

CHAPTER 2.

OVERVIEW OF PROPOSED ACTIONS

2.1 OVERVIEW

2.1.1 Introduction

As described in Chapter 1, the proposed actions consist of: (1) (a) developing and constructing facilities and infrastructure to support the relocation of approximately 8,600 Marines and their dependents from Okinawa (Japan) to Guam, (b) developing and constructing facilities and infrastructure to support training and operations on Guam and Tinian (Commonwealth of Northern Mariana Islands [CNMI]); (2) constructing a new deep-draft wharf with shoreside infrastructure improvements to create the capability in Apra Harbor, Guam to support a transient nuclear-powered aircraft carrier; and (3) developing facilities and infrastructure on Guam to support relocating approximately 600 military personnel, their dependents to establish and operate an Army Air and Missile Defense Task Force (AMDTF).

The proposed actions are a complex, multi-service project involving components of the United States (U.S.) Marine Corps, Navy, and Army. Facilities construction and improvements would be necessary to accommodate the three major elements of the proposed actions. On Guam, the proposed actions would entail increased training and operations, increased ship and personnel berthing frequency, and the establishment of aviation maintenance operations and facilities. Training could take the form of communications/control, combat skills, aviation, amphibious vehicle maneuvers, and weapons firing activities. Thus, required construction would include the facilities and infrastructure for maintaining a presence on Guam, and the creation of new training ranges to accommodate the training needs of a larger population of military personnel. These training facilities would be located on Guam and on Tinian in the CNMI. In summary, implementation of the proposed action or other alternatives would include the following major components:

- Temporary increase in population associated with the construction-related work force
- Permanent increase in number of military and civilian personnel and dependents on Guam with a transient presence during training on Tinian
- Increase in number and type of major equipment to support military personnel and operations (e.g., aircraft, ships, amphibious watercraft)
- Increase in number and type of training activities
- Construction of new facilities
- Improvements to existing facilities
- Improvements to infrastructure (including roads, utilities, etc.)
- Establishment of new special use airspace supporting training activities and the AMDTF
- Acquisition of additional land (required for three of the Marine Corps Relocation – Guam proposed actions and alternatives)

Chapter 2:

2.1 Overview

2.2 Marine Corps Relocation – Guam

2.3 Marine Corps Relocation – Training on Tinian

2.4 Aircraft Carrier Berthing

2.5 Army AMDTF

2.6 Related Actions – Utilities and Roadway Projects (Guam)

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2.1.2 Proposed Project Locations

Figure 2.1-1 shows an overview of proposed action project locations on Department of Defense (DoD) land on Guam. The figure outlines project locations at Finegayan, Apra Harbor Naval Complex, Naval Munitions Site (NMS), Air Force Barrigada, Andersen Air Force Base (AFB), Andersen South, and Navy Barrigada. Non-DoD land potentially involved with the proposed action includes the former Federal Aviation Administration (FAA) parcel, the Harmon Area, and the Route 15 Area. Figure 2.1-2 shows an overview of the proposed action project locations on non-DoD lands.

2.1.3 Proposed Personnel Changes

Even though Guam currently hosts a significant permanent Navy and Air Force population, the proposed actions would increase the population by approximately an additional 8,600 Marine Corps and 630 Army personnel, and their combined 9,950 dependents, on Guam (Table 2.1-1). The proposed action for the Marine Corps relocation includes personnel from the units being relocated and the associated base support personnel that must also be present at an installation to support the military mission. The Navy's proposed action does not require any additional permanent support personnel. The visiting (transient) population would increase due to the Marine Corps relocation (2,000 personnel). The Navy's transient population would increase due to the Navy's transient berthing of the aircraft carrier during the proposed 63 visit-days per year. An aircraft carrier is usually accompanied by supply and combatant escort ships. Collectively, the aircraft carrier and accompanying ships are referred to as a carrier strike group (CSG) and would have 7,222 transient personnel. Navy personnel (both military and civilian) would be housed on their ships or, on occasion, in existing facilities. Table 2.1-1 portrays the maximum potential loading due to permanent and transient personnel. However, given the transient cycle of both the Navy and the Marine Corps, the projected average daily loading is 2,178, much less than the potential total transient loading for both services (9,222 personnel).

Table 2.1-1. Summary of Direct Military Population Changes on Guam

<i>Service</i>	<i>Permanent Military Personnel</i>	<i>Dependents</i>	<i>Transient Military Personnel</i>	<i>DoD Civilian Workforce (from off island)</i>	<i>Subtotals by Service</i>
Marines	8,552	9,000	2,000	1,710	21,262
Navy*	0	0	7,222*	0	7,222*
Army	630	950	0	126	1,706
Subtotals by Population Type	9,182	9,950	9,222*	1,836	Total Proposed Action Population = 30,190*

Note: * = Up to 7,222 personnel on the aircraft carrier with its CSG could be in port at a given time, currently planned for a cumulative total of up to 63 visit days per year with an anticipated length of 21 days or less per visit. Marine Corps vessels would be berthed at Apra Harbor when in port. These vessels could include up to 6,213 personnel. However, this group would not be in port at the same time as the CSG, so the larger of the two personnel numbers is used in this table for conservative analysis purposes.

Source: Navy 2006.

Uniformed military personnel would be supported by civilian personnel some of whom would likely be newly relocated to Guam and some would be current Guam residents. For purposes of this analysis it was assumed that of the DoD civilian workforce: 75% would be coming from off island and 25% would be current Guam residents. It is also assumed that 25% would live on base (because they are military dependents) and 75% would live off base.

Finegayan (NCTS and South)

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- Main Cantonment
(includes quality of life facilities, family housing)
- Small Arms Firing Range (improve/expand existing)
- Army AMDTF Facilities
- Utilities: Power (Potts Junction), Potable Water, Wastewater

Naval Base Guam

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- Wharf Improvements/Waterfront Embarkation
- LCAC/AAV Laydown
- Military Working Dog Kennel Relocation
- Apra Medical/Dental Clinic
- USCG Relocation (minus Headquarters)
- Aviation Training
- Aircraft Carrier Wharf and Fairway
- Utilities: Solid Waste

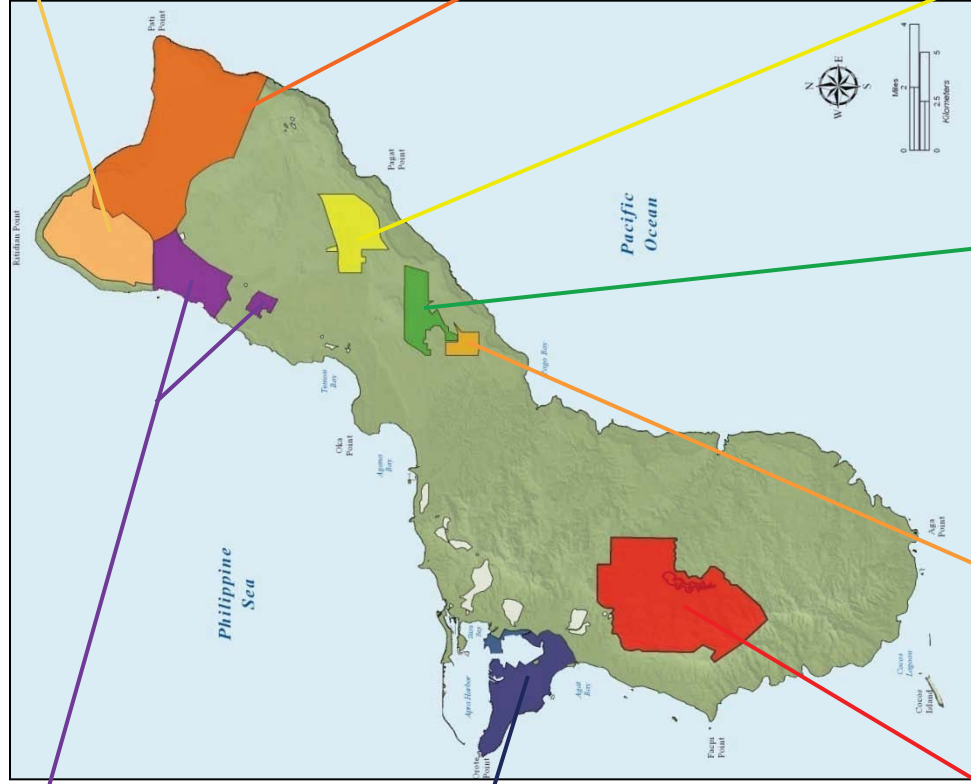
Naval Munitions Site

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- New Munitions Storage
- Company-level Maneuver Training (new access road)
- Aviation Training
- Utilities: Solid Waste

Figure 2.1-1 Overview of Projects on Guam (DoD Lands)

*Note: Specific locations & configurations vary by alternative. Refer to respective volume(s) of EIS for detailed descriptions; volume and section numbers are included for each area



Andersen AFB NWF

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- Aviation Landing Practice (training)
- Army AMDTF Weapons Emplacement Sites

Andersen AFB

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- Airfield Operations (North Ramp)
- Air Embarkation-Joint with Air Force (South Ramp)
- North Gate
- New Munitions Storage
- Aviation Landing Practice
- FACSFAC (Navy)
- Army AMDTF Ammunition Storage
- Utilities: Water, Wastewater, Solid Waste

Andersen South

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- Non-firing Training (urban combat, driver/convoy)
- Firing Range Complex
- Aviation Training
- Utilities: Water

Navy Barrigada

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- Main Cantonment (housing)
- Army AMDTF Facilities

Air Force Barrigada

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- Main Cantonment (housing)
- Army AMDTF Facilities

Table 2.1-2 presents the estimated annual population increase from off-island that would result from the proposed actions. The population numbers are larger than the numbers presented in Table 2.1-1 because they additionally include: (1) the dependents of off-island DoD Civilian workforce and; (2) the off-island population increase related to indirect and induced jobs. The estimates were derived as follows:

- The estimated numbers of active duty military, their dependents, and civilian military workers associated with the proposed action were provided by DoD and were based on the characteristics of personnel at other military installations.
- The estimated number of off-island construction workers who would be working on DoD projects was based on planned construction spending and a conversion factor (gathered from sources familiar with Guam construction projects) that translates construction spending into an estimated number of construction workers.
- The estimated number of indirect and induced full time equivalent (FTE) workers was generated using an economic model of the employment that would result from project-related expenditures in the Guam economy for military construction and base operations.
- Estimates of the number of dependents for construction workers, indirect and induced workers, and civilian military workers were based on data from the U.S Census and sources familiar with Guam construction projects.

