

**FINAL
(VERSION 4)
COMMONWEALTH OF THE NORTHERN MARIANA
ISLANDS JOINT MILITARY TRAINING
SOLID WASTE STUDY**



Department of the Navy
Naval Facilities Engineering Command, Pacific
258 Makalapa Drive, Suite 100
JBPHH HI 96860-3134

August 2014

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EXECUTIVE SUMMARY

PURPOSE

The purpose of this report is to provide specific information related to (insert specific study purpose here) associated with the proposed action to establish a series of live-fire and maneuver ranges, training areas, and support facilities on the islands of Tinian and Pagan within the Commonwealth of the Northern Mariana Islands (CNMI). Figure ES-1 provides an overview of the CNMI, and Figure ES-2 and Figure ES-3 provide an overview of Tinian and Pagan, respectively.

BACKGROUND

The United States (U.S.) Pacific Command has identified unfilled unit level and combined level training requirements in the Western Pacific. U.S. Pacific Command designated U.S. Marine Corps Forces Pacific (a part of the Marine Corps) as Executive Agent to address the unfilled training requirements. To address these shortfalls, the U.S. Marine Corps is overseeing the development of the CNMI Joint Military Training (CJMT) Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS) for the proposed action. Proposed actions on Tinian would focus on unit level training requirements, while actions on Pagan would focus on combined level training requirements.

There are two different training tempos proposed for both Tinian and Pagan. The first training tempo is the proposed action presented in the CJMT EIS/OEIS, consisting of 20 weeks per year on Tinian and 16 weeks per year on Pagan. In the future, the training tempo might be increased to 45 weeks per year on Tinian and 40 weeks per year on Pagan and is addressed by the CJMT EIS/OEIS as a potential future action. This study addresses both training tempos.

SUMMARY

Tinian

Existing Conditions. Solid waste on Tinian is currently transported by residents and business entities to the Tinian Municipal Dump, an open and non-compliant dump site near San Jose located south of the Tinian International Airport. This site does not comply with Resource Conservation and Recovery Act (RCRA) Subtitle D regulations and operates under a notice of violation issued by the CNMI Department of Environmental Quality. As such, the current Tinian Municipal Dump would not suffice as an option for the U.S. military to dispose of CJMT-generated municipal solid waste (MSW).

The CNMI Department of Public Works is required to maintain the Tinian Municipal Dump in accordance with an Administrative Order issued by the CNMI Department of Environmental Quality, which requires the application of daily cover material and prohibits burning wastes, among other operational requirements (DEQ 2010). The Administrative Order was issued in 2010 as a cease-and-desist action serving to document the findings of violations of the CNMI solid waste regulations.

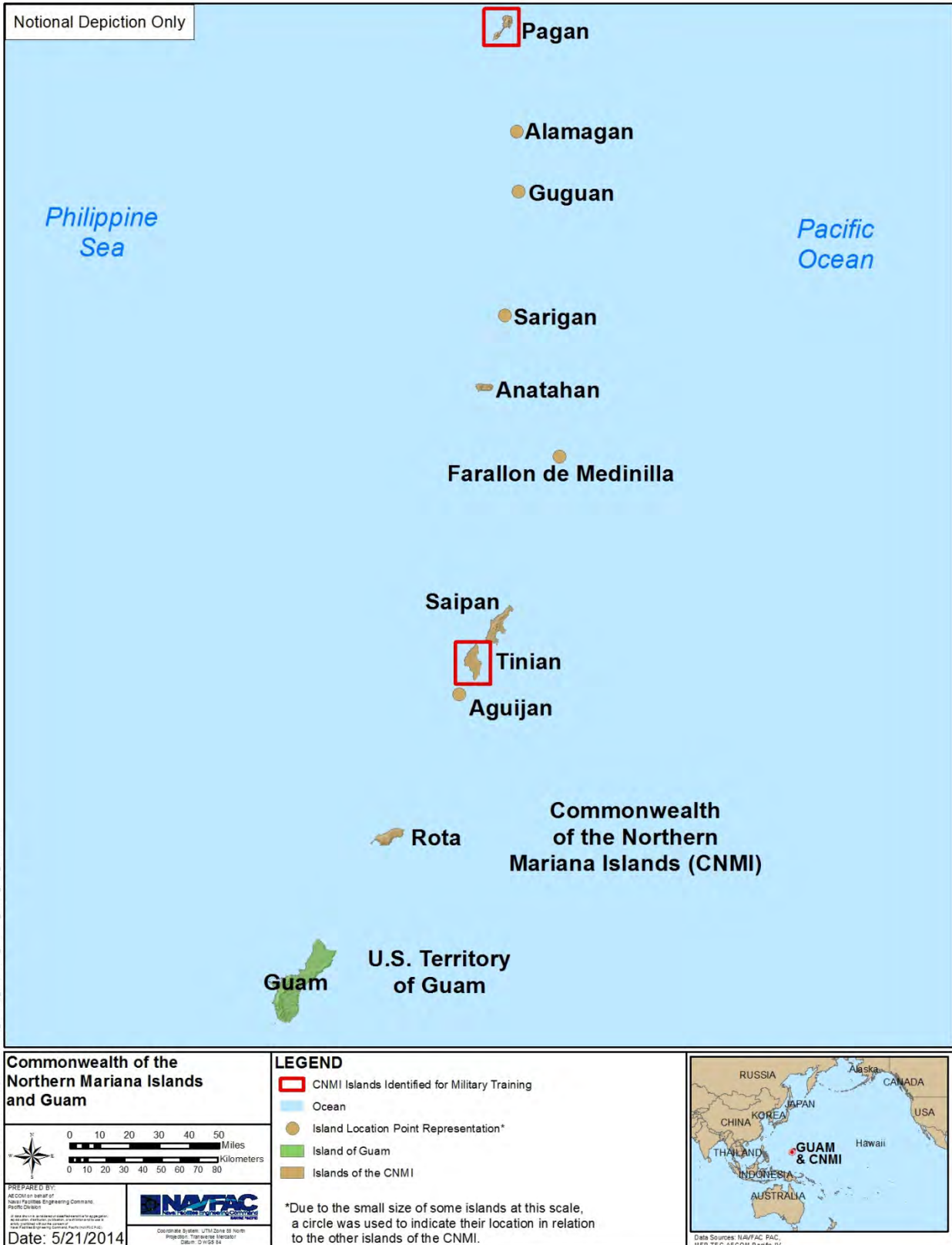


Figure ES-1. Commonwealth of the Northern Mariana Islands and Guam

Source: DoN 2014.



Figure ES-2. Island of Tinian and the Military Lease Area

Source: DoN 2014.

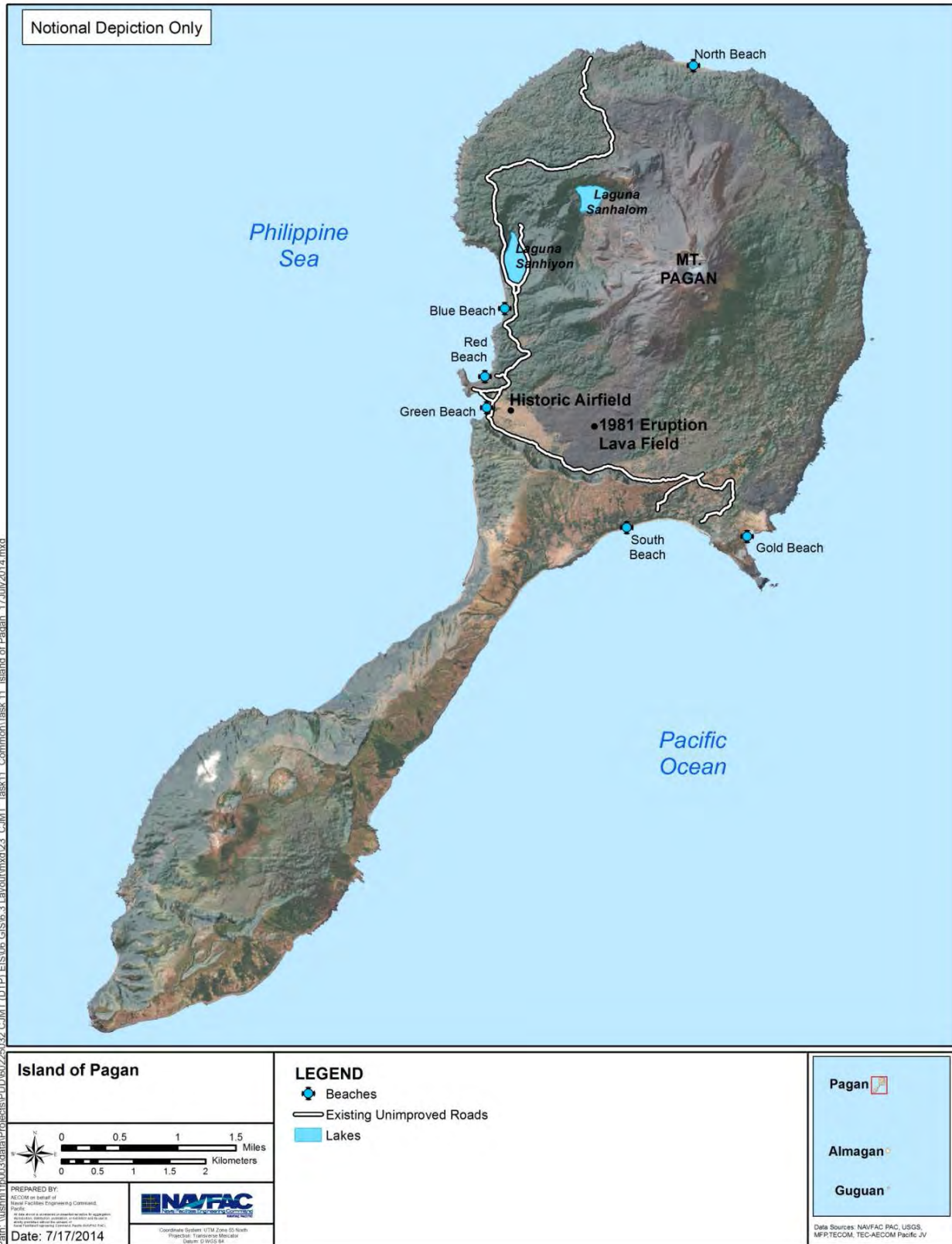


Figure ES-3. Island of Pagan
 Source: DoN 2014.

