nesting areas for the bittern, but this loss would not result in significant effects on its population. Impacts would be less than significant.

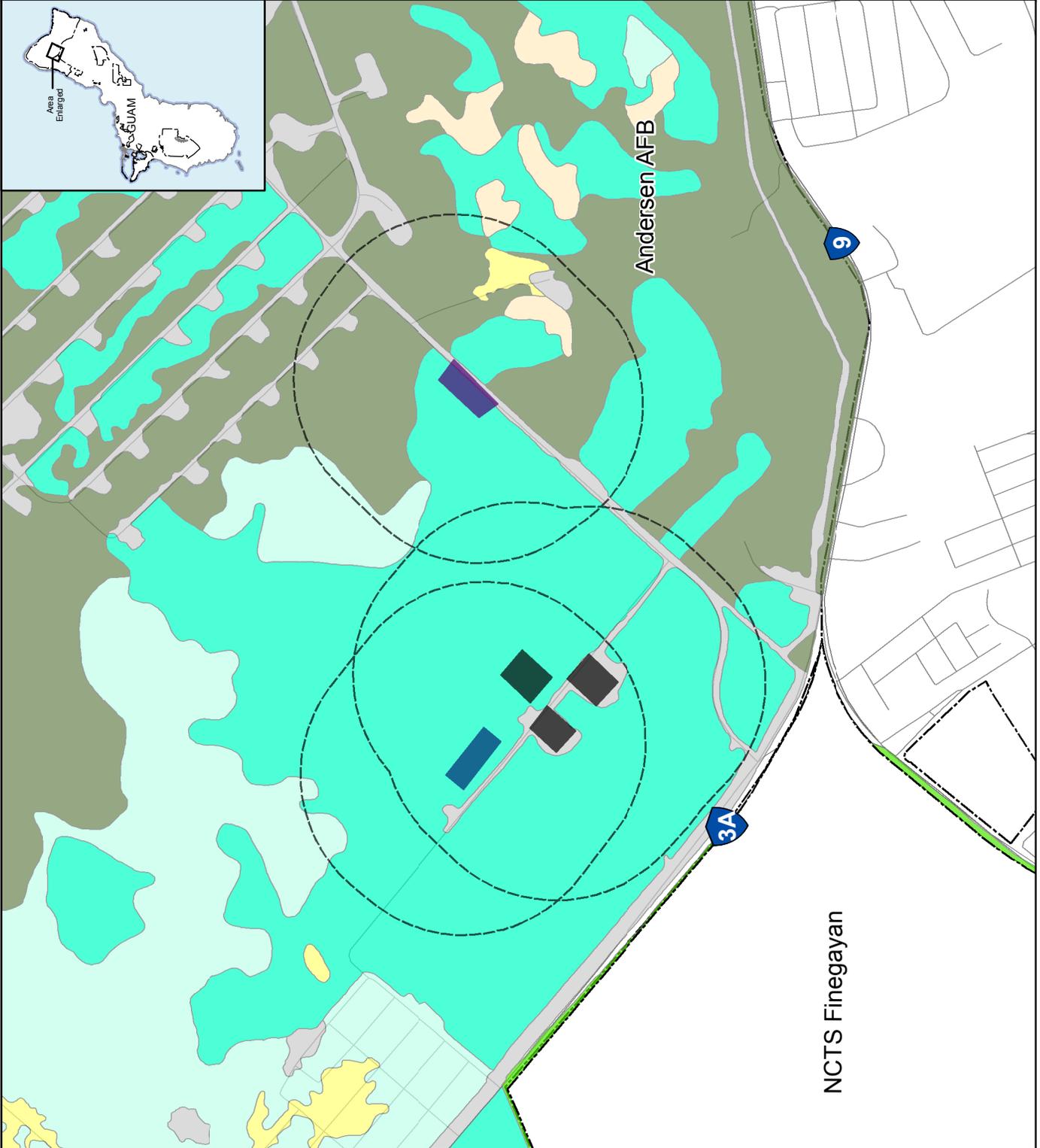
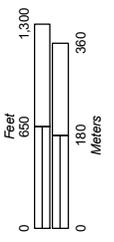
Proposed construction activities would displace the species and other wildlife from suitable habitat in the proposed project area. Smaller, less mobile species, and those seeking refuge in burrows, could inadvertently be killed during construction activities. However, long-term, permanent impacts to populations of such species would not result because the species known to be present are abundant in surrounding areas, and would rapidly repopulate suitable portions of the affected area. There would be no significant diminished population sizes or significant changes in distributions of migratory birds or regionally important native animal species. Therefore, there would be no significant direct impacts to wildlife due to proposed construction activities at Andersen AFB under Alternative 1.