Project-related construction work is expected to begin in 2010 and reach its peak in 2014. It is also assumed in this analysis that most of the Marines and their families would arrive on Guam in 2014. Since the peak in construction activities and expenditures would coincide with the arrival of Marines and their families, 2014 represents the peak year for population increase. At this peak, the total increase in Guam residents from off-island would be an estimated 79,178 people.

After the 2014 peak, project-related construction expenditures and the associated influx of construction workers would decline rapidly because 2014 is the last year that any new construction begins. By the time construction is completed and military operational spending reaches a steady state, the off-island population increase is projected to level off to an estimated 33,608 persons, approximately 58% below the peak level.

Approximately 1 week per month, 200 to 400 Marine personnel would travel to Tinian to train at the proposed ranges.

2.1.4 Organization of the Remaining Chapter

The following sections provide an overview of the proposed actions. The following lists the sections, along with the appropriate Volume of the Environmental Impact Statement (EIS) that contains detailed descriptions of the proposed action and alternatives:

- Section 2.2 Marine Corps Relocation – Guam (see Volume 2 for details)
- Section 2.3 Marine Corps Relocation – Training on Tinian (see Volume 3 for details)
- Section 2.4 Aircraft Carrier Berthing (see Volume 4 for details)
- Section 2.5 Army AMDTF (see Volume 5 for details)
- Section 2.6 Related Actions – Utilities and Roadway Projects (see Volume 6 for details)
- Section 2.7 Construction

**Table 2.1-2. Estimated Total Population Increase on Guam from Off-Island
(Direct, Indirect, and Induced)**

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Direct DoD Population¹											
Active Duty Marine Corps	510	1,570	1,570	1,570	10,552	10,552	10,552	10,552	10,552	10,552	10,552
Marine Corps Dependents	537	1,231	1,231	1,231	9,000	9,000	9,000	9,000	9,000	9,000	9,000
Active Duty Navy ²	0	0	0	0	0	0	0	0	0	0	0
Navy Dependents	0	0	0	0	0	0	0	0	0	0	0
Active Duty Army	0	50	50	50	50	630	630	630	630	630	630
Army Dependents	0	0	0	0	0	950	950	950	950	950	950
Civilian Military Workers	102	244	244	244	1,720	1,836	1,836	1,836	1,836	1,836	1,836
Civilian Military Worker Dependents	97	232	232	232	1,634	1,745	1,745	1,745	1,745	1,745	1,745
Off-Island Construction Workers (DoD Projects) ³	3,238	8,202	14,217	17,834	18,374	12,140	3,785	0	0	0	0
Dependents of Off-Island Construction Workers (DoD Projects)	1,162	2,583	3,800	3,964	4,721	2,832	1,047	0	0	0	0
Direct DoD Subtotal	5,646	14,112	21,344	25,125	46,052	39,685	29,545	24,713	24,713	24,713	24,713
Indirect and Induced Population											
Off-Island Workers for Indirect/Induced Jobs ³	2,766	7,038	11,773	14,077	16,988	12,940	6,346	4,346	4,346	4,482	4,482
Dependents of Off-Island Workers for Indirect/Induced Jobs	2,627	6,685	11,184	13,373	16,138	12,293	6,028	4,372	4,372	4,413	4,413
Indirect/Induced Subtotal	5,393	13,723	22,957	27,450	33,126	25,233	12,374	8,718	8,718	8,895	8,895
Total Population	<u>11,038</u>	<u>27,835</u>	<u>44,301</u>	<u>52,575</u>	<u>79,178</u>	<u>64,918</u>	<u>41,919</u>	<u>33,431</u>	<u>33,431</u>	<u>33,608</u>	<u>33,608</u>

Note¹ DoD population includes military personnel, DoD civilian workers, and dependents from off-island.

²The Navy rows do not include increases from the transient presence of aircraft carrier crew with its CSG.

³Population figures do not include Guam residents who obtain employment as a result of the proposed actions.

2.2 MARINE CORPS RELOCATION – GUAM

The Marine Corps proposed action would require construction and utilization of new facilities, infrastructure, and training assets to supplement the existing military assets on and around Guam. It would also increase operational activities, increase ship berthing, and require the establishment of aviation maintenance operations and facilities. Marine Corps forces would live, train, and work on the island. 3rd Marine Expeditionary Force (III MEF) with its elements (discussed below) would be based on Guam and would be a component of the over-arching Marine Forces Pacific for operation and support of U.S. Pacific Command requirements.

The relocating forces would include the following operational elements:

- Command Element, III MEF. III MEF is the Marine Corps' forward-deployed Air-Ground-Logistics-Base Team; it has the ability to deploy rapidly and conduct operations ranging from humanitarian assistance and disaster relief to amphibious assault and High Intensity Combat. Consists primarily of headquarters (HQ) and supporting organizations. Co-location and communications connectivity is a primary facility siting requirement.
- Ground Combat Element, 3rd Marine Division Units. The Ground Combat Element has the mission of locating, closing with, and destroying the enemy with firing, maneuvering, and close combat. It provides infantry, armor, artillery, reconnaissance, anti-tank, and other combat arms. Consists of Divisional HQ and subordinate organizations. Needs to be sited near Command and other HQ and subordinate operating elements. Ground combat and combat support organizations require proximity to ranges and training areas, as well as traditional base support facilities.
- Air Combat Element, 1st Aircraft Wing and subsidiary units. The Air Combat Element operates from a variety of sea- and shore-based facilities to support Marine Air Ground Task Force (MAGTF) expeditionary operations. The focus of the Air Combat Element is to support the MAGTF during the assault landing and subsequent operations ashore. Includes the Marine Aircraft Wing HQ, expeditionary, and garrison supporting organizations. Unlike the aircraft squadrons, aviation command and general supporting elements can be located convenient to the airfield and higher commands, and do not necessarily need to be located at the airfield.
- Logistics Combat Element, 3rd Marine Logistics Group. The Logistics Combat Element provides all support functions not organic to the Ground Combat Element and Air Combat Element units. Functions include: communications, combat engineers, motor transport, medical, supply, maintenance, air delivery, and landing support. Consists of Marine Logistics Group HQ and supporting organizations that provide a variety of direct logistics support to the rest of the III MEF. The Marine Logistics Group HQ element would be sited in proximity to Command HQ and other HQs. Indirect and industrial support facilities of the Logistics Combat Element would be located in proximity to mutually supporting activities to maximize efficiency, with efficient access to roads, ports, and airfields.

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- **Base Support.** This refers to all functions that may not be directly related to the military mission but are critical to the operation of the base and the quality of life (QOL) for military personnel and their families. Examples would include military exchanges, commissaries, and child development centers. These facilities would be sited throughout the Base.

Transient U.S. DoD and Allies operational forces would likely avail themselves of Guam's increased operational and training capabilities. A visiting Marine Expeditionary Unit, an Expeditionary Strike Group, and other joint and combined task forces including allied nation forces would likely conduct combined training exercises on Guam and the CNMI.

Typically, a visiting Expeditionary Strike Group would include three ships carrying amphibious vehicles, equipment, and personnel designed to support amphibious operations and an additional four surface combatant ships that escort the amphibious ships. The visiting ships and units involved in training exercises would berth at Apra Harbor for short periods. The numbers and types of ships and amphibious vehicles would vary with respective training missions. In addition to training, amphibious ships and their combatant escort ships may embark and disembark personnel and equipment on Guam for operational requirements. All waterfront improvements proposed to support Marine Corps requirements would be available for use by ships visiting Apra Harbor.

The following subsections describe the major activities that would be associated with the proposed Marine Corps relocation on Guam: Airfield, Main Cantonment, Waterfront, and Training.

2.2.1 Airfield

The majority of the proposed Air Combat Element (ACE) Beddown Project Area site is an inactive, previously disturbed area north of the existing Andersen AFB Airfield. This proposed area would accommodate helicopter and other vertical lift aviation assets operations, maintenance, and related training and support functions. The ACE beddown facilities would operate 24 hours per day and seven days per week. Approximately 2,000 people would occupy this space during the day shift and 400 people would be present at night. Traffic would include government owned vehicles, personal vehicles, and shuttle buses from the Main Cantonment area. Air traffic would include helicopter, vertical lift aircraft, fixed wing, and unmanned aircraft arrivals and departures. Air traffic rates are contingent on surge and operational requirements.

The Air Embarkation Project would include the Air Mobility Campus, Organic Marine Corps Cargo, and passenger operations. Air Embarkation/Disembarkation refers to the loading and unloading of passengers or cargo to aircraft. The passenger facilities are comparable to those of a small airport: luggage handling, wait area, and ticket/documentation area. Cargo is staged in the area awaiting loading to aircraft or disbursement to warehouses or individual commands. There are biosecurity searches of cargo and baggage. The site would operate 24 hours per day and 7 days per week. The total project area would be 28 acres (ac) (11.33 hectares [ha]), adjacent to the southeast boundary of the airfield (where land is available for expansion and redevelopment). The existing conditions include paved airfield parking and disturbed unused land adjacent to the airfield. This site would serve as the passenger terminal for Andersen AFB and temporary cargo storage.

Andersen AFB access improvements and the North Gate and Access Road proposed projects, would improve the traffic flow and physical security of vehicles entering and exiting the air base. The proposed 12 foot (ft) (3.66 meters [m])-wide access road is planned to intersect Route 9 approximately 10,561 ft (3,219 m) north of the existing Andersen AFB entry control point and extend into Andersen AFB

approximately 6,561.7 ft (2,000 m) until it terminates at 5th Avenue. A new entry control point facility is also proposed and would serve both commercial and private vehicles.

Roadway paving, street lighting, and drainage would be improved along the entire length of the alignment. Improvements at the new route intersection would include two dedicated turn lanes and traffic signals with demand left turn signals, via pavement detectors.