The CNMI Capital Improvement Project Office proceeded with design contracts to build a RCRA-compliant landfill to be located within the Military Lease Area (MLA) without any assurances from the military that the land would be available as excess military property when construction was to commence. The site, commonly called the Atgidon site, is within the MLA in the location of proposed future training ranges. An associated solid waste transfer station facility was also designed to be located on public lands in the village of San Jose. The U.S. military has agreed to do preliminary assessments of other locations for a combined municipal and military solid waste landfill. Building a landfill outside of the MLA was considered in previous versions of this study. Two locations in the southern part of Tinian were determined to be of sufficient size and meet regulatory and technical requirements. The finalized landfill study is included in Appendix B. However, discussions in March 2014 between the CNMI government and the U.S. military determined that the two proposed sites were unsuitable as a landfill location. Therefore, the landfill option was removed from consideration.

Requirements. The solid waste handling requirement for the proposed military action on Tinian is based on supporting 1,500 military trainees to be housed in permanent facilities, an additional 1,500 surge trainees to be housed in tents, and 100 permanent staff that would work at the base camp and live in the community. The total military population of 3,100 represents the maximum number of personnel projected to participate in unit level training. The training participants would use the Tinian facilities for up to 2 weeks at a time, not including the pre- and post-training periods of 1 week each involving a smaller number of personnel (25 to 30). The total projected live-fire training requirement would span 20 non-consecutive weeks per year. These assumptions were used to calculate the solid waste generation rates, which represent the maximum potential impact for this study analysis. The aggregate of 20 weeks of training is specified in the CJMT EIS/OEIS and represents the duration requirement that would drive the annual solid waste generation for the military. It is acknowledged that the 3,100 number is a very conservative planning figure. The study further addresses the long range training tempo of 45 weeks per year in Chapter 7, *Projected Annual Impacts for Proposed Action and Long Range Training Tempos*.

The 45-week training tempo requirement does not change the maximum military population of 3,100, but extends the duration of training, which impacts the amount of solid waste generated annually. The supported military population would form the basis for the types and sizes of the various solid waste handling facilities required to support the CJMT proposed action. The CNMI government has initiated planning and environmental assessment efforts (DCA 2012) to construct a solid waste transfer station that would handle the solid waste generated by the civilian population. An on-island solid waste disposal option could be suitable for a joint effort between the U.S. military and the CNMI; therefore, the total military and civilian generation of solid waste is considered where applicable.

Recommendations. Because there is no RCRA-compliant landfill facility to accept solid waste on Tinian, the U.S. military currently ships all MSW off island to either the Marpi solid waste facility on Saipan or the Navy solid waste facility on Guam. However, the Marpi solid waste facility is reaching capacity of its existing landfill cells, and improvements to the Marpi facility would be required should waste from Tinian be received. According to the U.S. Environmental Protection Agency, the Marpi solid waste facility operating permit was not renewed; therefore, any CJMT-generated waste would only be shipped to the Marpi facility pending the future approval of the permit. There are no regulatory impediments to shipment of MSW between the CNMI islands; however, an agreement would be required between Saipan and Tinian for long-term use of Marpi due to the increased cost of handling Tinian waste.

This study considered incineration and landfilling as possible on-island options to manage solid waste. Incineration would require 4,800 square feet (446 square meters) of paved surface area and a vertical

clearance of 48 feet (14.6 meters) to contain the incinerator and all associated air pollution control equipment. To meet CNMI and federal air emission requirements, air pollution control equipment consisting of heat recovery boilers, ductwork, bypass stack, gas quencher, wet scrubbing system caustic pump, and emission controls would be required to supplement the incinerator. The future use of any municipal waste incinerator would require compliance with CNMI and federal laws and regulations governing solid waste and air emissions. In addition, the ash waste product would need to be shipped off island to a permitted solid waste facility within the CNMI. It is assumed that the CNMI Department of Public Works would be the lead agency, with the U.S. military as a major customer in adopting incineration as the on-island waste disposal method for both the military and civilian solid waste.

Pagan

Existing Conditions. Pagan currently lacks any solid waste support infrastructure. The training on Pagan is proposed to be expeditionary and all solid waste would need to be transported off island. Current military training is rarely conducted on Pagan other than a few helicopters landing over the past few years. During these rare training events, military units were required to collect their generated MSW and transport the waste to an existing U.S. military landfill.

Requirements. The future demand factors affecting solid waste planning for Pagan are based on the cumulative durations of live-fire training ranging from 30 personnel to up to 4,000 personnel expected to participate in combined level training cycles of up to 16 non-consecutive weeks per year. The 4,000 personnel represents the ceiling and is a very conservative planning figure. The average number of personnel training on Pagan would approximate 1,260 over the 16 non-consecutive weeks when considering the specified training scenarios outlined in the *Preliminary Draft (Version 2), CJMT EIS/OEIS*, July 2014 (DoN 2014c). The military personnel would occupy temporary bivouac facilities during the proposed exercises. This study further addresses the long range training tempo of 40 weeks per year in Chapter 7, *Projected Annual Impacts for Proposed Action and Long Range Training Tempos*. The 40-week training tempo requirement does not change the maximum military population of 4,000 but extends the duration of training, which impacts the amount of solid waste generated annually.

Recommendations. Because the training on Pagan would be conducted solely in an expeditionary style, the generated solid waste would be collected by the military and deposited in waterproof containers (such as tri-wall containers) and transported via military vessel to a permitted landfill or other disposal facility. To utilize the Marpi solid waste facility, an agreement between the Department of Defense and the CNMI government would be required. The supported surge population on Pagan of 4,000 would require solid waste handling capabilities to bale, compact, and consolidate waste for off-island transportation. Separate disposal containers for recyclables (e.g., glass, paper, aluminum) would be provided on Pagan to separate the waste prior to off-island shipment. The training units would provide any required solid waste handling equipment for use during the training events.

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LIST OF ACRONYMS AND ABBREVIATIONS

§	Section	DPW	Department of Public Works
ACM	asbestos-containing material	EIS/OEIS	Environmental Impact Statement/Overseas Environmental Impact Statement
AO	Administrative Order		
APC	Area of Particular Concern		
BECQ	Bureau of Environmental and Coastal Quality	FAA	Federal Aviation Administration
C&D	construction and demolition	HPO	Historic Preservation Office
CFR	Code of Federal Regulations	MLA	Military Lease Area
CJMT	Commonwealth of the Northern Mariana Islands Joint Military Training	MSW	municipal solid waste
CNMI	Commonwealth of the Northern Mariana Islands	MSWLF	municipal solid waste landfill
CRM	Coastal Resources Management	NMIAC	Northern Mariana Islands Administrative Code
CY	cubic yard	RCRA	Resource Conservation and Recovery Act
DCA	Duenas, Camacho & Associates	RTA	Range and Training Area
DEQ	Department of Environmental Quality	U&SI	utilities and site improvements
DFW	Division of Fish and Wildlife	U.S.	United States
DOT	Department of Transportation	U.S.C.	United States Code
		USACE	U.S. Army Corps of Engineers
		USEPA	U.S. Environmental Protection Agency

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CHAPTER 1.

INTRODUCTION

1.1 OVERVIEW

This purpose of this report is to provide specific information regarding the solid waste management requirements associated with a proposed action to establish a series of live-fire ranges, training areas and supporting facilities within the Commonwealth of the Northern Mariana Islands (CNMI) to address the United States (U.S.) Pacific Command Service Components' unfilled training requirements in the Western Pacific. These live-fire ranges, training courses, and maneuver areas collectively constitute a Range and Training Area (RTA). Under the proposed action, a unit level RTA is proposed for Tinian and a combined level RTA is proposed on Pagan. The proposed action includes construction, range management, expanded training and operations (to include combined-arms, live-fire, and maneuver training at the unit and combined levels), establishment of danger zones, designation of special use airspace, and acquisition and/or lease of land to support simultaneous and integrated training. The CNMI Joint Military Training (CJMT) Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS) is being prepared to assess the proposed action. This report focuses on existing ground, air, and marine infrastructure capacity and facility requirements, proposed projects, and solid waste methodology to meet the proposed action. Figure 1.1-1 provides an overview of the CNMI and Guam, and Figure 1.1-2 and Figure 1.1-3 provide overviews of Tinian and Pagan, respectively.