Figure 10.2-2
Vegetation Impacts,
Munitions Storage
Alternatives –
Andersen AFB

Legend

- Military Installation 
- Route Number 
- Vegetation**
 - Coconut Forest 
 - Developed 
 - Mixed limestone Forest - Secondary 
 - Vitex - Closed Canopy 
 - Vitex - Sparse Canopy 
 - Mixed Herbaceous Scrub 
- Notional Location THAAD & PATRIOT ECMs
 - Alternative 1 
 - Alternative 2 
 - Alternative 3 
 - Notional IBD ESQD Arc 

Sources: UoG 2007,
Andersen AFB 2008a, c;



Construction activities for the munitions storage area would generate noise. Construction would take place during daylight hours. Only a few widespread migratory bird species are present that would be affected. They would move away from the construction areas, but there are other areas of suitable habitat nearby and they could return to some of the area when construction is complete. Effects would be short-term. There would be no significant diminished population sizes or significant changes in distributions of migratory birds or regionally important native animal species. Therefore, indirect impacts to wildlife from construction would be less than significant.

Special-Status Species

Proposed construction activities would directly impact habitat that could be used by special-status species (Table 10.2-3; Figure 10.2-3a, b). A total of 6.6 ac (2.7 ha) of Overlay Refuge would be developed.

MARIANA FRUIT BAT. Proposed construction activities would include the loss of disturbed limestone forest that is potential foraging and roosting habitat for the Mariana fruit bat population on the base. A total of 2.9 ac (1.2 ha) of recovery habitat would be removed for construction of the munitions storage area. Removal of this small area of habitat due to construction would not result in a significant impact. However, it should be noted that in conjunction with other habitat areas removed under the proposed action, impacts could be significant. Noise and activity associated with the proposed construction may significantly impact isolated roosting fruit bats in the vicinity of the proposed activities. Construction activities would generate noise. Monitoring for the fruit bat would be conducted before construction and if detected near construction areas the work would be halted until the animal departed. With this measure, indirect impacts from noise and activity associated with construction would result in less than significant impacts to fruit bats.

Table 10.2-3. Potential Impacts to Special-Status Species Habitat with Implementation of Munitions Storage Alternative 1 (ac[ha])

<i>Parcel and Activity</i>	<i>Overlay Refuge</i>	<i>Recovery Habitat – Bat & Kingfisher</i>	<i>Recovery Habitat – Crow</i>	<i>Recovery Habitat – Rail</i>	<i>Recovery Habitat – Serianthes</i>
Direct Impacts – Habitat Removed					
Munitions Storage Area	6.6 (2.7)	2.9 (1.2)	2.3 (0.9)	0	2.9 (1.2)
Total Habitat Removed	6.6 (2.7)	2.9 (1.2)	2.3 (0.9)	0	2.9 (1.2)
Total Habitat Area - DoD Lands	21,690 (8,778)	16,105 (6,517)	16,087 (6,510)	8,976 (3,632)	9,082 (3,654)
Total Habitat Area - Non-DoD Lands	0	12,550 (5,079)	11,037 (4,467)	40,588 (16,425)	2,640 (1,068)
% of Habitat Area on Guam that is Removed (DoD and Non-DoD Lands)	0.03%	0.01%	0.01%	NA	0.02%

Notes: Each habitat category is considered independently of others and is not additive. NA – Not applicable.

GUAM MICRONESIAN KINGFISHER. The kingfisher survives only in captivity at this time. Proposed construction activities would include the loss of limestone forest that is potential foraging and nesting habitat for a potential future re-introduction of the kingfisher. A total of 2.9 ac (1.2 ha) of recovery habitat would be removed for construction of the munitions storage area (Table 10.2-3). Removal of this small area of habitat due to construction would not result in a significant impact. However, it should be noted that in conjunction with other habitat areas removed under the proposed action, impacts could be significant.