2.2.2 Main Cantonment

The Main Cantonment would be the main base of operations for the Marine Corps, and in two alternatives, would also be the main base of operations for the Army AMDTF. Facility requirements for the Main Cantonment Area include a full range of facility types, not unlike a small city: various types of housing, workplaces, recreation areas, education facilities, and health and safety-related functions. The workplace facilities are typical of a military base and include headquarters, maintenance facilities, warehouses, training areas (field and classroom), equipment/vehicle storage, and hazardous materials management and storage areas. Marine Corps command guidance and planning principles employed in designing the Main Cantonment includes:

- Accommodating individual training and as much unit training as possible on Guam
- Encouraging functionality, efficiency, and sustainability in daily operations
- Requiring command and organizational integrity
- Ensuring a high quality of life for troops and families
- Accommodating anti-terrorism/force protection (AT/FP) requirements
- Minimizing potential future encroachment
- Preserving and optimizing existing mission capabilities and joint service requirements

In each of the alternatives, the parcels were subdivided into functional areas based on many factors including: habitat, topography, and constraints. Facilities were sited throughout the proposed installation based on functional efficiency, capacity, AT/FP requirements, sustainability, and many other factors, to optimize functionality and minimize environmental impacts. All proposed facilities are presented as a component of one of the functional groups, as follows:

HQ and Administrative Support Functions

- Administrative offices
- Vehicle maintenance
- Electronic/communications support and maintenance
- Security
- Warehousing
- Armory
- Fuel storage
- Recycling center

Base Operations

- Administrative offices
- Military police functions: brig/confinement, police offices, rehabilitation facilities, military dog kennels
- Fire station and alert force facilities
- Base access: gate house, pass and identification, photographic facilities

- Warehousing
- Legal services, dental services, family services, and Morale, Welfare, and Recreation support
- Defense Reutilization and Marketing Office
- Hazardous materials management and storage/corrosion control

Bachelor's Quarters and Temporary Lodging

- Bachelor Enlisted Quarters, club, dining, indoor fitness, and swimming pool
- Bachelor Officer Quarters, officer's club
- Temporary lodging facilities

Family Housing

- Single-family and attached housing facilities of various sizes and types

Educational Facilities

- Child development/daycare facilities
- Elementary schools
- Middle schools
- High school

QOL Functions

- Main Community Center: commissary, exchange, post office, theater, bowling alley, vehicle maintenance, hobby shop, medical clinic, religious ministry facilities
- Applied instruction and auditorium facilities
- Fitness centers, swimming pool, youth centers
- Services: restaurant, location exchange, bank, gas station, gate house

2.2.3 Waterfront

Naval Base Guam is an operating military naval base that presently supports surface and subsurface combatants, and logistic support ships including amphibious ships. The Navy's general purpose wharves are on the western side of Inner Apra Harbor. Other wharves are not general purpose and have specific uses, such as submarine berthing or supply ship berthing. Port operations manages traffic and berthing assignments within the harbor. It would continue to assign berthing for ships within the existing wharf areas. Ships are assigned specific berths to accommodate the draft of vessel, operational requirements of the vessel including repairs, and on and off load requirements for the particular ship. The berths and adjacent support structures and lay-down areas would be upgraded to accommodate increased usage, and upgraded to meet new and emerging requirements in support of the Marines' relocation. Dredging would be required to accommodate some of the escort ships. Volume 2 provides detailed information regarding the location and impacts from dredging in Inner Apra Harbor.

Relocation of the Marine Corps to Guam would result in frequent embarkation operations supporting amphibious transportation of Guam-based Marines and other transiting amphibious forces for potential contingency, humanitarian, and exercise operations in the Pacific theater. The Navy's amphibious task forces and the Marine Expeditionary Units are transient forces that traditionally utilize Guam for port visits and training; such task force visits would occur more frequently after relocation. The composition of the amphibious task force would vary with each specific mission. Typically, three ships would carry equipment to support amphibious operations, and an additional four combatant ships would serve as escorts.

The amphibious task forces have historically utilized general purpose Navy wharves in Inner Apra Harbor. The proposed increase in amphibious task force visits, the increased utilities requirements, and the change in the class (type) of visiting ships would require a new embarkation area (for loading and unloading of ships) and a new amphibious vehicle laydown area. The four waterfront facility projects proposed to support this action are described below.

2.2.3.1 Embarkation and Support Ship Berthing

The amphibious task force would require an area to load and unload personnel, vehicles, and other cargo. Equipment cleaning and inspections associated with bio-hazard and customs requirements would also occur in this area. These operations are collectively referred to as waterfront embarkation. The ships carrying amphibious vehicles require wharf space and nearby support facilities to manage such operations. Wharves supporting other escort ships and support vessels would not need to be located adjacent to embarkation operations. A summary of amphibious task force facility requirements is as follows:

- Embarkation operations:
 - The amphibious ships would be berthed at Victor Wharf (the wharf traditionally assigned for amphibious shipping in Apra Harbor). A new port operations building would be constructed at the wharf, and a cargo staging and vehicle wash down area would be provided in proximity to but not adjacent to the wharf.
 - The Victor Wharf requires structural/surface repairs and utility upgrades. Proposed utility upgrades and installation include the following systems: telecommunications infrastructure, bilge oily water treatment, potable water, electrical, steam, low pressure compressed air, and sewage collection. New hardware and fenders would be provided.
- Other support vessels including non-amphibious shipping troop transport berthing:
 - Uniform Wharf would be used for troop transport ships such as ferries including High Speed Vessels.
 - All Apra Harbor wharves sustained previous earthquake damage, but Uniform Wharf is in the worst condition and is currently unusable. Extensive structural upgrades to meet seismic standards and utility upgrades are proposed. Proposed utility upgrades or installation include: electrical, water, wastewater, and telecommunications infrastructure.
- Escort (supply ships and combatants) ship berthing:
 - Sierra Wharf would be improved for the escort ships.
 - Dredging would be required from -35 ft to -38 ft (-10.6 to -11.5 m) Mean Lower Low Water for the areas fronting Sierra and Tango Wharves (see dredging discussion below).
 - Structural wharf improvements would be needed to accommodate the new dredged depth and comply with Guam seismic standards. Concrete wharf surfaces would be repaired and new hardware and fenders provided. No changes to wharf design are proposed.
 - Utility upgrades are proposed at Sierra Wharf to include the following systems: bilge oily water treatment, potable water, electrical, steam, low pressure compressed air, and sewage collection.

- Dredging at Sierra and Tango Wharves:
 - The EIS assumes mechanical dredging, which has been the standard practice for Apra Harbor. Other options include hydraulic dredging, but mechanical is perceived to be the environmentally most conservative due to releases of dredged material into the water column and temporary impacts on water quality.
 - Three dredged material management options would likely be available on Guam in 2010. The existing options are beneficial reuse and upland dewatering site. The U.S. Environmental Protection Agency is pursuing the designation of an ocean dredged material disposal site (ODMDS) approximately 11 to 14 nautical miles (nm) (20.4 to 26 kilometers [km]) from the west coast of Apra Harbor. The designation is anticipated in 2010 and the ODMDS EIS is being prepared concurrent with this EIS. An ODMDS would provide Guam a third option for dredged material management.
 - Beneficial reuse is the preferred disposal option for suitable (e.g. chemically, geotechnically) dredged material when practical; several local potential beneficial reuse projects have been identified and represent one possible scenario for use of portions of the dredged material excavated for the proposed action.
 - Based on the sediment chemistry analysis of 58 sediment core samples that were composited into six samples by geographic area, the dredged material at Sierra/Tango Wharves is likely to be suitable for either ocean disposal or upland placement and beneficial reuse in upland placement sites (Naval Facilities Engineering Command [NAVFAC] Pacific 2006). The sampling plan and the compositing of samples were based on standard guidelines used to support U.S. Army Corps of Engineers (USACE) permit applications. The chemical data results are comparable to the results on previous maintenance and construction projects' dredged material. To date, none of the Apra Harbor dredged material from the dredge area or nearby projects has required special handling, remediation, or placement in lined confined disposal facilities. These measures are not anticipated for the Sierra/Tango dredged material (or the Navy's proposed aircraft carrier berthing project described in Section 2.4).
 - The EIS impact analysis considers several scenarios: 100% beneficial reuse in association with a proposed Port Authority of Guam expansion program; up to 20% beneficial reuse of dredged material within the proposed military construction projects with remainder disposal at the ODMDS; 100% upland dewatering and placement; and 100% ODMDS placement. There would, most likely, be a combination of disposal methods described in the dredged material disposal plan, which would be prepared for inclusion in the USACE permit applications. The permit application process is administered by the USACE and the applications, including the dredged material disposal plan, are subject to review by other regulatory agencies.
 - Additional laboratory analysis would be required for submittal to USACE to support the dredged material management plan for potential ocean disposal that would include a full suite of bio-effects tests to determine suitability for placement in the approved ocean site. The permit application review process and permit conditions ensure that dredged material is managed in accordance with applicable environmental regulations.

2.2.3.2 Amphibious Vehicle Laydown Area

The amphibious vehicle laydown area is required to store, wash down, maintain, and deploy amphibious vehicles, such as landing craft and amphibious assault vehicles. Landing Craft Air Cushions (LCACs), would also utilize this area. There are proposed to be as many as four LCACs, 14 amphibious assault vehicles, and eight small reconnaissance boats permanently based in this area. Amphibious vehicles and the LCACs travel on land and water. The laydown area should be close to the water and have ramps to access the harbor for training and operations. Amphibious vehicles produce noise comparable to a diesel powered boats on the water. On land, amphibious vehicles tracks on hard surfaces generate noise in addition to engine noise. LCACs; however, are powered by gas turbines using two large shrouded propellers at the stern for forward propulsion. These gas turbines are similar to aircraft jet engines. Therefore, the laydown area must also be remote from other operations because of the noise and spray associated with the LCACs. The area is proposed for this project is along Polaris Point's southern coast and east of Alpha Wharf in inner Apra Harbor. This area is within a man-made fill area, requires no demolition, and is undeveloped (vacant) with no land use constraints. It has direct water access to Apra Harbor.

Specific components of the laydown area are identified below.

- Two new concrete ramps, which are similar to recreational boat ramps seen at private marinas. There would be paving for amphibious vehicle parking, personal vehicle parking, staging equipment, and amphibious vehicle washing.
- There would be four support buildings for administration, small boat storage, and maintenance.
- A new access road would be provided from Marine Corps Drive.

2.2.3.3 Facility Relocation Projects

Two facility relocation projects are necessary to accommodate the Marine Corps waterfront requirements.

1. U.S. Coast Guard (USCG):

- Ship berthing and crew support buildings would be relocated from Victor Wharf to Oscar/Papa Wharves because ships carrying amphibious vessels would require the full length of Victor Wharf.
- USCG HQ and other facilities would remain at Victor Wharf within the USCG lease area.
- The Oscar/Papa Wharves would be refurbished and developed. The existing buildings would be demolished. The wharf face and surface deterioration would be repaired. There would be new wharf hardware and fenders. Proposed utility upgrades or installations include the following systems: bilge oily water treatment, potable water, electrical, fire protection water supply, communication infrastructure, and sewage collection.
- The area is currently leased to the Guam Economic Development Authority by the Navy and subleased from Guam to the Guam Shipyard. A reduced footprint is proposed for the shipyard.