There are two different training tempos proposed for both Tinian and Pagan. The first training tempo is the proposed action presented in the CJMT EIS/OEIS, consisting of 20 weeks per year on Tinian and 16 weeks per year on Pagan. In the future, the training tempo might be increased to 45 weeks per year on Tinian and 40 weeks per year on Pagan and is addressed by the CJMT EIS/OEIS as a potential future action. This study addresses both training tempos.

1.1.1 Goals and Objectives

This Solid Waste Study was prepared to analyze the condition and capacity of the existing solid waste handling infrastructure on Tinian and Pagan, describe the required waste management services to support the proposed training facilities and their operation, and make recommendations on how to provide those required services. The goal of this study is to propose workable plans that assess various municipal solid waste (MSW) solutions to accommodate waste generation for training on both Tinian and Pagan. Options to address solid waste were developed that consider the implementation, limitations, and proposed throughput of personnel on Tinian and Pagan, and the solid waste generated by the civilian sector in pursuit of joint U.S. military and civilian solutions. The study also includes an analysis of potential sites to locate a Resource Conservation and Recovery Act (RCRA)-compliant municipal solid waste landfill (MSWLF) on property that is outside the Military Lease Area (MLA) on Tinian. The potential landfill sites were evaluated to ensure compliance with all applicable regulatory requirements and screened against pertinent technical standards.

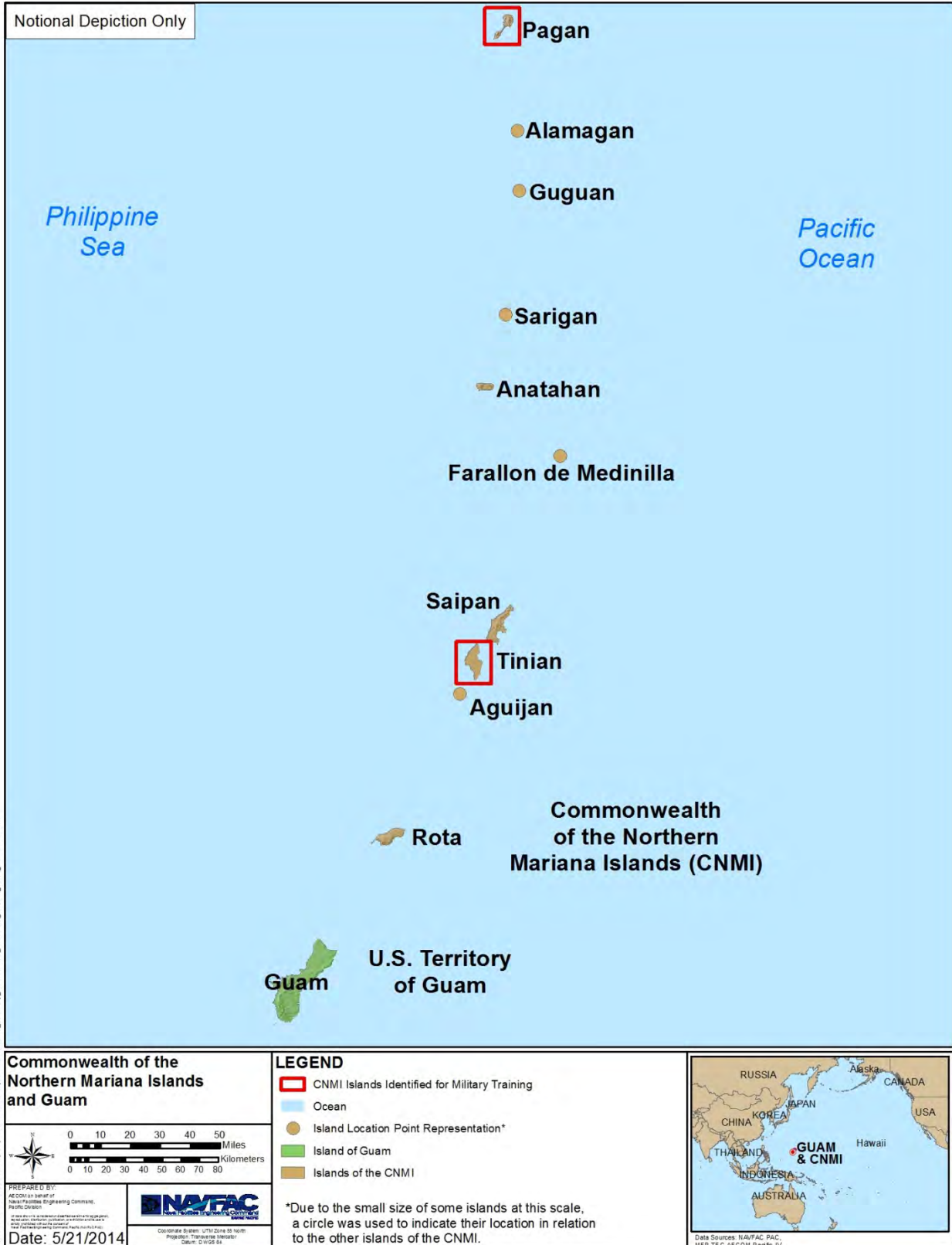


Figure 1.1-1. Commonwealth of the Northern Mariana Islands and Guam
 Source: DoN 2014.



Figure 1.1-2. Island of Tinian and the Military Lease Area
 Source: DoN 2014.



Figure 1.1-3. Island of Pagan

Source: DoN 2014.

Specific objectives supporting the stated goal of this study are summarized below:

- Gather and analyze existing studies, data, and reports to support the study.
- Evaluate solid waste solutions including a new RCRA-compliant Subtitle D (40 Code of Federal Regulations [CFR] 258) landfill on Tinian, waste volume reduction and shipping off island to a permitted MSWLF such as the Marpi solid waste facility on Saipan (assuming the permit is renewed), on-island incineration, and waste to energy.
- Prepare an Integrated Solid Waste Management Plan applicable to proposed U.S. military activities on Tinian (Appendix A).
- Examine recycling and reuse opportunities supporting U.S. federal government and military sustainability goals.
- Address impacts from solid waste generation at each of the training area alternatives on Tinian and Pagan to support the CJMT proposed action.
- Prepare a landfill siting study analyzing potential landfill sites located outside of the MLA on Tinian.

Specific information required to support this study was obtained during visits to CNMI government agencies from December 5 through December 7, 2013. The meeting minutes with the CNMI Capital Improvement Project Office and the CNMI Department of Environmental Quality (DEQ) are contained in Appendix C. (Note: The CNMI DEQ was recently reorganized along with the former Coastal Resources Management Office to form the Bureau of Environmental and Coastal Quality [BECQ]. For purposes of this report, both the DEQ and BECQ designations are used, depending on context and timing.) Related site-specific information was obtained from previous studies commissioned by the U.S. military and the CNMI (listed in Chapter 8, *References*).

EXISTING CONDITIONS

1.1.2 Tinian

Solid waste on Tinian is currently transported by residents and business entities to an open dump site near San Jose and the southwest coast (Figure 1.1-2), referred to as the Tinian Municipal Dump. This site is unlined and does not comply with RCRA Subtitle D regulations governing landfills. As such, the current Tinian Municipal Dump will not suffice as an option for the U.S. military to dispose of CJMT-generated MSW.

The CNMI Department of Public Works (DPW) is required to maintain the Tinian Municipal Dump in accordance with an Administrative Order (AO) issued by the CNMI DEQ, which requires the application of daily cover material and prohibits burning wastes, among other operational requirements (DEQ 2010). The AO was issued in 2010 as a cease-and-desist action serving to document the findings of violations of the CNMI solid waste regulations.

U.S. military units conducting exercises on Tinian collect their solid waste in waterproof containers and transport the waste to a permitted disposal facility in accordance with Appendix C of the *Marianas Training Manual, Joint Region Marianas Instruction 3500.4A* (DoN 2010).

1.1.3 Pagan

Pagan currently lacks any solid waste support infrastructure. The training on Pagan is proposed to be expeditionary and all solid waste would need to be transported off island. Current military training conducted on Pagan requires the units to collect their generated MSW and transport the waste to an existing U.S. military landfill.

1.2 ESTIMATES OF FUTURE SOLID WASTE GENERATION

1.2.1 Tinian

The future demand factors affecting solid waste planning on Tinian are based on the 1,500 military trainees and 100 permanent staff, as well as the additional 1,500 surge trainees, as described in Version 4 of the *CJMT Environmental Impact Statement/Overseas Environmental Impact Statement Development of the Description of Proposed Action and Alternatives* (DoN 2014a). The total military and support population of 3,100 projected to participate in intermittent training events that could last 1 to 4 weeks in duration with a total aggregate of up to 20 weeks of training per year was used to calculate the solid waste generation rate. The 3,100 population figure represents the maximum potential impact analyzed in this study. The supported military population would form the basis for the types and sizes of the various solid waste handling facilities required to support the CJMT proposed action. On the civilian side, the actual population of Tinian was reported to be 3,136 in 2010 (U.S. Census Bureau 2010). The CNMI government has initiated planning and environmental assessment efforts to construct a solid waste transfer station that would handle the solid waste generated by the civilian population (DCA 2012). The CNMI transfer station effort was preceded by the earlier planning and design performed in conjunction with the Tinian landfill (USACE 2005). Some options for handling and disposing of solid waste would be suitable for a joint effort between the U.S. military and the CNMI; therefore, the civilian generation of solid waste is also considered for those options.