Figure 10.2-3a

Special-Status Species Impacts and Recovery Habitat for Guam
 Micronesian Kingfisher, Mariana Crow, and Mariana Fruit Bat; Munitions Storage Alternatives – Andersen AFB

Legend

- Military Installation
- Route Number
- Mariana Crow Locations (Sept 2006)
- Mariana Fruit Bat Locations
- Mariana Crow Locations
- Pacific Slender-Toed Gecko
- Moth Skink
- Recovery Habitat
- Mariana Crow
- Mariana Crow, Mariana Fruit Bat, and Guam Micronesian Kingfisher
- Notional Location THAAD & PATRIOT ECMs
- Alternative 1
- Alternative 2
- Alternative 3
- Notional IBD ESQD Arc

Sources: (Bat) Janeke 2006; USFWS 2002, 2004c, 2005b, 2010

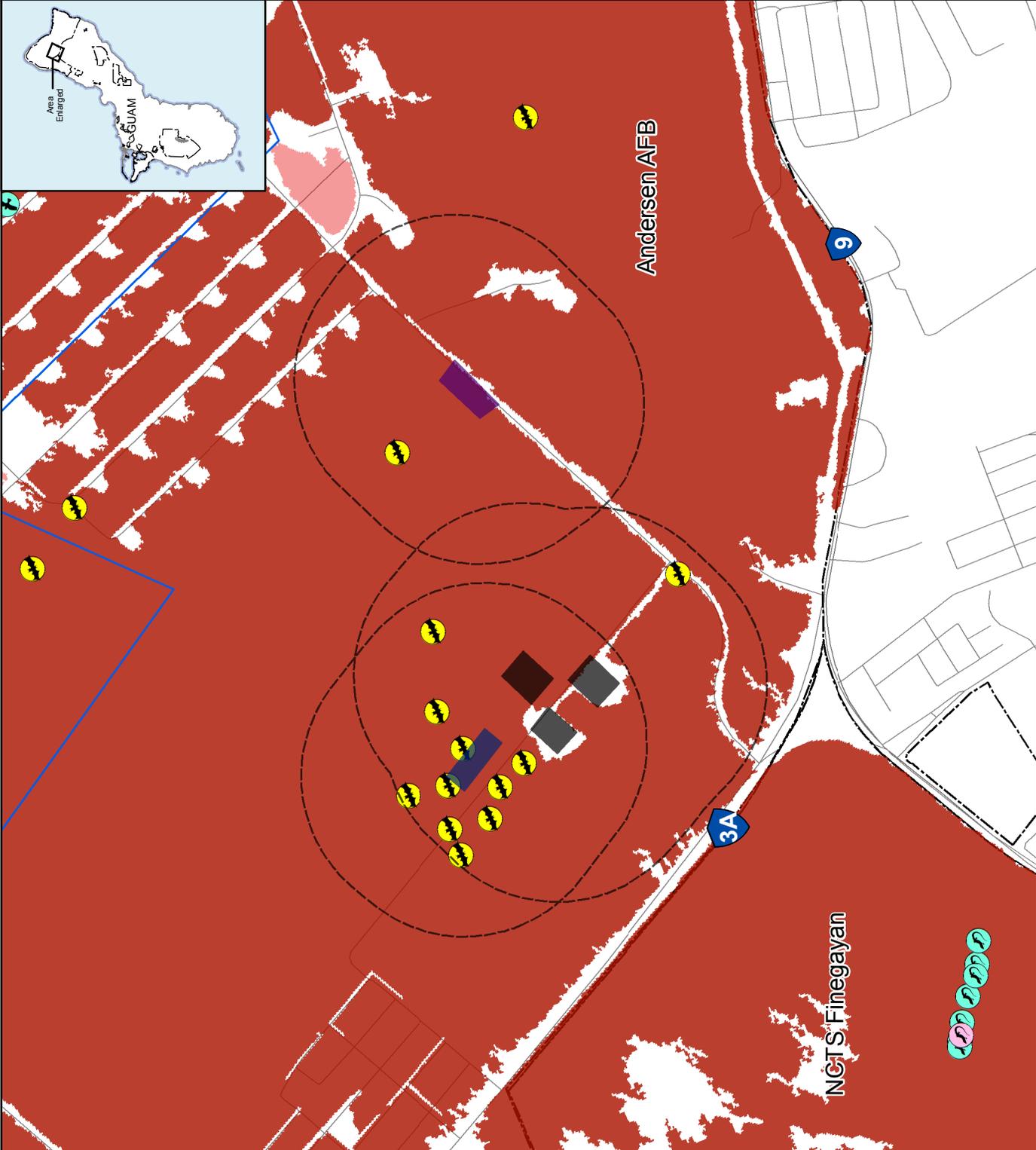
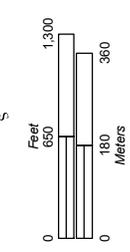