2. Military Working Dog Kennel:

- The existing Military Working Dog Kennel with eight dog runs and administrative spaces within the Security Compound at Victor Wharf would be relocated to a relatively quiet inland site at the southern side of Naval Base Guam because noise of embarkation would be incompatible with the existing uses as a military working dog kennel and training location.

2.2.3.4 Medical/Dental Clinic

The Naval Hospital serves all military and dependent personnel. There are clinics at Andersen AFB and Apra Harbor. The proposed Marine Corps population increase requires more medical specialties and an increase in hospital capacity on Guam. The plans for construction of a new hospital were underway prior to the proposed Marine Corps relocation and are not included in this EIS. Many outpatient services currently provided at the Naval Hospital would need to be diverted to clinics to free up space for critical care and overnight stays. One new medical/dental clinic is proposed as part of the new the Marine Corps facilities and would be located within the Main Cantonment. In addition, the existing clinic at Apra Harbor would assume more outpatient responsibility from the Naval Hospital. The current medical/dental clinic at Apra Harbor is inadequate from a size, operational, and structural perspective for the proposed new level of service. A new clinic is proposed to accommodate, in part, the increase in on-island military population.

The proposed site is centrally located on the installation on Marine Drive, near existing family and bachelor housing areas. The clinic would include administrative spaces, medical, mental health and dental clinic spaces, urgent care clinic, preventive medicine, ancillary services, and parking for personal and emergency vehicles (approximately 290 spaces). The space allocation and designs are provided by the Bureau of Medicine and Surgery. Apra Branch Health Clinic (medical and dental) would be a single-story concrete facility of 43,091 square feet (ft²) (4,003 square meters [m²]). The total project area within the perimeter of the facility would be 334,000 ft² (31,030 m²).

Site improvements include landscaping, sidewalks (with nonslip surface), curbs, and gutters. Subgrade construction would include utility lines and possible stormwater management systems (not yet designed). The facilities would be fully equipped with sprinkler and air conditioning systems. All facilities would be designed to Zone 4 seismic requirements, to withstand 170 mile per hour winds, and to include appropriate AT/FP distance setbacks.

2.2.4 Training

A variety of training requirements would have to be fulfilled on a regular basis by Marines as part of the proposed action, including maneuver and non-live-fire training, live-fire weapons and explosives training, and aviation operations and support. Ammunition storage areas are also part of the proposed action. The following training support and compatible high-use facilities would be required and integrated with the Main Cantonment:

- Audio-visual support, simulators, staff trainers, auditorium
- Physical fitness, swimming, obstacle course, rappelling
- Indoor small arms firing range and gas mask training chamber (effects contained within structure)
- Combat skills training
- Engineer equipment training

Andersen South would have facilities for Military Operations in Urban Terrain (MOUT) (urban warfare) and maneuver training areas. The NMS would also have maneuver training areas.

2.2.4.1 Live Fire Ranges

The proposed alternatives for the location of the Training Range Complex are on the east coast of Guam, east of Andersen South. Range Alternative A includes realignment of Route 15. Range Alternative B is south of Range Alternative A and would not include realignment of Route 15. Both alternatives would also include a proposal for special use airspace (SUA) from 0 to 3,000 ft (914 m) above ground level

(AGL) for the Surface Danger Zones (SDZs) of the machine gun range over parts of Andersen South and off the east coast of Guam. Weapons live-fire training activities would be the same at either location and would include:

- Small arms range complex: Multiple ranges would be in the complex. The proposed Known Distance (KD) range would provide for 50 firing points, but the range area would be sized for future expansion up to 80 firing points. The KD range would be 160-yards (yd) (146-m) wide and 500 yd (457 m) from the farthest firing line to the target line. The proposed pistol range would provide for 25 firing points and would be expandable to 30 firing points with a 150-ft (46-m) nonstandard small arms range for multi-purpose use. The proposed Modified Record of Fire Range would contain 16 lanes, expandable to 24 lanes in future for training with 5.56 millimeter (mm) weapons. The proposed Nonstandard Small Arms Range would be 100 m (328 ft) in length with 25 firing points, expandable in future to 50 firing points for training with 9-mm and 5.56-mm weapons.
- Machine Gun Multi-Purpose Range: The range would have eight stationary firing lanes, expandable to 12, and two moving target lanes. Lanes would be approximately 3,820 ft (1 km) long. The firing line is 492 ft (150 m) wide and the target line at its farthest extent is 984 ft (300 m) wide. The firing line is raised to include a vehicle firing platform extending 130 ft (40 m) deep. Projectiles authorized for this range include 7.62-mm, .50 caliber, and MK19 40-mm Training Projectile (TP). There would be a restricted area to 3,000 ft (914 m) AGL if this range is located near Route 15.

The following explosives live-fire training activities are also part of the proposed actions:

- Hand Grenade Range: An approximately 1 to 2 ac (0.4 to 0.8 ha) area would be cleared and developed as a hand grenade training range complex for the M67 (6.5 ounce Comp B) fragmentation hand grenade and the M69 inert practice grenade. Two alternative locations are proposed, both on Andersen South.
- Demolition Range: A pit of dirt or sand, approximately 100 ft (30 m) in diameter, would be excavated where explosives would be rigged, primed, and detonated. Training personnel would be sheltered in a bunker or defilade position approximately 985 ft (300 m) from the point of detonation. Up to 20 pounds of explosives could be used. These activities would occur at the Northwest Field.
- Breacher and Shooting House: The breacher and shooting house operations would be integrated into the MOUT at Andersen South. The shooting house would be a standard two-story enclosed structure with 100-ft (30 m) clearance on all sides. A small explosive charge (less than ¼ lb TNT) would be used as a part of training; typically five charges during the daytime and one at time (before 10 P.M.).

2.2.4.2 Naval Munitions Site Access Road Alternatives

The access road alternatives are located outside NMS property and would require acquisition of a right-of-way extending approximately 300 ft (91 m) from the road centerline. The access road alternatives are as follows:

- NMS Access Road Alternative A: This existing hiking trail is 0.4 mi (0.6 km) long, would cover 0.8 ac (0.3 ha) at a 16-ft (5-m) width, and includes no stream crossings. Under Alternative A, the trail would be improved. Vegetation would be cleared for the road shoulder for a total estimated

width of disturbance of 50 ft (15 m). Locked, unmanned gates would be placed at the beginning of the access road and at the entrance to the NMS.

- NMS Access Road Alternative B: Under this alternative, the road would not be improved and would be used by foot traffic.

2.2.4.3 Ammunition Storage

Only existing munitions storage areas were considered to be candidate sites for the proposed ammunition storage facilities under the proposed action. This narrowed the candidate sites to the NMS and the Andersen AFB Munitions Storage Areas (MSAs). Within these two areas, the primary factors in selecting alternative munitions storage configurations were as follows:

- Operational: the earth-covered magazines (ECMs) should be sited as close together as safety setback distances allow, to minimize logistical and maintenance requirements and total area encumbered by Explosive Safety Quantity-Distance (ESQD) arcs.
- Biological: the amount of habitat disturbed should be minimized (e.g., siting ECMs on previously cleared or paved areas or areas of lesser habitat value, and avoiding removal of mature trees) and the ECMs should be sited to avoid sensitive essential habitat for threatened and endangered species.
- Safety: ECMs must be sited in accordance with all regulatory guidance to ensure the safe working environment for munitions and other base personnel (i.e., the direction that the igloos are oriented in relation to each other, safety setback distances between ECMs, and explosive safety arcs within and outside of munitions storage area).

2.2.4.4 Aviation Training

Aviation operations and support would occur at multiple locations on Guam as described below.

Andersen AFB North Ramp and Northwest Field

- Marine Air Control Group (MACG) Training: The MACG is part of the ACE of the MAGTF. MACG training involves coordination of air command and control and air defense within the MAW. Tactical Air Operations Center training is also part of this training. Tactical Air Operations Center training involves establishment of operating air traffic control radar and radar frequency emitters and facilities consisting of shelters, a portable tower, and electrical power sources in about 48 hours, and dismantling them in approximately the same time.
- Improved Airfield Training: Certain aviation training requires improved airfields. Field Carrier Landing Practices (FCLP) training requires a lighted pad sized for a large amphibious deck ship for day/night use and with night vision goggles. Familiarization and instrument flight (FAM) requires an improved airfield with Aircraft Rescue and Fire Fighting for autorotation and simulated engine-out approaches. FCLP and FAM training would occur at an improved airfield. FCLP training involves landing on a simulated aircraft carrier. FCLP operations are almost circular patterns often conducted with several aircraft at low altitude. Approximately three training operations are conducted with each FAM sortie and five training operations with each FCLP sortie. Both are conducted during day and night.
- Landing Zones (LZ): Both improved and unimproved LZs are required to support training in Confined Area Landing (CAL), External Loads (EXT), and Helicopter Insertion Extraction (HIE). CAL training requires different closely located LZs. EXT training requires access to pre-positioned external loads for practice, and access is needed for ground helicopter support team personnel. External loads cannot be carried across public roads or populated areas. EXT training

operations would involve one pass for LZ orientation, followed by an approach of the LZ, hovering at approximately 30 ft (9 m) AGL for approximately one minute while the helicopter support team attaches a load (e.g., concrete block, items in a cargo net, or a vehicle), departure from the LZ vicinity with the load in tow, flying with the load in an arc, then returning to the LZ with the load, and hovering for approximately 30 seconds while the helicopter support team retrieves the load/equipment, and then departing the LZ vicinity. HIE activities include fast rope, rappelling, and parachute operations. HIE training operations would involve one pass for LZ orientation, followed by an approach to the LZ, hovering at approximately 30 ft (9 m) AGL for approximately 1 minute for the HIE event, and then departing the LZ. During each sortie, approximately three HIE operations would be conducted at one or more closely located LZs.

Andersen South and the NMS

- Landing Zone: Training similar to the LZ training occurring at Andersen AFB North Ramp and Northwest Field.

2.2.4.5 Development of Future Training Ranges

All Marine units, to include those relocating from Okinawa to Guam, are required to complete core competency MAGTF training to ensure that forward-deployed Marines sustain operational readiness in core competencies to meet all readiness requirements and are able to support operational requirements assigned by the Combatant Commander. This level of training, which is beyond individual live-fire qualification and requalification training, would be conducted on training ranges being constructed on Guam and Tinian and would involve integration of ground, aviation, and logistics elements under a common command element in preparation for large scale combat operations. The training ranges currently planned for Guam and Tinian only replicate existing individual-skills training capabilities on Okinawa and do not provide for all requisite collective, combined arms, live and maneuver training the Marine Corps forces must meet to sustain core competencies. As with Marine Corps forces currently in Okinawa who must now travel to mainland Japan, other partner nations, and the United States to accomplish this requisite core competency training, the Marine Corps forces relocating from Okinawa to Guam would also have to use alternate locations to accomplish requisite core competency training.