1.2.2 Pagan

The future demand factors affecting solid waste planning for Pagan are based on the 3,000 military personnel expected to participate in combined level training cycles of up to 16 weeks per year, with a surge capacity of up to 4,000 personnel for larger exercises. The military personnel would occupy a cleared bivouac area during the proposed exercises, and would generate solid waste during their stay on Pagan.

CHAPTER 2.

ISLAND-WIDE SOLID WASTE CONDITIONS (TINIAN)

2.1 DOMESTIC SOLID WASTE

The CNMI DPW operates the existing Tinian Municipal Dump located west of 8th Avenue and south of the Tinian International Airport; however, this site does not comply with the applicable CNMI or RCRA regulations governing solid waste disposal. The DEQ issued a Cease and Desist AO to the DPW in January 2010 (DEQ 2010) documenting findings of violations regarding the operation and maintenance of the Tinian Municipal Dump. Specific operations and maintenance measures were ordered by the DEQ to more properly mitigate and control potential health hazards (see Chapter 3, *Regulatory Setting*).

No trash pickup service is available on Tinian; therefore, residents take their trash to the Tinian Municipal Dump for disposal. The CNMI offices and private businesses, including the Tinian Dynasty Hotel and Casino, transport their solid waste to the Tinian Municipal Dump as well.

2.2 CONSTRUCTION AND DEMOLITION DEBRIS

There is currently no available permitted landfill where debris generated from construction and demolition (C&D) could be properly disposed of. The amount of C&D waste that is currently generated on Tinian is relatively small given the scarcity of commercial or governmental construction work. The small amount of C&D waste is taken to the Tinian Municipal Dump for disposal.

2.3 ASBESTOS-CONTAINING MATERIAL

Given the situation at the Tinian Municipal Dump, there are no compliant sites on Tinian that can accept asbestos-containing material (ACM) waste. ACM waste must be properly packaged, labeled, and contained as special waste and transported to a permitted landfill in accordance with U.S. Environmental Protection Agency (USEPA) procedures. The Marpi solid waste facility on Saipan (upon permit renewal) and the Government of Guam Layon Landfill are both permitted to accept ACM as special waste. There would be no anticipated ACM generated during construction or demolition activities connected with the CJMT proposed action.

2.4 GREEN WASTE

Similar to C&D waste, there are no dedicated sites on Tinian for green waste disposal, nor are there any ongoing composting operations due to the small amount of green waste generated on island. The green waste generated by residents and businesses is taken to the Tinian Municipal Dump for disposal.

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CHAPTER 3. REGULATORY SETTING

The information presented in this chapter was obtained primarily from the *Comprehensive Study Report of Tinian Landfill* (USACE 2005) and updated with pertinent regulatory actions since 2005.

3.1 COMMONWEALTH OF THE NORTHERN MARIANA ISLANDS

3.1.1 Bureau of Environmental and Coastal Quality

The BECQ (formerly the DEQ) is the lead regulatory agency for solid waste management within the CNMI. Solid waste regulations have been promulgated pursuant to the *Commonwealth Solid Waste Management Act of 1989* (NMIAC 1989), the *Commonwealth Environmental Protection Act* (NMIAC 1982a), and the *Commonwealth Environmental Amendments Act of 1999* (NMIAC 1999). All U.S. military operations on Tinian and Pagan are required to comply with the BECQ as well as applicable federal and U.S. military laws and regulations.

The purpose of the regulations is to establish the requirements and criteria for new and existing solid waste management activities and solid waste management facilities including MSWLFs and other land filling operations, incineration, solid waste collection and transfer, recycling, composting, and salvage. The solid waste management regulations further require an MSWLF to comply with Part 258 (*Criteria for Municipal Solid Waste Landfills*) of Title 40 CFR, which the *Solid Waste Management Regulations* (NMIAC 2004) have adopted and incorporated by reference.

The DEQ issued a Cease and Desist AO to the DPW in January 2010 (DEQ 2010) documenting findings of violations regarding the operation and maintenance of the Tinian Municipal Dump. The AO cited violations of USEPA and *Solid Waste Management Regulations* (NMIAC 2004) and ordered the following actions:

- Prohibit the open burning of solid waste.
- Maintain a minimum of 6 inches (15 centimeters) of earthen material at the end of each operating day to control disease vectors, fires, odors, and scavenging.
- Implement a waste exclusion program to prevent the acceptance of regulated hazardous wastes and polychlorinated biphenyl wastes.
- Train employees in the recognition of hazardous wastes and polychlorinated biphenyl wastes.
- Implement measures to control illegal dumping both within and outside the dump boundary.
- Prohibit the dumping of septic tank waste within the area used for solid waste disposal.

The DPW is the CNMI agency charged with operating and maintaining the Tinian Municipal Dump and would be the lead agency tasked to manage the future operation of all solid waste disposal operations.

3.1.2 Coastal Resources Management

Public Law 3-47 (NMIAC 1983) established the CNMI Coastal Resources Management (CRM) Office within the Office of the Governor on February 11, 1983. The CRM was later reorganized by CNMI Executive Order 2013-24 (NMIAC 2013) on November 13, 2013, which merged the CRM and DEQ into

one bureau. The BECQ was formally established on January 13, 2014. The CRM program promotes the conservation and wise development of coastal resources. One of the office's functions is to coordinate the site selection permit process, thereby ensuring that permit decisions are consistent with CRM regulations.

Site selection refers to any proposed project with the potential to directly and significantly impact coastal resources. Per Title 15, Chapter 10, *Coastal Resources Management Rules and Regulations* (NMIAC 2014), the selection of a municipal sanitary landfill site and projects involving incineration would fall within the purview of this regulation.

An Area of Particular Concern (APC) is a geographically delineated area with special management requirements enforced by the CRM Office. The five APCs are:

- Shoreline (area between the mean high water mark and 150 feet [46 meters] inland).
- Lagoon and reef (area extending seaward from the mean high water mark to the outer slope of the reef).
- Wetlands and mangroves (areas that are permanently or periodically covered with water and where wetland or mangrove vegetation can be found).
- Port and industrial (land and water areas surrounding the commercial ports of Saipan, Tinian, and Rota).
- Coastal hazards (areas identified as a coastal flood hazard zone).

For the purpose of siting an on-island MSWLF, a solid waste transfer station facility, or an incineration facility, the Municipality of Tinian should avoid APCs or, if unavoidable, ensure that the proposed facilities situated within an APC would comply with CRM coastal permit requirements.

3.1.3 Division of Fish and Wildlife

The CNMI Division of Fish & Wildlife (DFW) is one of several agencies under the CNMI Department of Land and Natural Resources tasked with ensuring the long-term survival and sustainability of the CNMI's natural resources. Development proposals (e.g., major site location permit applications and associated environmental assessments) submitted to the newly formed BECQ are reviewed by DFW to ensure that negative impacts on endangered or threatened species are minimized, mitigated, or avoided. Additionally, DFW would be involved with consultation with the U.S. Fish and Wildlife Service pursuant to the federal *Endangered Species Act* (16 U.S.C. 1536) as warranted.

3.1.4 Historic Preservation Office

The CNMI Historic Preservation Office (HPO) was established by the *Commonwealth Historic Preservation Act of 1982* (NMIAC 1982b) to ensure the identification and protection of significant archaeological, historic, and cultural resources in the CNMI. Under Public Law 3-39, the HPO is mandated to review proposed developments pursuant to Section 106 of the National Historic Preservation Act of 1982 (NMIAC 1982b). A Section 106 review must be performed for projects that involve a direct, indirect, or an adverse impact on a property that is on or eligible for inclusion in the National Register of Historic Places. The responsibility of initiating and completing the Section 106 review lies with the proponent of a proposed action. The HPO assists the CRM Office with the evaluation of major site location permit applications and environmental assessments.

The HPO's input would ensure that significant prehistoric, historic, and cultural resources at or in the proximity of a proposed MSWLF are either protected from damage or that sufficient site data are

compiled prior to alteration or destruction. The proponent may also be required to complete an *Application for Historic Preservation Review* to include construction plans and location maps.

3.2 UNITED STATES FEDERAL GOVERNMENT

3.2.1 Environmental Protection Agency

Subtitle D of RCRA uses a combination of design and performance standards for regulating MSWLFs and solid waste management facilities in general. It also establishes facility design and operating standards, groundwater monitoring, corrective action measures, and conditions (including financial requirements) for landfill closure and post-closure care as enforced by the USEPA.

Subtitle D of RCRA creates a framework for federal, state, and local government cooperation in controlling the disposal of MSW. While the federal landfill rule establishes national minimum standards for protecting human health and the environment, implementation of solid waste programs remains largely the responsibility of local, state, or tribal governments. As stated above, the CNMI solid waste management regulations have adopted RCRA Subtitle D codified as 40 CFR Part 258.