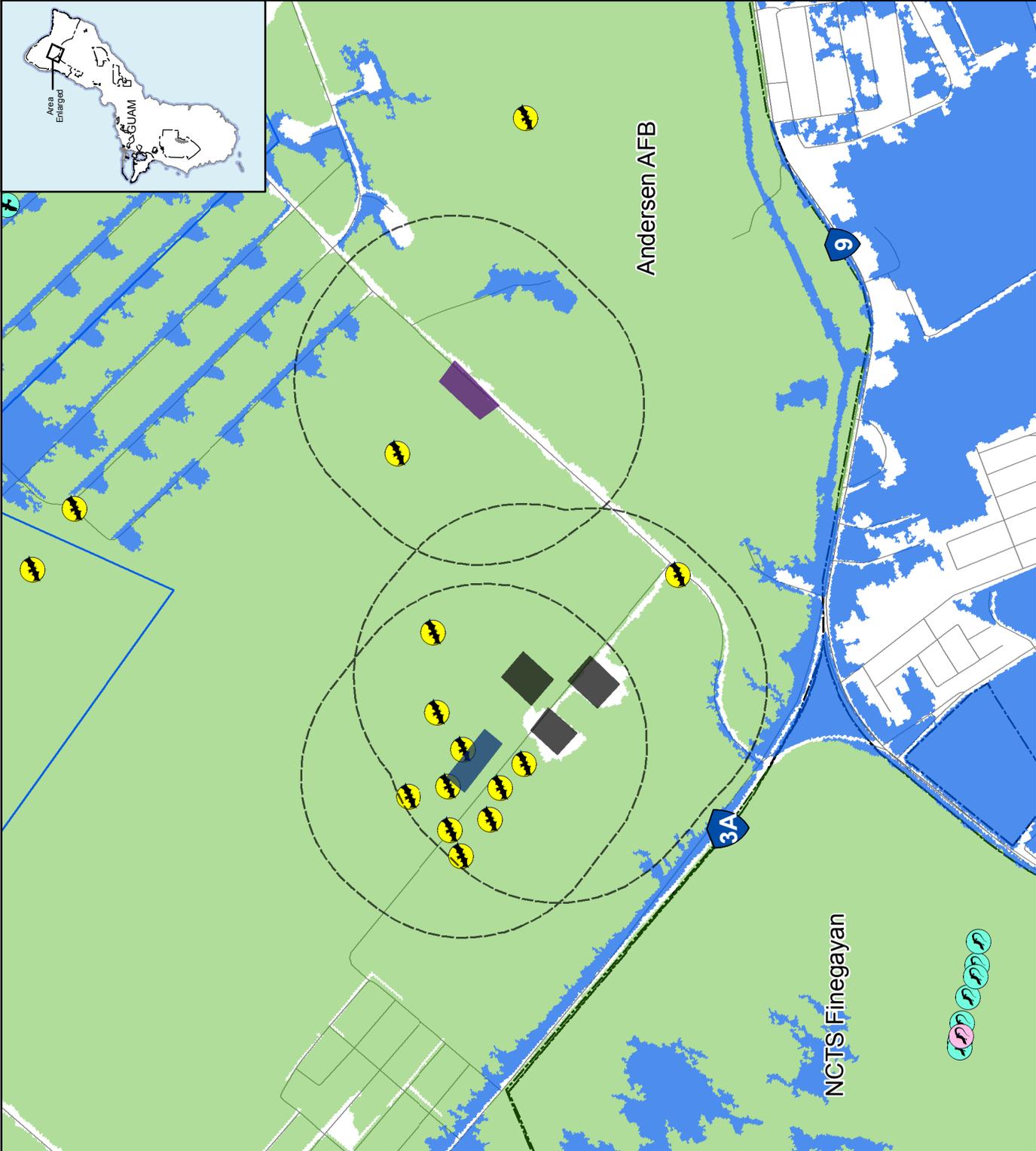
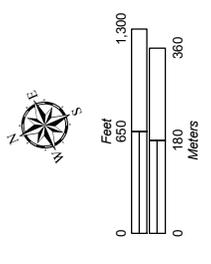
Figure 10.2-3b

Special-Status Species Impacts and Recovery Habitat for Guam Rail, and *Serianthes nelsonii*, Munitions Storage Alternatives – Andersen AFB

Legend

- Military Installation
- Route Number
- Mariana Crow Locations (Sept 2006)
- Mariana Fruit Bat Locations
- Mariana Crow Locations
- Pacific Slender-Toed Gecko
- Moth Skink
- Recovery Habitat
- Guam Rail
- Serianthes nelsonii*
- National Location THAAD & PATRIOT ECMS
- Alternative 1
- Alternative 2
- Alternative 3
- Notional IBD ESQD Arc