The Marine Corps ultimately desires to conduct core competency training in areas that limit the time Marines must travel to train and thereby reduce operational non-availability. There is an ongoing need to reassess current training locations and to develop additional training capacity for higher level integrated core competency training in the Western Pacific. Future joint training needs, to include Marine Corps training and the suitability of CNMI to meet these future requirements, were evaluated during the 2010 QDR process.

To the extent that the QDR process results in recommendations and proposals subject to NEPA or EO 12114, the DoD will conduct additional NEPA/EO 12114 analysis as necessary prior to implementation. Such proposals, and any associated NEPA/EO 12114 analysis, are separate and distinct from the ongoing proposed relocation of Marine Corps forces from Okinawa to Guam and have independent utility from the proposed relocation. Further, such actions are not connected to the relocation of Marine Corps forces from Okinawa to Guam.

2.3 MARINE CORPS RELOCATION – TRAINING ON TINIAN

Under the proposed action, the Marine Corps would develop live-fire training ranges on Tinian (CNMI) to support the training and operations of Marine Corps units relocating to Guam. DoD currently leases, for military purposes, approximately two-thirds of the northern portion of Tinian. Elements of the proposed training consist of the following:

1. *Firing Ranges*: a Rifle KD Range, Automated Combat Pistol/Military Police Firearms Qualification Course, Platoon Battle Course, and Field Firing Range are proposed on Tinian
2. *Airspace Management*: Airspace use overlying the proposed firing range would continue as currently managed by the FAA. Establishment of SUA is not required or proposed for the firing ranges.

Individual, crew, and small unit weapons training would be required for Marine forces relocating from Okinawa to Guam pursuant to the Roadmap Agreement with Japan. Individual and crew weapons qualification and familiarization training ranges, maneuver areas, and aviation training including LZs are proposed for Guam as discussed previously in Section 2.2.4 of this Volume. The concept for Tinian is to provide the next stage in the training progression, and includes development of ranges for tactical employment of the basic weapons skills developed on Guam.

2.3.1 Proposed Firing Ranges

The proposed action consists of introducing live-fire weapons ranges into the Tinian Military Leaseback Area. This would require the modification of the existing lease-back agreements with the CNMI. The specific set of ranges proposed to meet the purpose and need include:

- Rifle KD Range (5.56-mm, 1,000 yd [914 m]). A Rifle KD Range, designed for training rifle marksmanship and target engagement techniques, would be developed. This range would supplement the KD range on Guam (see Section 2.2.4) by providing the additional distance required of up to 1,000 yd (914 m). Fifty firing points would be constructed, with a range width of 100 yd (91 m), and a length of 1,000 yd (914 m). The total distance of ground disturbing activities is approximately 1,050 yd (960 m) by 100 yd (91 m), or 22 ac (9 ha). The surface danger zone (SDZ) for this range is 2.17 miles (mi) (3,500 m) horizontally, with a vertical hazard distance of 388 yd (355 m).
- Automated Combat Pistol/Military Police Firearms Qualification Course. This range would be designed to meet training and qualification requirements with combat pistols and revolvers and used to train and test personnel on the skills necessary to identify, engage, and hit stationary infantry targets. This range would supplement the Pistol KD Qualification Course located on Guam. The range would be suitable for 9-mm and .45 caliber weapons. Up to 25 firing points would be constructed, with a maximum range distance of 50 yd (46 m). Total ground disturbance would take place over an area of approximately 55 yd (50 m) by 50 yd (46 m) wide, or 0.6 ac (0.24 ha). The SDZ for this range would extend 1.12 mi (1.8 km) horizontally, with a vertical hazard of 109 yd (100 m).

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- **Platoon Battle Course.** The Platoon Battle Course would provide the capacity for small units of up to approximately 40 personnel to train in tactical scenarios, engaging targets at varying distances and angles while moving. There is no such range on Guam because the required range footprint and SDZ exceeds available land areas. Weapons that would be used on this range are those found at the platoon level. These are 5.56-mm carbines and rifles and Squad Automatic Weapons. The range footprint would be approximately 1,312 yd (1,200 m) long and 656 yd (600 m) wide, encompassing approximately 178 ac (72 ha). Within that footprint, target pits, access ways, and back stops would be constructed. For operation of the targets and safety management of the range, a range control tower would be located at the initial firing line. The SDZ would extend 2.17 mi (3.5 km) horizontally, with a vertical hazard distance of 388 yards (355 m).
- **Automated Field Firing Range.** This range would be designed for training target engagement techniques with the rifle, including identifying, engaging, and hitting stationary infantry targets. This would be a scored range for use with the 5.56-mm rifle but would also be suitable for the M4 Carbine and Squad Weapons System. The proposed range would be approximately 219 yd (200 m) wide by 547 yd (500 m) long, or approximately 25 ac (10 ha). The length of the SDZ is approximately 2.17 mi (3.5 km) long from the firing line and 388 yd (355 m) vertically.

2.3.2 Supporting Activities

Supporting activities include: range maintenance (grading for line of sight, creation of earthen berms, sifting of impact berms to remove used rounds for recycling), bivouac activities (i.e., setting up camp), emergency services support, and range access via roadways. No permanent facilities for supporting activities are proposed for the Tinian ranges. All training would be considered “expeditionary”, in that the Marines would bring all necessary equipment to the ranges, would bivouac onsite, and would remove all equipment following completion of the training activities. No utilities systems would be required. Water and power would be provided by alternate means such as mobile water tanks and generators. Supporting activities would be accomplished without construction of permanent facilities.

2.3.3 Range Training Area (RTA) Management

The RTA on Tinian would be managed in accordance with Marine Corps Order 3550.10 (*Policies and Procedures for Range Training Area Management*) and U.S. Pacific Fleet directives contained in the Mariana Islands Range Complex and the U.S. Defense Representative (Commander Navy Region Marianas) training instructions that address safe, efficient, effective, and environmentally sustainable use of the range area. These policies include security and safety procedures and environmental management.

2.3.4 Range Operations

It is estimated that civilian use of, and access to and through, the RTA would be affected approximately 12 to 16 weeks per year. The limit of the restrictions would depend on the training uses scheduled. The transport of 200-400 Marines to Tinian from Guam for the proposed one week per month company-level training exercises would be via air or surface ferry transport. Ranges would primarily be used during daylight hours; however, some training is required during night-time hours, typically between the hours of 7:00 p.m. and 6:00 a.m.

The estimated sorties associated with the notional airlift requirements are provided in Table 2.3-1. The rotary-wing sorties would be between Andersen AFB North Field on Guam to either the bivouac area,

North Field or Tinian Airport (West Field) on Tinian. The fixed-winged sorties (C-17s) would be between Andersen AFB and the Tinian Airport (West Field). Tinian Airport (West Field) has the runway requirements for these aircraft. The fixed-winged sorties (C-130s) could use both North Field as an expeditionary field and the Tinian Airport (West Field). If equipment is moved by barge, a single barge would be able to carry the equipment necessary to support the estimated 200 to 400 Marines training evolution. Based on past practices and other range operations, elements of RTA management such as range security, range maintenance, vehicle maintenance, emergency services (fire fighting and medical), personnel support for range users (including transportation services and food services), and environmental services may be accomplished on a contract basis.

Table 2.3-1. Estimated Sorties Associated with the Notional Airlift Requirements

<i>Aircraft Type</i>	<i>Capacity (Marines Transported) per Sortie</i>	<i>Sorties for Airlift of 200 Marines</i>	<i>Sorties for Airlift of 400 Marines</i>
CH-53D	37	6	11
CH-53E	55	4	8
MV-22	20	10	20
C-130	76	3	6
C-17	102	2	4

2.3.5 Airspace

FAA Order JO 7400.2G, Procedures for Handling Airspace Matters (FAA 2008), and Marine Corps Order P3550.10, Policies and Procedures for Range and Training Area Management (Marine Corps 2005), do not require the establishment of restricted areas over small arms ranges. Airspace would continue to be managed by the FAA using established policies. Establishment of restricted area airspace for training on Tinian is not part of the proposed action evaluated in this EIS.

2.4 AIRCRAFT CARRIER BERTHING

2.4.1 Operation

The Pentagon's strategic QDR of 2006 supports an increased Navy presence in the Pacific. The most current QDR in 2010 reconfirms the Navy's capability for a "robust forward presence." To meet this objective, on average six aircraft carriers, including air wings and escort ships, would be homeported in the Pacific. The mission of the aircraft carrier includes:

- Providing a credible, sustainable, independent forward presence and conventional deterrence in peacetime
- Operating as the cornerstone of joint/allied maritime expeditionary forces in times of crisis
- Operating and supporting aircraft attacks on enemies, protecting friendly forces and engaging in sustained independent operations in war

Five of the six aircraft carriers are homeported on the west coast of the contiguous U.S. Rather than traveling long distances to U.S. homeport bases to refresh forces and conduct emergent repairs, the Navy proposes increased numbers and durations of aircraft carrier visits to Guam, the closest U.S. sovereign soil to the CSG operational areas in the Western Pacific. These visits would facilitate a greater transient presence in the Western Pacific. The increased presence on Guam may include up to 63 days total per year as operational requirements dictate. A new deep-draft wharf at Apra Harbor is proposed to support the transient aircraft carrier capability

Currently, Apra Harbor supports an average of two CSG port calls for an average of up to 7 days in duration per year, though actual port visits and durations are subject to change based upon Fleet operational requirements. Previous nuclear powered aircraft carrier berthing has been at Kilo Wharf. The longer transient visits, however, would interfere with existing ammunition operations at Kilo Wharf. It is the only DoD ammunition wharf in the Western Pacific and serves 12 to 14 ammunition ships in the area of operations.

2.4.2 Wharf Locations

An assessment of existing Navy wharves revealed the need for new construction. The Navy proposes to construct a deep-draft wharf and supporting infrastructure in Outer Apra Harbor to berth transient aircraft carriers and provide shoreside utilities. While berthed, the ships would be resupplied using the current logistics infrastructure. The ships do not require housing for crew or additional training facilities, but do require utilities and limited temporary shoreside facilities for Sailor liberty support services.

No new facilities are proposed to support the aircraft carrier escort ships. They would be accommodated at Inner Apra Harbor wharves on a space available basis. The Inner Apra Harbor wharf improvements proposed under the Marine Corps action would also benefit the CSG escort ships.