Location restrictions are described in the following sections of 40 CFR Part 258:

- Airport Safety (Section [§] 258.10)
- Floodplains (§258.11)
- Wetlands (§258.12)
- Fault Areas (§258.13)
- Seismic Impact Areas (§258.14)
- Unstable Areas (§258.15)

The disposal of sewage sludge generated from the wastewater treatment process would be regulated under the provisions contained in 40 CFR Part 503, *Standards for the Use or Disposal of Sewage Sludge*.

3.2.2 Department of Commerce, Office of Coastal Resources Management

The *CNMI Coastal Resources Management Rules and Regulations* are consistent with the federal *Coastal Zone Management Act* (16 U.S.C. 1451-1465) and applicable rules and regulations (as described in Section 3.1.2).

3.2.3 United States Fish and Wildlife Service

Section 7 of the *Endangered Species Act* (16 U.S.C. 1536) outlines the procedures for interagency cooperation to conserve federally listed species and designated critical habitats. Applicable regulations codified in the *Endangered Species Act of 1973* (16 U.S.C. 1536) establish the procedural requirements to initiate the consultation process. By law, Section 7 consultation is a cooperative effort involving affected parties analyzing effects posed by a proposed action on listed species or critical habitats.

Section 7 consultation would apply to any future planning connected with the siting of solid waste facilities, as the proposed action could potentially impact endangered species and designated habitats.

3.2.4 Federal Aviation Administration

Improved reporting, studies, documentation, and statistics clearly show that aircraft collisions with birds and other wildlife are a serious economic and public safety problem. Section 503 of the *Wendell H. Ford Aviation Investment and Reform Act for the 21st Century* (U.S. Congress 2000), enacted in April 2000, addresses this hazard by prohibiting the construction or establishment of a new MSWLF within 6 statute miles (9.7 kilometers) of certain public-use airports measured from the airport property line to the landfill property line.

In its *National Plan of Integrated Airport Systems (2001–2005)* (DOT 2002), the Federal Aviation Administration (FAA) lists the Tinian International Airport as a primary commercial service facility, thus requiring compliance with the *Wendell H. Ford Aviation Investment and Reform Act for the 21st Century* (U.S. Congress 2000). However, the FAA district office acknowledges that geographic and physical limitations preclude compliance with the distance requirement; consequently, the Municipality of Tinian—through the Commonwealth Ports Authority—must apply for a variance using FAA Form 7460-1 (*Notice of Proposed Construction or Alteration*) to site an MSWLF within 6 statute miles (9.7 kilometers) of the airport.

CHAPTER 4.

SOLID WASTE SOLUTIONS FOR PROPOSED TINIAN OPTIONS

The scope of the Solid Waste Study is to assess the condition of the existing solid waste infrastructure on Tinian, and make recommendations on how to meet the needs of the CJMT proposed action. The following sections focus on the investigation of options to dispose of U.S. military-generated solid waste, both during the construction of the base camp and ranges, and during the follow-on operation of all facilities. The options include: off-island shipment of baled and volume-reduced solid waste to a RCRA-compliant landfill and on-island incineration. The incineration option would consider the combined military and civilian generated waste on Tinian.

The U.S. military has agreed to do preliminary assessments of other locations for a combined municipal and military solid waste landfill. Building a landfill outside of the MLA was considered in previous versions of this study. Two locations in the southern part of Tinian were determined to be of sufficient size and meet regulatory and technical requirements. The finalized landfill study is included in Appendix B. However, discussions in March 2014 between the CNMI government and the U.S. military determined that the two proposed sites were unsuitable as a landfill location. Therefore, the landfill option was removed from consideration.

The solid waste analysis includes an Integrated Solid Waste Management Plan (Appendix A).

4.1 GENERAL REQUIREMENTS AND CONSIDERATIONS

Both options would require obtaining one or more of the following permits:

- BECQ Solid Waste Management Permit (applicable to transfer station and recycling center construction).
- BECQ Solid Waste Processing Permits (applicable to composting operations, recycling center, and transfer station).
- BECQ Solid Waste Collection Permit (applicable to solid waste collection operations).
- BECQ Air Quality Permit (applicable to solid waste disposal using incineration).
- BECQ Landfill Permit (applicable to on-island ash monofill to support incineration option).

The permits identified above would require detailed information on the size, function, handling capacity, and equipment specifications. This information would not be known until the design details are finalized; therefore, it is recommended that the permit application be submitted through the prescribed U.S. military channels to the BECQ after the proposed design is approved.

All proposed solid waste handling options would need to address the clearing and grubbing of vegetated areas to construct the base camp, munitions storage area, and associated training ranges. The clearing operations would generate green waste. One way to divert the green waste would be to require the utilities and site improvements (U&SI) contractor(s) to set up, permit, and operate a composting operation in the designated laydown area. The contract specifications provided to the U&SI contractor(s) would include specified green waste diversion rates.

4.2 OPTION 1: PROCESS AND DISPOSE OF SOLID WASTE OFF ISLAND

The option to process and dispose of U.S. military-generated MSW at an off-island location such as the Marpi solid waste facility on Saipan would involve the construction of a solid waste transfer station and recycling center within the base camp. Use of the Marpi solid waste facility as a disposal site for Tinian MSW would be dependent on their permit being renewed and a suitable agreement between the municipal governments of Tinian and Saipan to allow inter-island waste disposal.

Sections 3.2 and 3.6 of Appendix A contain the planning details applicable to the recycling center and transfer station, respectively. The per capita and industrial facility MSW generation rates in Appendix A were used to estimate the requirements for both facilities. Based on the projected maximum base camp population of 3,100, the following solid waste facilities would be needed to support the off-island option (Table 4.2-1).

Table 4.2-1. Solid Waste Facilities Needed to Support Off-Island Option

<i>Facility</i>	<i>Size</i>	<i>Functional Support</i>
Recycling Center	6,325 SF (587 square meters)	Collect, process, and bale recyclable waste: aluminum cans, glass, cardboard, paper, scrap metal, and expended small arms brass casings in a single story structure.
Transfer Station	2,700 SF building + 17,185 SF storage area (232 + 1,597 square meters)	Collect, separate, shred, bale, and temporarily store baled MSW. Segregate and wrap putrescible waste in water-tight containers to be handled apart from the non-organic MSW.

Legend: MSW = municipal solid waste; SF = square foot.

Source: Integrated Solid Waste Management Plan (Appendix A).

The recycling center and solid waste transfer station would be centrally located within a fenced area in the proposed base camp. Upon completion of the waste processing functions, the MSW would be prepared for shipment, transported via trucks, and loaded onto barges at the Port of Tinian for shipment off island (e.g., to the Marpi solid waste facility on Saipan).

The green waste generated during the construction of the base camp, munitions storage area, and training ranges would be diverted into compost and mulch by the U&SI contractor(s). Maintenance of the training ranges would generate a reduced quantity and rate of green waste generation; therefore, the composting operation would be scaled down to meet this need and operated by the maintenance staff.

The secondary sewage effluent generated at the planned wastewater treatment plant to be located within the base camp and supporting the CJMT facilities would be placed in containers and shipped off island (e.g., to the Marpi solid waste facility on Saipan). 40 CFR 503 allows secondary sewage effluent to be composted and the product used as a soil amendment. Composting of the secondary effluent could be done as a cost-saving measure if there is a demand for the soil amendment end product.

4.3 OPTION 2: PROCESS SOLID WASTE ON ISLAND USING INCINERATION AND DISPOSE OFF ISLAND

On-island disposal possibilities apart from landfilling include thermal processing using combustion or pyrolysis. A specific pyrolysis option was presented in prior versions of this study and removed from consideration due to the experimental nature of the micro auto gasification system. The micro auto gasification system is in the testing phase within the U.S. military community and has not yet been approved.

4.3.1 Incineration

Smaller sized municipal incinerators could meet the need if adequately supported with sufficient air pollution control equipment. From Section 3.6.2, Appendix A, the daily MSW generation rate by the U.S. military on Tinian was estimated to be 21,700 pounds (9,843 kilograms) per day. Executive Order 13514 (EO 2009) established a federal agency environmental performance goal of diverting at least 50% of non-hazardous solid waste, excluding construction and demolition waste, from landfills by the end of FY 2015. Notwithstanding the 50% goal, a conservative diversion rate of 40% was selected. Therefore, the total amount of waste requiring incineration would be 13,020 pounds (5,906 kilograms) per day. This rate of MSW generation represents the peak rate that would occur during periods when 3,100 military personnel are present on Tinian. For purposes of this analysis, the combined military and civilian MSW is assumed to form the total incineration requirement. The total civilian population of Tinian was measured in the 2010 census to be roughly 3,100. Adding a conservative number of 300 tourists (roughly 75% of the Tinian Dynasty Hotel and Casino), the total civilian population would amount to 3,400. The estimated civilian per capita MSW generation rate of 6.2 pounds (2.8 kilograms) per person per day was taken from actual waste generation data collected in the *DoD Integrated Solid Waste Management Plan for DoD Bases, Guam* (DoN 2013). Applying the 6.2 pounds (2.8 kilograms) per person per day MSW generation rate for civilians and 7.0 pounds (3.2 kilograms) for military MSW, the table below summarizes the gross on-island MSW incineration requirement (Table 4.3-1).