Sources: (Bat) Janke 2006; USFWS 2002, 2004c, 2005b, 2010



MARIANA CROW. Proposed construction activities would include the loss of disturbed limestone forest that is potential foraging and nesting habitat for the crow. A total of 2.9 ac (1.2 ha) of recovery habitat would be removed for construction of the munitions storage area (Table 10.2-3). Removal of this small area of habitat due to construction would not result in a significant impact. However, it should be noted that in conjunction with other habitat areas removed under the proposed action, impacts could be significant. A suite of proposed mitigation measures is described in Volume 2, Section 10.2.2.6 for all impacts to special-status species. Construction could result in a significant impact from noise and activity. Monitoring for the Mariana crow and halting construction when nesting or roosting crows are in the project areas would reduce the impact to less than significant.

GUAM RAIL. The rail survives only in captivity at this time. Proposed construction activities would not include loss of any identified recovery habitat for the Guam rail. Impacts would be less than significant.

SERIANTHES TREE. A total of 2.9 ac (1.2 ha) of recovery habitat for this tree species would be removed for construction of the munitions storage facilities (Table 10.2-3). This represents about 0.02% of the recovery habitat identified by USFWS for the species. Based on the low amount of habitat impacted compared to the total habitat remaining for this tree species, impacts would be less than significant.

ALL SPECIAL-STATUS SPECIES. Other indirect effects on all species may occur as a result of the proposed construction. Movement of construction personnel, equipment, and supplies could result in the movement and spread of non-native, invasive plant and animal species to Guam, within Guam, and to other locations from Guam. Non-native, invasive species would affect special-status species or degrade habitat, thus are potential indirect impacts resulting from actions proposed in Alternative 1. Special status species impacts could be significant but numerous proposed mitigation measures, as specified under proposed mitigation in Volume 2, Section 10.2.2.6, would be implemented to reduce non-native, invasive species impacts to less than significant.

Operation

Vegetation

There would be less than significant impacts to vegetation. Munitions storage sites are near roads and other maintained areas.

Wildlife

The magazine areas would be accessed infrequently and there would be no night lighting or shielded lighting will be used. Impacts would be less than significant.

Special-Status Species

The magazine areas would be accessed infrequently and there would be no night lighting or shielded night lighting will be used. Impacts would be less than significant.

Alternative 1 Proposed Mitigation Measures

Proposed mitigation measures would include monitoring the project area before and during construction for the presence of the Mariana fruit bat and Mariana crow. If either species was detected during monitoring and potentially impacted by construction noise or activity, the construction would be halted until the species left the area. In addition, a suite of additional mitigation measures that are proposed for the entire set of actions proposed in this EIS, including those mentioned above, are described in Volume 2, Chapter 10, Section 10.2.2.6. Actions proposed in this EIS include development of a Micronesia

10.2.3.2 Munitions Storage Alternative 2

Construction*Vegetation*

A total of 2.7 ac (1.1 ha) of disturbed limestone forest (classified as *Vitex*-closed canopy) would be removed during proposed munitions facility construction activities (Figure 10.2-2). Impacts to vegetation would be less than significant because no primary limestone forest would be removed. The vegetation to be removed also serves as potential habitat for special-status species and that impact is addressed separately below.

Wildlife

Impacts would be the same as for Alternative 1, less than significant.

Special-Status Species.

Proposed construction activities would directly impact habitat that could be used by special-status species (Figure 10.2-2; Table 10.2-4). A total of 2.7 ac (1.1 ha) of Overlay Refuge would be developed.

MARIANA FRUIT BAT. Proposed construction activities would include the loss of disturbed limestone forest that is potential foraging and roosting habitat for the Mariana fruit bat population on Andersen AFB. A total of 2.3 ac (0.9 ha) of recovery habitat would be removed for construction of the munitions storage area. The amount of recovery habitat impacted is similarly to Alternative 1 and overall impacts and mitigation proposed would be the same as those described in Alternative 1.