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2.4.3 Wharf Design

Several structural design and alignment options were developed for Polaris Point and Former Ship Repair Facility alternatives. General site compatibility, constructability, costs, and seismic performance were evaluated in a feasibility study that represents a 20-30% level of design (NAVFAC Pacific 2008). The evaluation of seismicity, storm surge, wave analysis, bathymetry, and construction costs favored a vertical steel pile wharf over a concrete caisson and sheet pile bulkhead design. The vertical steel pile wharf design is assessed in the EIS impact analysis. If during the development of the 100% level of design, a different design is proposed, additional consultation with a regulatory agency including the USACE would be initiated. All designs are described further in Volume 4.

2.4.4 Dredging

The dredging methods and dredged material management options are as described for the proposed dredging at Sierra Wharf under the Marine Corps action (Section 2.2.3.1). The EIS assumes mechanical dredging, which has been the standard practice for construction and maintenance dredging in Apra Harbor. Other options include hydraulic dredging, but mechanical is perceived to be the environmentally most conservative due to releases of dredged material into the water column and temporary impacts to water quality.

Based on the sediment chemistry analysis of 14 sediment core samples that were composited into three samples by geographic area (i.e., turning basin, Polaris Point and Former SRF), the dredged material from wharf alternatives and turning basin areas is likely to be suitable for ocean disposal or upland placement in dewatering sites (NAVFAC Pacific 2006). Beneficial reuse is the preferred dredged material management alternative and several potential local reuse opportunities have been identified and are discussed in this EIS. Beneficial reuse remains an important option and is a priority. The material could be retained for Navy use (e.g., landfill cover, fill of berms in new military ranges, wharf stabilization, etc.), removed by the Government of Guam (GovGuam) (including the Port Authority of Guam), or sold to another party. Options for beneficial reuse of dredged material would be examined on a case-by-case basis.

2.5 ARMY AMDTF

2.5.1 Background

On December 16, 2002, National Security Presidential Directive-23 directed the DoD to establish a capability to protect the U.S. homeland, forces, and its allies from ballistic missile attacks starting in 2004.

The ballistic missile defense program develops the capability to defend territories and forces of the U.S. and its allies against all classes and ranges of ballistic missile threats. The proposed action is comprised of developing facilities and infrastructure on Guam to support relocating approximately 630 military personnel and their 950 dependents to establish and operate an AMDTF. The proposed Army AMDTF would be placed on Guam to defend U.S. interests on Guam from any threat of ballistic missiles. Its defensive umbrella would ensure that local military assets are protected and remain available to meet their military missions.

The proposed Army AMDTF on Guam contains the following three missile components:

- The Terminal High-Altitude Area Defense (THAAD) system is a long-range, land-based theater defense weapon which acts as the upper tier of defense against ballistic missiles. This system is designed to intercept missiles during late mid-course or final stage flight. The THAAD flies at high altitudes and provides broad area coverage against threats to critical assets such as population centers, industrial resources, and military forces.
- Patriot Missiles target short-range ballistic missiles which threaten the THAAD or other civilian or military assets on Guam. This weapon system is a point defense option with limited range designed to strike ballistic missiles, aircraft, unmanned aerial vehicles, and cruise missiles just before impact. This system utilizes hit-to-kill technology.
- A Surface-Launched Advanced Medium-Range Air-to-Air Missile (SLAMRAAM) engages targets to beyond line-of-sight and defends against the air threat from unmanned aerial vehicles and cruise missiles.

The Army AMDTF is a ground force and would not be accompanied by aircraft or ships. Components would include command and control, missile field teams, maintenance, and logistics/supplies support. The proposed mode of operation relies on inter-service agreements for all other support facilities.

2.5.1.1 Administration/HQ and Maintenance

During a typical notional work week, operations at the administration/HQ and maintenance facilities would occur 12 hours per day and 5 days per week. Each day, approximately 630 personnel would first report to the administration/HQ facilities for daily briefings and other activities before reporting to their assigned duty locations, including the emplacement sites.

Maintenance activities, including vehicle services (oil changes and lubrications, brake jobs) and any engine maintenance repairs that are needed would be conducted. Other repair activities would include air conditioning repair, generator repair, communication equipment repair and testing, and radar system

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repairs (may require radiating to validate repair). Painting would only be done for minor repairs. Other activities would include storage of petroleum, oils and lubricant products, battery storage, fuel dispensing, and welding.

2.5.1.2 Weapons Emplacement Sites

Planned preventive maintenance would require a minimum continuous period of 45 minutes daily Monday-Friday. Personnel would be on-site after initially reporting to administration/HQ and the system would be active based on need. Each THAAD and Patriot Missile facility would be maintained by approximately 25 personnel at any given time.

2.5.1.3 Training

Two major categories of training would be required: individual/crew and collective. Individual/crew training would include basic rifle marksmanship and crew-served weapons training. Training ranges on Guam and in the CNMI are considered joint use (i.e., available to all U.S. forces). Consequently, the Army would utilize ranges within the Mariana Islands Range Complex for this type of training. Collective training would be required for the AMDTF. Regular crew training on all aspects leading up to and through a launch would be required for THAAD, Patriot, and SLAMRAAM weapons systems. These training exercises would be conducted at the Army facilities and no training-specific facilities would be required. No live-fire missile launch training exercises would occur on Guam or in the CNMI.

2.5.2 Proposed Action

The Army AMDTF proposed action for the development of facilities and infrastructure consists of five main elements:

1. Administration/HQ and maintenance facilities
2. Munitions storage
3. Unaccompanied and family housing and associated QOL facilities
4. SUA (a restricted area) due to potential radar operation hazards to military and civilian aircraft
5. Weapons emplacement sites

The administration/HQ and maintenance facilities would comprise approximately 28 ac (11 ha) of developed land that includes a battalion HQ, company facilities, and tactical vehicle maintenance facilities. The siting options and analyses, including the alternatives considered and dismissed for HQ, operations, bachelor quarters, and family housing would be as described for the Marine Corps portion of the proposed action (see Section 2.2). Requirements for the facilities are addressed in the Marine Corps Main Cantonment component as the Army and Marine Corps would be sharing these facilities. The AMDTF support facility alternatives are: co-location of support facilities with the Marine Corps facilities at Naval Computer and Telecommunications Station (NCTS) Finegayan; locating the Army AMDTF support facilities at Navy Barrigada; and a combination of co-location of HQ facilities with the Marine Corps facilities at NCTS Finegayan and placement of housing facilities at Navy Barrigada and Air Force Barrigada.

Eight new climate-controlled, ECMs, and/or Modular Storage Magazines are proposed on Andersen AFB approximately 1 mi (1.6 km) north of the junction of Route 9 and Route 3A. The ESQD arcs are an important operational component of munitions storage. These are planning areas that surround explosive hazard sites and define the minimum permissible distance between the hazard of the explosive and any inhabited building, public assembly area, and/or the boundary of Department of Defense (DoD) lands. The ESQD arcs for existing munitions storage facilities in MSA 1 encompass much of the land in central

Andersen AFB. Due to the hazards associated with the munitions to be stored in them, the ESQD arcs for the proposed new munitions storage facilities would extend to 1,250 feet (381 m) from each magazine. The ESQD arcs for the new magazines would encompass land outside the area of existing ESQD arcs, so the existing arcs would expand.

During THAAD radar operation, there is a potential hazard to military and civilian aircraft. Therefore, a proposed SUA would be located along and off the northwest coast of Guam. The SUA would consist of a proposed Restricted Area (R-7205) to accommodate hazards associated with THAAD radar operations. Planned preventive maintenance would require a minimum continuous period of 45 minutes daily Monday-Friday. Training and certification periods would be processed to the FAA for approval to use the R-7205 airspace. The FAA would issue a Notice to Airmen prior to scheduled use of the airspace.

The weapons emplacement sites would be constructed to accommodate THAAD and Patriot launcher operations. Associated facilities would include hardstands, readiness buildings, missile and launcher facilities, and inclement weather storage. The Avenger/SLAMRAAM operations are mobile units. Weapon platform siting is classified and is assessed in Classified Appendix L to this Final EIS. This classified information will be reviewed by regulatory agency personnel with the appropriate security clearance.

2.6 RELATED ACTIONS – UTILITIES AND ROADWAY PROJECTS (GUAM)

The proposed military growth on Guam associated with the relocation of the Marines, the Navy aircraft carrier berthing, and Army AMDTF would increase demands on power, potable water, and wastewater utilities. The proposed actions would also affect the remaining life of the solid waste facilities currently on Guam. For purposes of this EIS, utilities actions are considered “related actions”, to be implemented as a part of the proposed actions. To meet the estimated future demand resulting from the proposed actions, basic and long-term alternatives for certain utilities were developed and are presented in Volume 6. The four utilities evaluated are listed below:

- Power
- Potable Water
- Wastewater
- Solid Waste

It must be understood that utility and roadway alternatives are tied to the alternatives for the main NEPA actions: the Marine Corps Relocation, the Marine Corps Relocation Training on Tinian, the Aircraft Carrier Berthing, and the Army Air & Missile Defense Task Force. The utility and roadway alternatives are evaluated as options for the best approach considering their impacts to the various resource categories, but are not independent alternatives. Since the utilities are related actions, the “no-action” alternative is not really pertinent to their analyses and presentation. Thus, in Volume 6, “no action” is not evaluated for utilities. However, Chapters 3 and 4, Affected Environment, characterize the existing utility and roadway conditions that would likely continue in the absence of the proposed Marine Corps, Navy and Army actions.

The utility alternatives presented may be either basic alternatives to meet both immediate and long-term needs; or long-term alternatives that would meet needs beyond the temporary surge of the proposed relocation. In addition, while basic alternatives are addressed with known or project-specific information, long-term alternatives are dealt with more generally at a programmatic level. This approach anticipates that long-term alternatives may not be implemented in time to accommodate the Marine Corps relocation schedule. However, basic alternatives would be readily available for pursuit upon signature of the Record of Decision.

DoN representatives have been meeting regularly with Guam Power Authority (GPA) and Guam Waterworks Authority (GWA). These meetings have been to coordinate needed utility upgrades, identify the best technical solutions, discuss business solutions to implement the technical solutions, and lead toward viable utility solutions both on base and off base. Volume 1, Section 4.3 describes the progress made regarding each utility.