Table 4.3-1. MSW Incineration Requirement ¹

<i>MSW Parameter</i>	<i>Military</i>	<i>Civilian</i>	<i>Total</i>
Population	3,100	3,400	6,500
MSW Generated in Pounds (at 7 lbs [3.2 kg] per person/day for military) and (at 6.2 lbs [2.8 kg] per person per day for civilian)	21,700 lbs (9,843 kg)	21,080 lbs (9,562 kg)	41,780 lbs (19,405 kg)
MSW Requiring Incineration (Assumes 40% Diversion Rate)	13,020 lbs (5,906 kg)	12,648 lbs (5,737 kg)	25,668 lbs (11,643 kg)

Note:

¹ Represents maximum requirement during peak periods of training.

Legend: kg = kilogram; lbs = pounds; MSW = municipal solid waste.

Source: DoN 2014.

Documentary information obtained from Pennram Diversified Manufacturing Corporation (Andrew Hooker, President and General Manager, Pennram, April 3, 2014), noted that a 1,000-pound (454-kilogram) per hour incinerator rated at 10.9 tons (9.9 metric tons) per day would suffice to handle this estimated generation rate. Although the rated production rate of 10.9 tons (9.9 metric tons) per day is less than the peak generation rate of 12.8 tons (11.6 metric tons) per day, any excess amount not able to be immediately incinerated would be temporarily stockpiled. Because the peak training population of 3,000 would be on Tinian for relatively short periods of up to 2 weeks per occurrence, compared to the normal tempo of 1,500, the temporary storage requirement would not be significant. The incinerator would produce ash equal to roughly 1% to 5% of the total solid waste incinerated based on waste composition. Therefore, the maximum daily amount of ash produced would amount to 1,283 pounds (583 kilograms) per day using the 5% estimated rate. This generated amount of ash would need to be packed and transported off island to a permitted disposal facility. To meet CNMI and federal air emission requirements, air pollution control equipment consisting of heat recovery boilers, ductwork, bypass stack, gas quencher, wet scrubbing system caustic pump, and emission controls would be required to supplement the incinerator. The incineration option is projected to require the following permanent facilities (Table 4.3-2).

Table 4.3-2. Solid Waste Facilities Required to Support Incineration Option

Facility	Size	Functional Support
Incineration Facility	4,800 SF (446 m ²)	1,000 lbs/hour (454 kg/hour) incinerator sited inside a building, equipped with air pollution control equipment and allowing vertical clearance of 48 feet (14.6 meters) (for exhaust stack).
Recycling Facility	6,325 SF (587 m ²)	Collect, process, and bale recyclable waste: aluminum cans, glass, cardboard, paper, scrap metal, and expended small arms brass casings in a single story structure.

Legend: kg = kilogram; lbs = pound; m² = square meter; SF = square foot.

Source: DoN 2014.

CHAPTER 5.

SOLID WASTE SOLUTION FOR PROPOSED PAGAN OPTIONS

5.1 GENERAL REQUIREMENTS AND CONSIDERATIONS

The planned expeditionary training on Pagan would consist of up to 4,000 personnel training for various deployment durations for a total of up to 16 weeks over the course of a year. No permanent waste facilities would need to be built to support the planned training.

5.2 PROCESS AND DISPOSE OF SOLID WASTE OFF ISLAND

The only option envisioned for Pagan is to collect waste generated during the training cycles and transport the waste off island to a properly permitted waste disposal facility. The collected MSW would require a centralized location near the proposed bivouac area. Some separation of waste to facilitate recycling at the disposal facility would be needed at the solid waste handling area, which would consist of equipment to bale and place waste into shipping containers. Because all field rations on Pagan are planned to be issued individually as meals ready to eat or as unitized group rations to training units, there would be no field kitchens serving Class A rations. It is anticipated that each training exercise would provide equipment required for solid waste handling and set aside appropriate areas for this activity. The equipment would need to be powered using portable generators.

The per capita solid waste generation rate applicable to U.S. Marine Corps Forces deployed in an expeditionary status world-wide is 5.3 pounds (2.4 kilograms) per person per day as provided in the *MAGTF* [Marine Air Ground Task Force] *Planner's Reference Guide* (U.S. Marine Corps 2010). Therefore, the maximum amount of MSW expected to be generated on a daily basis would be 21,200 pounds (9,616 kilograms), based on 4,000 personnel multiplied by 5.3 pounds (2.4 kilograms) per person. The density of baled MSW is roughly 500 pounds per cubic yard (CY) (296.6 kilograms per cubic meter); therefore, 42 CY (32 cubic meters) of baled MSW would be generated per day whenever 4,000 personnel participate in training. Assuming a 7-day holding period on Pagan, a total of 294 CY (225 cubic meters) of waste would need to be stored near the bivouac area before being loaded onto ships.

Allowing for a 10% expansion factor and double stacking of the baled MSW, a total of 162 square yards (135 square meters) of storage area would be required to support the maximum waste loading for 7 days. The storage site would ideally be located near the solid waste handling area.

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CHAPTER 6. POTENTIAL IMPACTS AND ISSUES

6.1 PROPOSED ACTION

The CJMT proposed action would add up to 3,100 military personnel and would significantly increase the amount of solid waste currently generated on Tinian. The 2010 U.S. Census reported a population of approximately 3,100 persons living on Tinian; therefore, the maximum military population would nearly double the current civilian population for a part of each year. Because of the current non-compliant regulatory status of the Tinian Municipal Dump, the U.S. military would require an alternative off-island or on-island solid waste disposal solution for the CJMT proposed action, as described in Chapter 4. For Pagan, the supported population ceiling is projected to be 4,000 military members. All solid waste generated during the periodic training deployments to Pagan would have to be collected, baled, placed in shipping containers, and transported off island to an existing U.S. military landfill.

The supported maximum military population and waste generation quantities are summarized in Table 6.1-1.

Table 6.1-1. MSW Generation on Tinian and Pagan

<i>Location</i>	<i>Maximum Population</i>	<i>Solid Waste Generation Rate (Per Day Per Person)¹</i>	<i>Maximum Daily MSW Generated</i>
Tinian	3,100	7.0 lbs (3.175 kg)	21,700 lbs (9,843 kg)
Pagan	4,000	7.0 lbs (3.175 kg)	28,000 lbs (12,700 kg)

Note:

¹ Daily MSW generation rate per Section 3.6.2, Appendix A. This rate represents the maximum MSW generated during peak periods of the training cycle. Actual rates would vary depending on the number of people during each training cycle, which would occur 20 weeks per year on Tinian and 16 weeks per year on Pagan.

Legend: kg = kilograms; lbs = pounds; MSW = municipal solid waste.

Source: MSW Generation Rate Data from PTA, Hawaii (U.S. Army 2014).

For both options on Tinian, the management of solid waste would be the same under the proposed action as it would be under the *Unconstrained Training Concept for Tinian and Pagan* (DoN 2014b).

6.2 OPTION 1 FOR TINIAN: OFF-ISLAND DISPOSAL OF SOLID WASTE

The solid waste handling facilities required to collect, separate, process, and ship MSW off island would consist of a 6,325 square foot (587 square meter) single-story recycling center and a 2,700 square foot (250 square meter) waste transfer station co-located next to 17,185 square feet (1,597 square meters) of hardstand (open storage). A total maximum MSW generation rate of 21,700 pounds (9,843 kilograms) per day would need to be processed at the peak CJMT population load of 3,100 personnel. The MSW generated by the military population on Tinian would be transported off island (e.g., to the Marpi solid waste facility on Saipan). Per recent discussions with the USEPA, the Marpi landfill operating permit was not renewed; therefore, any future plan to dispose of Tinian waste in the Marpi facility would be subject to USEPA renewal of the Marpi permit. Disposal of Tinian waste in the Marpi facility would require an agreement between the municipal governing bodies and the CNMI DPW (Appendix C). For Saipan, the impact on the overall capacity of the Marpi facility would not be significant in terms of the MSW amount disposed of at the facility. Marpi was opened in 2003 and currently supports a population of 48,000 (U.S. Census 2010), a decrease of 30% from the 2000 population of 69,000. Therefore, the MSW generated by the total projected CJMT military and civilian population of 6,200 would not significantly

impact the designed capacity of the Marpi solid waste facility. However, the DEQ stated during the Joint Venture’s site visit in December 2013 that cell 1 at Marpi is nearly full and that cell 2 cannot be used until cell 3 is prepared to accept waste. Although the overall design capacity of Marpi can accommodate the projected increased MSW from Tinian, the CNMI government does not have the funding needed to build the new cell at Marpi. Therefore, U.S. military funding assistance to facilitate the opening of the new cell may need to be considered as a preliminary step toward resolving the off-island MSW transportation issue. The funding assistance by the Department of Defense could only cover the cell expansion attributable to the CJMT-generated military waste.

6.3 OPTION 2 FOR TINIAN: PROCESS SOLID WASTE ON ISLAND USING INCINERATION AND DISPOSE OFF ISLAND

Apart from landfilling, the on-island disposal of solid waste would require the following facilities: a 6,325 square foot (587 square meter) recycling center and a 4,800 square foot (446 square meter) incineration facility. The green waste generated during the base camp construction (121,968 tons [110,647 metric tons]) and training ranges (719,875 tons [653,060 metric tons]) would be processed to produce mulch and compost by the assigned U&SI contractor(s) during the construction phase. The only appreciable C&D waste would amount to 93 tons (84 metric tons) of steel debris and 456 tons (413 metric tons) of concrete debris in the event that the two aboveground storage tanks are demolished (if the International Broadcasting Bureau compound is relocated). Disposal of the C&D debris would be the responsibility of the assigned contractor to recycle or dispose of off island in a permitted C&D landfill or hardfill.