Table 10.2-4. Potential Impacts to Special-Status Species Habitat with Implementation of Munitions Storage Alternative 2 (ac[ha])

<i>Parcel and Activity</i>	<i>Overlay Refuge</i>	<i>Recovery Habitat – Bat & Kingfisher</i>	<i>Recovery Habitat – Crow</i>	<i>Recovery Habitat – Rail</i>	<i>Recovery Habitat – Serianthes</i>
Direct Impacts – Habitat Removed					
Munitions Storage Area	2.7 (1.1)	2.3 (0.9)	2.3 (0.9)	0	2.3 (0.9)
Total Habitat Removed	2.7 (1.1)	2.3 (0.9)	2.3 (0.9)	0	2.3 (0.9)
Total Habitat Area - DoD Lands	21,690 (8,778)	16,105 (6,517)	16,087 (6,510)	8,976 (3,632)	9,082 (3,654)
Total Habitat Area - Non-DoD Lands	0	12,550 (5,079)	11,037 (4,467)	40,588 (16,425)	2,640 (1,068)
% of Habitat Area on Guam that is Removed (DoD and Non-DoD Lands)	0.01%	0.01%	0.01%	< 0.01%	0.02%

Notes: Each habitat category is considered independently of others and is not additive. NA – Not applicable.

GUAM MICRONESIAN KINGFISHER. The kingfisher survives only in captivity at this time. Proposed construction activities would include the loss of 2.3 ac (0.9 ha) of limestone forest that is identified as potential recovery habitat for the potential future re-introduction of the kingfisher. The amount of recovery habitat impacted is similar to Alternative 1 and overall impacts and proposed mitigation measures would be the same as those described in Alternative 1.

MARIANA CROW. Proposed construction activities would include the loss 2.3 ac (0.9 ha) of disturbed limestone forest that is identified as potential recovery habitat for the crow. This recovery habitat is also designated as Overlay Refuge. The amount of recovery habitat impacted is similar to Alternative 1 and overall impacts and proposed mitigation would be the same as those described in Alternative 1.

GUAM RAIL. The rail survives only in captivity at this time. Proposed construction activities would not include loss of any identified recovery habitat for the Guam rail. Impacts would be less than significant.

SERIANTHES TREE. A total of 2.3 ac (0.9 ha) of identified potential recovery habitat for this tree species would be removed for construction of the munitions storage facilities (Table 10.2-2). This represents about 0.02% of the recovery habitat identified by USFWS for the species. Based on the low amount of habitat impacted compared to the total habitat remaining for this tree species, impacts would be less than significant.

Operation

Impacts would be the same as for Alternative 1, less than significant.

Alternative 2 Proposed Mitigation Measures

Mitigation measures would be the same as proposed for Alternative 1.

10.2.3.3 Munitions Storage Alternative 3

Construction

Vegetation

Although Alternative 3 is in a slightly different location from Alternative 2, impacts would be the same as for Alternative 2, less than significant, because the vegetation type is the same.

Wildlife

Impacts would be the same as for Alternative 2, less than significant.

Special-Status Species

Although Alternative 3 is in a slightly different location from Alternative 2, impacts would be the same as for Alternative 2, less than significant, because the habitat in the area is similar.

Operation

Impacts would be the same as those described for Munitions Storage Alternative 1.

Alternative 3 Proposed Mitigation Measures

Mitigation measures would be the same as proposed for Alternative 1.

10.2.4 Weapons Emplacement Alternatives

Detailed information on the weapons emplacements is contained in a Classified Appendix (Appendix L). An unclassified summary of impacts specific to each set of alternatives is presented at the end of this chapter.

10.2.5 No-Action Alternative

Under the no-action alternative the proposed munitions storage area and the proposed Army AMDTF would not be located on Guam and baseline terrestrial biological resources would remain unchanged as presented in Volume 2, Chapter 10, Terrestrial Biological Resources. Therefore, there would be no impacts to biological resources with implementation of the no-action alternative.

10.2.6 Summary of Impacts

Tables 10.2-5, 10.2-6, 10.2-7 summarize the potential impacts of construction and operation of headquarters/housing area, munitions storage areas, and weapons emplacement sites, respectively, on terrestrial biological resources.