It is anticipated that some utilities solutions would be implemented by Special Purpose Entities (SPEs), which would likely be private business entities formed to finance, operate, manage, upgrade, or develop utility plants and associated infrastructure such as collection or distribution systems. It is anticipated that in accordance with the Realignment Roadmap the SPEs would utilize \$740 million of Government of

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Japan financing for utilities infrastructure improvements to support for the 3rd Marine Expeditionary Force (III MEF) forces that would be realigning from Okinawa to Guam. Alternatively, Government of Japan financing could be provided to Guam utilities to conduct the upgrades. The precise manner in which these SPEs would operate is not known. The Department of the Navy will not exercise any authority or control over the SPEs but is committed to facilitate discussions between the Government of Japan, the SPEs, and Guam to focus SPE efforts on addressing utility impacts associated with the realignment, including short-term construction work force and long-term population growth. The U.S. Government would then likely purchase utilities from the SPE or Guam utility under a utilities service contract. Fees generated through utilities service contracts could be used by the SPE or Guam utility to repay financing costs or a portion thereof. The DoD rate structure that would be established with any utilities service contract with a SPE or Guam utility would reflect current rates adjusted for inflation. Given that these SPEs have yet to be formed, these business arrangements are not currently defined in detail. Therefore, they are presented as “conceptual” business arrangements.

Long-term utility alternatives, if necessary, may require further NEPA-tiered and/or supplemental documentation as they are not evaluated herein at the project specific level, but only programmatically. If the NEPA documents are tiered from this Final EIS, the proposal and documentation would be procedurally related to the large-scale proposals to implement any of the long-term alternatives presented.

Volume 6 also evaluates the related action pertaining to roadway improvements on Guam. The Guam Road Network (GRN) is comprised of the non-military roadway system on the island of Guam. Construction of the GRN is required to provide mission-critical transportation infrastructure as part of the planned construction, training, and operations associated with the Marines, Navy, and Army proposed actions. Improvements to the roadway network are needed to allow efficient and safe access to military lands for construction of facilities and to accommodate both military-related and projected organic (ongoing) traffic growth on Guam. Without improved roads and bridges, the movement of people, materials, equipment, and waste associated with construction and operations would result in congestion. Additionally, the resultant wear and tear on existing roads could severely limit the construction schedule if these roadway and bridge projects are not implemented. Proposed improvements to the GRN would result in roadway strengthening, bridge replacement, increasing roadway capacity, roadway realignment (Route 15), providing new access, and enhancing roadway safety in response to construction for military relocation and growth.

2.7 CONSTRUCTION

This subsection discusses the construction aspects of the proposed actions and alternatives. Based on the estimates of the project planners, the proposed actions would result in approximately \$12 billion, in 2008 dollars, worth of construction occurring on Guam between 2010 and 2016. Although the desired completion date for Marine relocation is 2014, the construction would likely continue to 2016.

The physical environment is primarily affected during the construction phase due to the actual physical aspects of construction. Construction would typically include (1) demolition, site clearing and grubbing, and grading; (2) horizontal layouts including placing infrastructures and roadways; and (3) vertical building including building of facilities, structures, housing, and related uses such as parks, training areas, and landscaping. Construction activities are typically short-term and in most cases would be completed in a 1- to 2-year period. However, because construction would likely occur in different geographical areas concurrently, the impacts, especially when considering commonly used facilities, such as roads, utilities, landfill locations, ports, and workers' housing, would have individual as well as a cumulative impact. See Volume 7, Proposed Mitigation Measures, Preferred Alternatives' Impacts, and Cumulative Impacts, for more information.

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2.7.1 Overview

2.7.1.1 Military Construction Funding

Military construction funding would be used for a significant portion of the construction for the proposed actions. The Congressional Armed Services Committees specify military construction funding by state/territory, installation, and project in the actual statutory language. Once the funds are appropriated, they can be spent over a five year period. This form of funding provides much greater flexibility than operations and maintenance funding that must be obligated (spent) for the year appropriated. Volume 7, Chapter 2 presents two proposed mitigation measures that would impact the on-island population during construction to reduce the impacts. One proposed mitigation measure is to extend the arrival time of military personnel and their dependents to trail construction without altering the construction schedule. This is referred to as a reduction in force flow. A second proposed mitigation measure is adaptive program management. The DoD would adaptively manage the construction by slowing the tempo of construction and the adjusting sequencing of construction activities to directly influence workforce population levels associated with the proposed action before unacceptable conditions exceed infrastructure capabilities. The latter mitigation would also likely result in reduced force flow.

2.7.1.2 Value and Schedule

The proposed actions would be constructed over a six year period: 2010 - 2016.

Construction values have been calculated for each year, for each DoD component, and for the related actions direct and indirect impacts. The schedule and values are summarized in Table 2.7-1.

Table 2.7-1. Unconstrained Construction Values

<i>Year</i>	<i>Marine Corps</i>	<i>Navy</i>	<i>Army</i>	<i>Related Actions</i>	<i>Totals</i>
2010	\$424,780,371	\$0	\$0	\$99,666,667	\$524,447,038
2011	\$1,022,986,846	\$61,320,000	\$0	\$217,666,667	\$1,301,973,512
2012	\$1,647,695,494	\$81,760,000	\$0	\$483,560,000	\$2,213,015,494
2013	\$2,108,773,907	\$81,760,000	\$0	\$532,293,333	\$2,722,827,241
2014	\$2,034,326,311	\$61,320,000	\$241,581,604	\$468,293,333	\$2,805,521,248
2015	\$1,409,617,662	\$0	\$241,581,604	\$202,400,000	\$1,853,599,266
2016	\$523,758,878	\$0	\$0	\$54,000,000	\$577,758,878
Total	\$9,171,939,469	\$286,160,000	\$483,163,208	\$2,057,880,000	\$11,999,142,677

Note: The above are in 2008 dollars.

Source: NAVFAC Pacific 2009b.

2.7.1.3 Locations

The primary locations of Marine Corps, Navy, and Army, utilities and road widening construction are identified in Table 2.7-2 through Table 2.7-6.

Table 2.7-2. Primary Locations of Marine Corps Construction

<i>Facility</i>	<i>Location</i>	<i>Alternative</i>
Main Cantonment	Finegayan (NCTS & South)	Alternatives 1, 2, 3, & 8
	NCTS (Potts Junction)	
	Former FAA	Alternatives 1, 2, & 8
	Harmon Annex	Alternative 1
	Air Force Barrigada	Alternatives 3 & 8
	Navy Barrigada	Alternative 3
Marine Corps Air Combat Element	Andersen AFB North Ramp	Alternatives 1, 2, 3, & 8
Training Facility	Andersen South	Alternatives 1, 2, 3, & 8
Munitions Storage	Fena NMS	Alternatives 1, 2, 3, & 8
Munitions Storage Area 1 Storage	Andersen AFB	Alternatives 1, 2, 3, & 8
Air Embarkation	Andersen AFB	Alternatives 1, 2, 3, & 8
Victor Wharf Embarkation	Naval Base Guam	Alternatives 1, 2, 3, & 8

Table 2.7-3. Primary Locations of Navy Construction

<i>Facility</i>	<i>Location</i>	<i>Alternative</i>
Aircraft Carrier Wharf Apra Harbor	Naval Base Guam	Alternatives 1 & 2

Table 2.7-4. Primary Locations of Army Construction

<i>Facility</i>	<i>Location</i>	<i>Alternative</i>
Army Missile Defense	Finegayan	Alternatives 1 and 3
	Navy Barrigada	Alternative 2
Munitions Storage	Andersen AFB	Alternatives 1, 2, & 3

Table 2.7-5. Primary Locations of Utilities Construction

<i>Facility</i>	<i>Location</i>	<i>Alternative</i>
Recondition Power Stations plus transmission and distribution upgrades	Northern & Central Guam	Basic Alternative 1
Additional water capacity of 11.3 million gallons per day (MGd), which is anticipated to be met by an estimated 22 new water supply wells, refurbish some existing wells, water line improvements, ground level and elevated water tanks	Northern, Central & Southern Guam	Basic Alternative 1
Additional water capacity of 11.7 MGd, which is anticipated to be met by an estimated 31 New Water Supply Wells, Refurbish Some Existing Wells, water line improvements, ground level and elevated water tanks	Northern, Central & Southern Guam	Basic Alternative 2
Development of Lost River	Southern Guam	Long-Term Alternative 1
Desalination	Northern and Central Guam	Long-Term Alternative 2
Dredging of Fena Reservoir	Southern Guam	Long-Term Alternative 3
Refurbish Northern District Wastewater Treatment Plant (NDWWTP) Primary Treatment and expand/Upgrade to Secondary Treatment	Northern and Central Guam	Basic Alternative 1a
Refurbish Primary and expand/Upgrade to Secondary Treatment at NDWWTP and include a New Sewer from Barrigada to NDWWTP	Northern and Central Guam	Basic Alternative 1b
New Stand-Alone DoD Only Primary/Secondary Treatment Plant on DoD Property With New Outfall and Collection System.	Northern & Central Guam	Long-Term Alternative 1
Utilize Existing Navy Landfill Until New Layon Landfill is Open. Continue to use existing Navy Landfill for waste streams not accepted by Layon Landfill.	Southern Guam	Basic Alternative 1

Table 2.7-6. Primary Locations of Roadway Widening and Bridge Replacement Construction

<i>Facility</i>	<i>Location</i>	<i>Alternative</i>
Route 3	Route 1 to Route 9 – North	Alternatives 1, 2, 3, & 8
Route 9	Route 3 to Andersen AFB – North	Alternatives 1, 2, 3, & 8
Route 8	Route 33 (east) to Route 1 – Central	Alternatives 1, 2, 3, & 8
Route 16	Route 10A to Sabana Barrigada – Central	Alternative 2
Route 8A	Route 16 to Air Force Barrigada – Central	Alternative 2
Route 25	Route 16 to Route 26	Alternatives 1, 2, 3 & 8
Route 26	Route 1 to Route 15	Alternatives 1, 2, 3 & 8
Route 28	Route 1 to Route 3	Alternatives 1, 2, 3 & 8
Agana Bridge (GRN #3)	Route 1	Alternatives 1, 2, 3 & 8
Agueda Bridge (GRN #35)	Route 1	Alternatives 1, 2, 3 & 8
Asan Bridge #1 (GRN #35)	Route 1	Alternatives 1, 2, 3 & 8
Asan Bridge #2 (GRN #35)	Route 1	Alternatives 1, 2, 3 & 8
Atantano Bridge (GRN #35)	Route 1	Alternatives 1, 2, 3 & 8
Fonte Bridge (GRN #35)	Route 1	Alternatives 1, 2, 3 & 8
Laguas Bridge (GRN #35)	Route 1	Alternatives 1, 2, 3 & 8
Sasa Bridge (GRN #35)	Route 1	Alternatives 1, 2, 3 & 8

Proposed dredging is described in Volumes 2 and 4 would be performed at two Apra Harbor locations:

- Sierra Wharf, Inner Apra Harbor - 327,000 cy (250,000 m³) of dredged material, including 2 ft of overdredge
- Aircraft Carrier Wharf, Outer Apra Harbor - 479,000 to 608,000 cubic yards (366,221 to 464,849 m³)

Beneficial reuse of dredged material for use in local construction or other rehabilitation projects would be investigated. A second option is upland placement. Five potential associated dredged material upland placement sites are located in the vicinity of Inner Apra Harbor. One or more of the following would be identified for use during the Army Corps of Engineers (ACOE) permit process:

- Polaris Point
- Public Works Center
- Field 3
- Field 4
- Field 5

EPA is in the process of designating an ocean dredged material disposal site that would be a third option for the management of dredged material from Apra Harbor, if the material meets rigorous laboratory testing criteria.