6.4 OPTION 1 FOR PAGAN: TRAINING UNITS COLLECT AND HAUL AWAY THEIR GENERATED SOLID WASTE

As outlined in Section 5.2, no permanent waste handling facilities are planned to support the expeditionary deployments to Pagan. A solid waste storage area of 162 square yards (135 square meters) would need to be sited near the bivouac area to store up to 7 days of collected solid waste. Each deployment of military personnel would need to provide their own waste handling equipment such as watertight containers, small-sized baling equipment, and shipping containers to support the on-island waste processing function. All equipment requiring electrical power would need to be supported using portable generators. Units would have to transport all waste off island to an existing U.S. military landfill.

CHAPTER 7.

PROJECTED ANNUAL IMPACTS FOR PROPOSED ACTION AND LONG RANGE TRAINING TEMPOS

The preceding chapters presented the solid waste solutions based on the military population ceilings expected to train (3,100 for Tinian and 4,000 for Pagan) for periods of up to 20 weeks on Tinian and 16 weeks on Pagan. Planning guidance contained in the *CJMT Unconstrained Training Concept* (DoN 2014b) specifies an annual training tempo of up to 45 weeks on Tinian and 40 weeks on Pagan as the long-term benchmark. This chapter addresses the solid waste planning needed to support the proposed action and potential future increased training tempos.

7.1 PROJECTED ANNUAL IMPACTS ON TINIAN

The daily MSW generation amount estimated in Chapter 6 represents the MSW requirements during peak periods of training (3,100 personnel). The peak population number was then used to estimate the size of the supporting recycling center, transfer station, and incineration facility, where applicable. The long range training tempo would not change the number of personnel supported; however, the total duration of the training over a 1-year period would increase from 20 weeks to 45 weeks. The impacts of the additional waste amount and an adjustment for average supported training population are summarized in the following sections.

7.1.1 Option 1: Off-Island Disposal of Solid Waste

While the peak training population plus permanent maintenance workers is approximately 3,100, the average training population is much lower. Given that most training activities would be less than 1,000 personnel and that the surge of 1,500 trainees would only occur for a few weeks a year, a reasonable estimate of average trainees and maintenance workers is approximately 1,200. The 45-week long range training tempo would generate approximately 2.25 times more MSW annually (compared to the 20-week duration) that an off-island (e.g., Marpi) solid waste facility would need to accommodate (Table 7.1-1).

Table 7.1-1. Annual MSW Requirement, Off-Island Disposal of Solid Waste

<i>MSW Generation Rate</i>	<i>Average Supported Population</i> ¹	<i>Total Daily MSW Generation</i>	<i>Average Daily Disposal Requirement</i> ²	<i>Total Annual MSW for Off-Island Disposal 20 Weeks</i>	<i>Total Annual MSW for Off-Island Disposal 45 Weeks</i>
7 lbs (3.2 kg) per person per day	1,200	8,400 lbs (3,810 kg)	5,040 lbs (2,286 kg)	353 tons (320 metric tons)	794 tons (720 metric tons)

Notes:

¹ Includes military only. Estimated from various training scenarios provided in CJMT in-progress EIS/OEIS.

² Assumes 40% Diversion Rate.

Legend: kg = kilograms (rounded); lbs = pounds; MSW = municipal solid waste.

Source: DoN 2014.

7.1.2 Option 2: Process Solid Waste On Island Using Incineration and Dispose Off Island

As stated in Section 4.3, the on-island disposal of solid waste using incineration would support both the military and civilian populations. The peak combined on-island population of 6,500 was used as the planning figure to estimate the sizes of the supporting solid waste handling facilities. Similar to option 1, the long range training tempo would not change the number of personnel supported during peak periods;

however, the total duration of the training annually would increase from 20 weeks to 45 weeks. The impacts of the additional waste amount are summarized in Table 7.1-2.

Table 7.1-2. Annual MSW Requirement, On-Island Disposal Using Incineration

<i>Annual MSW Requirement</i>	<i>MSW Generation Rate</i>	<i>Average Supported Population</i> ¹	<i>Total Daily MSW Generation</i>	<i>Average Daily Disposal Requirement</i> ²	<i>Total Annual MSW for Incineration 20 Weeks Training</i> ³	<i>Total Annual MSW for Incineration 45 Weeks Training</i> ³
Military	7 lbs (3.2 kg) per person per day	1,200	8,400 lbs (3,810 kg)	5,040 lbs (2,286 kg)	353 tons (320 metric tons)	794 tons (720 metric tons)
Civilian	6.2 lbs (2.8 kg) per person per day	3,400	21,080 lbs (9,561 kg)	12,648 lbs (5,737 kg)	2,302 tons (2,088 metric tons)	2,302 tons (2,088 metric tons)
Total Annual MSW Disposal Requirement					2,655 tons (2,408 metric tons)	3,096 tons (2,808 metric tons)

Notes:

¹ Includes military and civilian (from Section 4.3). Military estimated at an average of 1,200 trainees and permanent maintenance workers.

² Assumes 40% Diversion Rate.

³ Civilian population generates MSW all year; military generates MSW during training periods only.

Legend: kg = kilograms (rounded); lbs = pounds; MSW = municipal solid waste.

Source: DoN 2013.

The 45-week long range training tempo would require disposal of 17% more MSW annually than the 20-week requirement. This increase would affect the permitting process connected with incineration and would require a joint CNMI-U.S. military agreement since it would dispose of both military and civilian MSW.

7.2 PROJECTED ANNUAL IMPACTS ON PAGAN

Chapter 5 presents the maximum daily MSW generation rate of 21,200 pounds (9,616 kilograms) per day, based on a peak training population of 4,000 persons on Pagan. Because there would be no permanent solid waste handling facilities on Pagan, all MSW would need to be transported off island to a properly permitted disposal facility. Similar to the Tinian solid waste planning, the 40-week long range training tempo would not change the peak training requirement; however, the total duration of training annually would increase from 16 weeks to 40 weeks. Table 7.2-1 summarizes the impact of the increased tempo.

Table 7.2-1. Annual MSW Requirement, Off-Island Disposal of MSW from Pagan

<i>MSW Generation Rate</i>	<i>Supported Population</i> ¹	<i>Daily Disposal Requirement</i>	<i>Normal Tempo 16 Weeks</i>	<i>Increased Tempo 40 Weeks</i>
5.3 lbs (2.4 kg) per person per day	1,260	6,678 lbs (3,029 kg)	374 tons (339 metric tons)	935 tons (848 metric tons)

Note:

¹ Per Chapter 2, CJMT PDEIS (Version 2), the average supported training population on Pagan would number 1,260 over the 16-week training tempo.

Legend: kg = kilograms; lbs = pounds; MSW = municipal solid waste.

Source: U.S. Marine Corps 2010.

The planned solid waste handling area of 162 square yards (135 square meters) would not change to handle the increased 40-week tempo since the maximum number of training personnel would remain at 4,000. The annual increase in MSW requiring disposal would impact the disposal facility receiving the MSW from Pagan. The greater volume of waste would be spread out over the 24 additional weeks spent training on Pagan, and the units would transport the generated waste to an existing U.S. military landfill in the same manner as described for the normal 16-week tempo.

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Appendix A
Integrated Solid Waste Management Plan

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**FINAL
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COMMONWEALTH OF THE NORTHERN MARIANA
ISLANDS JOINT MILITARY TRAINING
SOLID WASTE STUDY**

**APPENDIX A
INTEGRATED SOLID WASTE MANAGEMENT PLAN**



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(VERSION 4)
COMMONWEALTH OF THE NORTHERN MARIANA
ISLANDS JOINT MILITARY TRAINING
SOLID WASTE STUDY**

**APPENDIX A
INTEGRATED SOLID WASTE MANAGEMENT PLAN**



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LIST OF ACRONYMS AND ABBREVIATIONS

C&D	construction and demolition	MLA	Military Lease Area
CFR	Code of Federal Regulations	MSW	municipal solid waste
CJMT	Commonwealth of the Northern Mariana Islands Joint Military Training	NAVFAC	Naval Facilities Engineering Command
CNMI	Commonwealth of the Northern Mariana Islands	NMIAC	Northern Mariana Islands Administrative Code
CY	cubic yard(s)	PTA	Pohakuloa Training Area
DEQ	Department of Environmental Quality	RCRA	Resource Conservation and Recovery Act
DoN	Department of the Navy	U&SI	utilities and site improvements
EO	Executive Order	U.S.	United States
ESC	Engineering Service Center	U.S.C.	United States Code
FY	fiscal year	USACE	U.S. Army Corps of Engineers
IBB	International Broadcasting Bureau	USEPA	United States Environmental Protection Agency
ISWMP	Integrated Solid Waste Management Plan	WTE	waste to energy

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CHAPTER 1.