Table 10.2-5. Summary of Headquarters/Housing Impacts – Alternatives 1, 2, and 3

<i>Alternative 1</i>	<i>Alternative 2</i>	<i>Alternative 3</i>
Construction		
SI <ul style="list-style-type: none"> Alternative 1 would have the Army AMDTF headquarters/housing co-located with the proposed Marine Corps cantonment at NCTS and South Finegayan. These impacts are addressed in Volume 2, Alternatives 1 or 2 as part of the proposed Marine Corps cantonment and are not separated. Impacts to special-status species would be significant. 	SI <ul style="list-style-type: none"> Direct significant impacts to 153 ac (62 ha) of limestone forest at Navy Barrigada; direct significant impacts to the Guam tree snail known to be present in the limestone forest, mitigated to less than significant. 	SI <ul style="list-style-type: none"> Alternative 3 would have the Army AMDTF headquarters/housing co-located with the Marine Corps cantonment at Navy and Air Force Barrigada. These impacts are addressed in Volume 2, Alternative 3 as part of the proposed Marine Corps cantonment and are not separated. Impacts to special-status species would be significant.
Operation		
SI-M <ul style="list-style-type: none"> Alternative 1 would have the Army AMDTF headquarters/housing co-located with the proposed Marine Corps cantonment at NCTS and South Finegayan. These impacts are addressed in Volume 2, Alternatives 1 or 2 as part of the proposed Marine Corps cantonment and are not separated. Impacts to special-status species would be significant but mitigable. 	LSI <ul style="list-style-type: none"> Noise and activity from operations would be less than significant to wildlife and special-status species. 	SI-M <ul style="list-style-type: none"> Alternative 3 would have the Army AMDTF headquarters/housing co-located with the proposed Marine Corps cantonment at Navy and Air Force Barrigada. These impacts are addressed in Volume 2, Alternative 3 as part of the proposed Marine Corps cantonment and are not separated. Impacts to special-status species would be significant but mitigable.

Legend: SI = Significant impact; SI-M = Significant impact mitigable to less than significant; LSI = Less than significant impact

Impacts to special-status species would be significant under Alternatives 1 and 3 due to the removal during construction of large areas of recovery habitat for several endangered species. Under Alternative 2 impacts to most special-status species affected under Alternatives 1 and 3 would not occur but impacts to the Guam tree snail that are mitigable would occur. Also under Alternative 2 primary limestone forest would be removed, resulting in a significant impact to vegetation.

Table 10.2-6. Summary of Munitions Storage Impacts – Alternatives 1, 2, and 3

<i>Alternative 1</i>	<i>Alternative 2</i>	<i>Alternative 3</i>
Construction		
LSI <ul style="list-style-type: none"> Impacts to vegetation and wildlife would be less than significant. SI-M <ul style="list-style-type: none"> There would be significant impacts to special-status species (the endangered Mariana fruit bat, Micronesian kingfisher, and Mariana crow) from possible disturbance to special-status species and from introduction of non-native, invasive species, mitigated to less than significant. 	LSI <ul style="list-style-type: none"> Impacts to vegetation and wildlife would be less than significant. SI-M <ul style="list-style-type: none"> The impacts on special-status species would be the same as Alternative 1. 	LSI <ul style="list-style-type: none"> Impacts to vegetation and wildlife would be less than significant. SI-M <ul style="list-style-type: none"> The impacts on special-status species would be the same as Alternative 1.
Operation		
LSI <ul style="list-style-type: none"> Impacts to vegetation, wildlife and special-status species would be less than significant 	LSI <ul style="list-style-type: none"> The impacts would be the same as for Alternative 1. 	LSI <ul style="list-style-type: none"> The impacts would be the same as for Alternative 1.

Legend: SI-M = Significant impact mitigable to less than significant; LSI = Less than significant impact; NI = No impact

Impacts to special-status species would be significant from construction under all alternatives due to possible disturbance of endangered species and introduction of non-native, invasive species but would be mitigated to less than significant.

Table 10.2-7. Summary of Weapons Emplacement Impacts – Alternatives 1, 2, 3 and 4