2.7.1.4 Construction Requirements

The goal for all proposed construction (and design) is Leadership in Energy and Environmental Design (LEED) Silver rating. The major construction categories would include demolition, clearing and grubbing, grading, structural concrete foundations, building envelope (structural, walls, roofs and insulation), finishes, and subsystems (electrical, plumbing and electrical).

Demolition would generate a significant volume of material, as described in Volume 6, Section 2.4. Asbestos, lead-based paint, and other materials would be assessed and appropriately handled and disposed of primarily on-island.

DoN guidance and qualification for LEED Silver points requires a minimum of 50% of non-hazardous waste and demolition debris be recycled. Discrete items such as doors, windows, cabinets, plumbing, and lighting fixtures can be re-used if removed for reuse. Metal components of rough-in systems, such as conduit and wire, pipe, and duct work can be recycled. Concrete can be crushed for re-use in new portland cement and asphaltic concrete, and as aggregate base below footings, slabs, parking areas, and roads. The presence of paint on most of the existing concrete would affect how the concrete is prepared for use in re-use methods. The alkali content and presence of rebar in existing concrete would be addressed as a part of re-use plans. Emissions from a concrete crushing reuse facility would be controlled according to applicable statutes and regulations.

The clearing and grubbing would generate a mix of soil and organic material. Soil encountered is not expected to be contaminated; however, if it is within an area of known contamination or suspected contamination, the soils would be tested and, if contaminated, would likely be disposed of off-island.

In known uncontaminated areas, the possibility of allowing interested islanders to harvest plants that would be cleared is being considered; also, the contractor may be asked to set plants and trees aside for replanting and/or landscaping after the project is completed. The latter would allow existing indigenous and/or native plants already adapted to the area to be reused and reduce the need to purchase and use exotic plants. Other woody brush, such as tangantangan (*Leucaea leucocephala*), can be removed and used for mulch. Based on Guam landfill requirements, green waste would be recycled and not placed in public landfills.

The proposed new Guam landfill is located in Layon, near the village of Inarajan. This new landfill is not intended for construction debris disposal but it can use construction debris in its operation (recycled into beneficial use). Construction debris that is not recycled would be directed to Guam Environmental Protection Agency-approved landfills. Grading generally would not create excess material. All clean soil and rock would likely be used on the originating site. Additionally, where possible, soil and rock would be stockpiled and used for other DoD construction projects. Reuse of the concrete, plant materials, clean soil, topsoil, and rock would constitute cost savings as well as promote recycling. Compaction of aggregate and soil would require water and where possible surface runoff water would be captured and used. Fill and/or engineered fill (aggregate or specific ratios of varying sizes) would likely be required but stockpiled material would be selected before new aggregate materials are purchased. Grading typically requires dust control and periodic or continuous watering may be needed. However, because rainfall occurs frequently (85 inches [215 centimeters] to 115 inches [235 centimeters] annually) on Guam and the humidity is high, continuous or frequent watering may not be needed. In order to save potable water resources, designers and contractors would consider captured runoff or brackish water use for water control. Stormwater Pollution Prevention Plans employing Best Management Practices would be prepared and implemented during the grading work.

All material used at the sites, with the exception of aggregate, clean soil, and topsoil would be imported from off-island. Because most of the construction materials used must be imported from off-island, the DoD would reuse demolition waste and recover and use plant materials, clean soil, topsoil, and rocks when effective. This would limit construction materials from off-island thus reducing the need to dispose of the recovered material in a landfill and the resources and facilities needed to ship materials to Guam.

Foundations, walls and roofs would be primarily concrete; some may be cast-in-place and some may be precast. Concrete batch plants would likely be set up on larger construction sites for cast-in-place construction and possibly precast facilities. On-site batch plants would require delivery of cement via specialty hopper trucks; aggregate via 18-20 cubic yard (14-15 cubic meter) dump trucks; and other minor ingredients of concrete (admixtures) primarily delivered in small bulk containers, sacks, and as liquid in drums.

Precast operation may also be set up at other sites that would require truck transportation of precast panels to the site. Some wall construction may use concrete masonry units, which would be fabricated in an off-site specialty yard. For smaller sites, and at some larger sites, concrete would be delivered in mixer trucks from commercial off-site concrete batch plants. All other 'post-structural' building and construction work would involve on-site workers installing delivered material.

Table 2.7-7. Estimated Total and Off-island Construction Workers Needed for DoD Projects

<i>Year</i>	<i>Marine Corps</i>	<i>Navy</i>	<i>Army</i>	<i>Related Actions</i>	<i>Totals</i>
2010	3,186	0	0	748	3,934
	2,624	0	0	615	3,239 (82%)
2011	7,627	460	0	1,633	9,720
	6,447	386	0	1,369	8,202 (84%)
2012	12,358	613	0	3,627	16,598
	10,589	525	0	3,100	14,214 (86%)
2013	15,816	613	0	3,992	20,421
	13,817	535	0	3,482	17,834 (87%)
2014	15,257	460	1,812	3,512	21,041
	13,329	401	1,580	3,063	18,373 (87%)
2015	10,572	0	1,812	1,518	13,902
	9,236	0	1,580	1,324	12,140 (87%)
2016	3,928	0	0	405	4,333
	3,432	0	0	353	3,785 (87%)

Notes: White rows represent the estimated total number of construction workers needed for DoD projects. Shaded rows represent the estimated off-island construction workers needed for DoD projects. Parentheses represent the percentage of off-island construction workers compared to the total number of construction workers.

2.7.1.5 Labor Force Requirement for DoD Projects

There would be a demand for construction-related labor for DoD projects between the years of 2010 and 2016. The estimated demand of total labor, off-island-sourced labor by year, and DoD component and related actions is shown in Table 2.7-7. The table presents unconstrained values.

There is an inadequate supply of labor available on Guam for all categories of work: management, supervision, skilled labor, and general labor. Management support during the past years of high construction activity (1990-1996) primarily came from the U.S., Japan, Korea, and Australia. It is reasonable that this historical pattern would be repeated for these proposed actions.

Historically, skilled, semi-skilled, and general labor primarily came from the Philippines and China but some skilled labor came from the other areas of the U.S. This historical pattern may be repeated, with at least two differing conditions:

- Early phases of the construction are expected to occur during reduced level of American and worldwide economic activity. This may cause jobs on Guam to be more attractive to Americans living in the continental U.S. than they were in the early 1990s.
- Use of Chinese labor in the 1990s included a high level of misrepresentation of workmen's skills. The nature of construction in China is such that skill levels in many cases are lower, and the knowledge required to execute the work do not match American style construction practices. There may be an effort by public and private entities to minimize, or even prevent such workers from being brought to Guam for the proposed actions.

Workers may be available from the CNMI and the Federated States of Micronesia. The skill level and knowledge of American construction practices are also limited in these groups. They have been used in the past with some success for labor type work but would be a numerically insignificant source of labor for the proposed actions, especially for skilled labor.

If adequate workers are not willing to travel from other parts of the U.S. to Guam to work, then foreign workers would be required to make up the shortfall. Legally, this is accomplished by issuing H-2B visas to workers from other countries, such as the Philippines. These visas are issued for specific projects and expire on completion of the work.

Although there is no conclusive method to determine where most of the off-island construction workers (under H-2B visas) would originate from, it is likely that a majority of these workers would be from the Philippines. This is because (1) Filipinos speak English, and their skill sets and construction knowledge and practice in the Philippines most closely match that of the U.S., when compared with any other nearby nations; (2) the proximity of the Philippines to Guam and the familiarity of cultural aspects on Guam; and (3) worldwide, Filipino workers represent the highest number of expatriate workers in other countries (approximately 2 million in 2008) with an estimated remittance sent back to the Philippines of \$3.2 billion (Government of the Philippines 2008).

The widespread employment of H-2B workers may lead to only a small number of workers from the U.S. mainland being employed on construction projects related to the proposed actions. U.S. mainland labor may be hesitant to work on Guam since Guam tends to have lower construction wages than other U.S. regions; the lower wages can, partially, be attributed to the availability of H-2B labor. However, the current economic downturn has resulted in substantial unemployment among construction workers on the U.S. mainland and these workers may look to Guam for employment opportunities. Also, Guam labor law guarantees that U.S. citizens get first priority in job placement.

2.7.1.6 Work Force Housing

Applications for work force housing permits, conditions on workforce housing operators and the indirect impacts of workforce housing are discussed in this Volume, Chapter 4, Section 4.15.

2.7.1.7 Aggregate Requirements

Aggregate material is used in construction. It is used in concrete and pavement mixes. It can also be used as backfill. Aggregate material is divided into either coral or basalt based on its origin. It can be further divided based on its intended use.

Transportation

There are four sites on Guam from which coral aggregate material can be gathered. Basalt aggregate would be imported to Guam via ocean transportation through the Port of Guam and then transported in trucks to specific Guam locations.

Stockpile

Some aggregate material may require stockpiling off-site, depending on the availability of an area at the construction sites. Several areas may be available for off-site stockpiling such as Harmon Industrial Park, and currently undeveloped areas in Yigo and Dededo. Some on-site stockpiling may be possible at Finegayan, North Ramp, and the wharf. On-site stockpiling is less costly for the government if an area is available.

2.7.1.8 Equipment Requirements

Import of grading equipment, trucks, cranes, and small equipment would occur. There is equipment on-island but currently not enough for the proposed actions especially if multiple construction projects occur during the same time period.

2.7.1.9 Fuel Requirements

All powered equipment would be powered by diesel, gasoline, and possibly propane fuel.

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