Alternative 1	Alternative 2	Alternative 3	Alternative 4 (preferred)
Construction			
<p>SI</p> <ul style="list-style-type: none"> There would be significant impacts from loss of recovery habitat for five special-status species (Mariana fruit bat (328 ac [133 ha]), Guam Micronesian kingfisher (328 ac [133 ha]), Mariana crow (328 ac [133 ha]), Guam rail (36 ac [15 ha]), and <i>Serianthes</i> tree (328 ac [133 ha]) Impacts to 368 ac (149 ha) of Overlay Refuge. Possible disturbance to special-status species during construction, mitigated to less than significant 	<p>SI</p> <ul style="list-style-type: none"> There would be significant impacts from loss of recovery habitat for five special-status species (Mariana fruit bat (288 ac [117 ha]), Guam Micronesian kingfisher (288 ac [117 ha]), Mariana crow (288 ac [117 ha]), Guam rail (45 ac [18 ha]), and <i>Serianthes</i> tree (288 ac [117 ha]) Impacts to 333 ac (135 ha) of Overlay Refuge. Possible disturbance to special-status species during construction, mitigated to less than significant 	<p>SI</p> <ul style="list-style-type: none"> There would be significant impacts from loss of recovery habitat for five special-status species (Mariana fruit bat (178 ac [72 ha]), Guam Micronesian kingfisher (178 ac [72 ha]), Mariana crow (178 ac [72 ha]), Guam rail (47 ac [19 ha]), and <i>Serianthes</i> tree (174 ac [70 ha]) Impacts to 228 ac (92 ha) of Overlay Refuge. Possible disturbance to special-status species during construction, mitigated to less than significant. There would be a significant impact due to the loss of forest recovery conservation areas (ungulate enclosures) near Ritidian Point, per section 7 consultation for a previous Air Force action 	<p>SI</p> <ul style="list-style-type: none"> There would be significant impacts from loss of recovery habitat for five special-status species (Mariana fruit bat (150 ac [61 ha]), Guam Micronesian kingfisher (150 ac [61 ha]), Mariana crow (150 ac [61 ha]), Guam rail (9.2 ac [3.7 ha]), and <i>Serianthes</i> tree (153 ac [62 ha]) Impacts to 187 ac (76 ha) of Overlay Refuge. Possible disturbance to special-status species during construction, mitigated to less than significant Removal of 13 ac (5.3 ha) of the existing fenced Area 50 experimental site
Operation			
<p>NI</p> <ul style="list-style-type: none"> There would be no impacts to vegetation <p>LSI</p> <ul style="list-style-type: none"> There would be less than significant impacts to wildlife. <p>SI</p> <ul style="list-style-type: none"> There would be significant indirect impacts to special-status species recovery habitat due to noise, lighting, and operations. 	<p>NI</p> <ul style="list-style-type: none"> The impacts would be the same as for Alternative 1 <p>LSI</p> <ul style="list-style-type: none"> The impacts would be the same as for Alternative 1 <p>SI</p> <ul style="list-style-type: none"> The impacts would be the same as for Alternative 1 	<p>NI</p> <ul style="list-style-type: none"> The impacts would be the same as for Alternative 1 <p>LSI</p> <ul style="list-style-type: none"> The impacts would be the same as for Alternative 1 <p>SI</p> <ul style="list-style-type: none"> The impacts would be the same as for Alternative 1 	<p>NI</p> <ul style="list-style-type: none"> The impacts would be the same as for Alternative 1 <p>LSI</p> <ul style="list-style-type: none"> The impacts would be the same as for Alternative 1

Legend: SI = Significant impact; LSI = Less than significant impact; NI = No impact

Impacts to special-status species would be significant under all Alternatives due to the removal during construction of large areas of recovery habitat for several endangered species. Operations would also result in significant impacts for several endangered species because of indirect impacts due to noise, lighting, and operations of the facilities.

10.2.7 Summary of Proposed Mitigation Measures

Table 10.2-8 summarizes proposed mitigation measures for each action alternative. A

Table 10.2-8. Summary of Proposed Mitigation Measures

<i>Headquarters/Housing Alternatives</i>	<i>Munitions Storage Alternatives</i>	<i>Weapons Emplacement Alternatives</i>
Vegetation		
<ul style="list-style-type: none"> Proposed mitigation measures for Alternatives 1 and 3 are included under the Marine Corps action described in Volume 2 (Alternatives 1 or 2). Proposed mitigation for the Army AMDTF action cannot be determined independently from the mitigation proposed for the Marine Corps action. Mitigation of Alternative 2 would include a suite of mitigation actions as described in Volume 2, Section 10.2.2.6. 	<ul style="list-style-type: none"> No mitigation measures are proposed. 	<ul style="list-style-type: none"> No mitigation measures are proposed.
Wildlife and Special-status Species		
<ul style="list-style-type: none"> Proposed mitigation measures for Alternatives 1 and 3 are included under the Marine Corps action described in Volume 2 (Alternatives 1 or 2). Proposed mitigation for the Army AMDTF action cannot be determined independently from the mitigation proposed for the Marine Corps action. Actions include development of a Micronesia Biosecurity Plan (MBP) and implementation of interim measure to address non-native, invasive species issues. Under Alternative 2 mitigation would also include translocation of Guam tree snails to another site on DoD lands. 	<ul style="list-style-type: none"> Proposed mitigation for all alternatives would be conducted as described in Volume 2, Section 10.2.2.6. 	<ul style="list-style-type: none"> Proposed mitigation for all alternatives would be conducted as described in Volume 2, Section 10.2.2.6.