INTRODUCTION

1.1 SCOPE AND PURPOSE

The Integrated Solid Waste Management Plan (ISWMP) was prepared as an appendix to the Commonwealth of the Northern Mariana Islands (CNMI) Joint Military Training (CJMT) Solid Waste Study. The ISWMP considers the impacts of the proposed action (including personnel and facilities), and develops the planning factors relative to each of the United States (U.S.) military waste management elements outlined below.

Marine Corps Order P5090.2A, *Environmental Compliance and Protection Manual* (DoN 1998), serves as the applicable document guiding the CJMT ISWMP. The waste management hierarchy in Marine Corps Order 5090.2A (DoN 1998) establishes the following elements in descending order of precedence: source reduction, reuse, recycling, composting/mulching, incineration for volume reduction with energy recovery, other forms of volume reduction, and landfilling. The contents of the CJMT ISWMP are presented in this hierarchical context. The report includes planning for non-hazardous municipal solid waste (MSW). A separate Hazardous Waste Study covers the planning for asbestos containing material, lead-based paint, and other hazardous wastes.

Additional resources used to complete this ISWMP include previous studies completed for CNMI governmental agencies (e.g., *Comprehensive Study Report of Tinian Landfill* [USACE 2005], and *Final Environmental Assessment for the Siting of a Solid Waste Transfer Station on Tinian, CNMI* [DCA 2012]). These studies are referenced as they contain pertinent technical analyses that have been incorporated in this document.

1.2 BACKGROUND INFORMATION

Solid waste on Tinian is currently transported by residents and business entities to the Tinian Municipal Dump, an open dump site near San Jose and the southwest coast (Figure 1.2-1). The Tinian Municipal Dump is unlined and does not comply with Resource Conservation and Recovery Act (RCRA) Subtitle D regulations governing landfills. As such, the current Tinian Municipal Dump would not suffice as an option for the U.S. military to dispose of CJMT-generated MSW.

The CNMI Department of Public Works maintains the Tinian Municipal Dump in accordance with an Administrative Order issued by the CNMI Department of Environmental Quality (DEQ), which ordered the application of daily cover material and prohibited the burning of wastes, among other operational measures (DEQ 2010). The Administrative Order was issued in 2010 as a cease and desist action and documented findings of violations of the *Solid Waste Management Regulations* (NMIAC 2004).

Pagan currently lacks any solid waste support infrastructure. The training on Pagan is proposed to be expeditionary, and all solid waste would need to be transported off island. Current military training is rarely conducted on Pagan other than a few helicopters landing over the past few years. During these rare training events, military units were required to collect their generated MSW and transport the waste to an existing U.S. military landfill.



Figure 1.2-1. Tinian Municipal Dump Location

Source: DoN 2014.

CHAPTER 2.

REGULATIONS AND GUIDANCE DOCUMENTS

This section outlines the laws and regulations applicable to solid waste management on Tinian and Pagan.

2.1 EXECUTIVE ORDERS

2.1.1 Executive Order 13423

Executive Order (EO) 13423, *Strengthening Federal Environmental, Energy, and Transportation Management*, signed on 24 January 2007, sets goals for federal agencies to conduct their activities in an environmentally, economically, and fiscally sound, integrated, continuously improving, effective, and sustainable manner. The head of each agency is required to:

- Acquire goods and services through: (1) the use of sustainable environmental practices including bio-based, environmentally preferable, energy-efficient, water-efficient, and recycled content projects; and (2) the use of paper of at least 30% post-consumer fiber content.
- Reduce the quantity of toxic and hazardous chemicals and materials acquired, used, or disposed of by the agency; increase the diversion of solid waste as appropriate; and maintain cost-effective waste prevention and recycling programs in its facilities.

2.1.2 Executive Order 13514

EO 13514, *Federal Leadership in Environmental, Energy, and Economic Performance*, signed on October 5, 2009, expands upon the energy reduction and environmental protection requirements identified in EO 13423. The head of each federal agency is required to:

- Minimize the generation of waste and pollutants through source reduction.
- Divert at least 50% of non-hazardous solid waste, excluding construction and demolition (C&D) waste, by the end of fiscal year (FY) 2015 (FY15).
- Divert at least 60% of C&D waste by the end of FY15.
- Increase the diversion of compostable and organic material from the waste stream.

2.2 SOLID WASTE LAWS AND REGULATIONS

All U.S. military operations on Tinian and Pagan are required to comply with the federal and CNMI laws and regulations outlined below.

2.2.1 Federal Laws and Regulations

Because the CNMI has Commonwealth status within the U.S. government, the following federal laws and regulations apply to the ISWMP:

- *Clean Air Act of 1963* established performance standards related to solid waste combustion (42 United States Code [U.S.C.] 7401-7671).

- *Clean Water Act of 1972* established standards governing the discharge of pollutants into navigable waters (33 U.S.C. 1251).
- U.S. Code of Federal Regulations (CFR) established rules governing the executive departments and agencies of the federal government. The following CFRs govern solid waste management:
 - 29 CFR 1910: Occupational Safety and Health Administration, Department of Labor.
 - 40 CFR 240: Guidelines governing the thermal processing of solid waste.
 - 40 CFR 243: Regulates the storage and collection of residential, commercial, and institutional solid waste.
 - 40 CFR 246: Governs the source separation for materials recovery.
 - 40 CFR 247: Establishes procurement guidelines for products containing recovered materials.
 - 40 CFR 255: Identifies regions and agencies responsible for solid waste management.
 - 40 CFR 257: Establishes criteria related to the classification of solid waste disposal facilities and practices.
 - 40 CFR 258: Establishes criteria governing solid waste landfills.

2.2.2 CNMI Laws and Regulations

Solid waste is regulated within the CNMI under the following laws and regulations in addition to the federal laws and regulations described in Section 2.2.1:

- Commonwealth Solid Waste Management Act of 1989 (NMIAC 1989): Establishes criteria related to the management of solid waste facilities and systems.
- Commonwealth Environmental Protection Act (NMIAC 1982): Regulates solid waste activities to protect the environment.
- Commonwealth Environmental Amendments Act of 1999 (NMIAC 1999): Establishes policy requiring the Commonwealth to update its laws to be consistent and compatible with applicable federal U.S. Environmental Protection Agency (USEPA) requirements.

2.3 U.S. MILITARY INSTRUCTIONS, MEMORANDA, AND DIRECTIVES

The following documents guide solid waste management at U.S. military installations worldwide and would apply to CJMT operations on Tinian and Pagan:

- *Department of Defense Strategic Sustainability Performance Plan, FY 2012* (Department of Defense 2012) provides updated solid waste diversion goals of 50% on non-hazardous solid waste diverted by FY15, and thereafter through FY20; and 60% of C&D debris diverted by FY15, and thereafter through FY20.
- *DoD Integrated (Non-Hazardous) Solid Waste Management Policy* (Department of Defense 2008) requires all facilities to maintain waste prevention and recycling programs in the most cost-effective manner possible and sets solid waste diversion goals.

- Department of Defense (1998) Instruction 4715.4, *Pollution Prevention*, prescribes implementation of pollution prevention programs and authorizes the publication of the *Guide for Qualified Recycling Programs*.
- *Department of Defense Instruction 4715.6, Environmental Compliance* (Department of Defense 1996), requires activities to comply with applicable EO, federal, state, inter-state, regional, and local regulatory requirements.
- *Environmental Compliance and Protection Manual* (DoN 1998), serves as the guidance document governing solid waste management and planning.

2.4 GUIDANCE DOCUMENTS

The following Department of Defense documents provide general guidance on managing solid waste:

- *Integrated Solid Waste Management Plan (ISWMP) Guide* (NAVFAC ESC 2009).
- *Qualified Recycling Program (QRP) Guide* (NAVFAC ESC 2000).
- *Solid Waste Management, NAVFAC MO-213/Air Force AFR 91-8/Army TM 5-634* (Department of Defense 1990).

2.5 OTHER PERTINENT DOCUMENTS

The following documents contain relevant solid waste management information referenced in this ISWMP:

- Tinian Landfill Siting Letter to CNMI Governor Eloy S. Inos from Rear Admiral T.D. Payne, U.S. Defense Representative to the CNMI (May 2013).
- *Final Environmental Assessment for the Siting of a Solid Waste Transfer Station on Tinian, CNMI* (DCA 2012).
- Cease and Desist Administrative Order issued by the DEQ in January 2010, *Subject: Prohibition of Burning of Wastes and Requirement to Maintain Minimal Cover at the Tinian Dump* (DEQ 2010).
- *Comprehensive Study Report of Tinian Landfill, CNMI* (USACE 2005).

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CHAPTER 3.

DEPARTMENT OF DEFENSE INTEGRATED SOLID WASTE MANAGEMENT PLAN

3.1 SOURCE REDUCTION AND REUSE

The USEPA defines source reduction as altering the design, manufacture, purchase, or use of products to reduce the amount and toxicity of what gets disposed. The optimum approach to solid waste management is to reduce the amount of waste generated; waste that is not created does not have to be disposed of later. Source reduction is the first step in USEPA's hierarchy of waste management. The following programs are required by U.S. military directives, and their use would reduce the generation of solid waste:

- *Green Procurement Program:* Affirmative procurement (buy recycled) is required by Section 6002 of the *Solid Waste Disposal Act* (42 U.S.C. 6901-6992k). The Green Procurement Program (formerly known as Affirmative Procurement) is the preferential purchase and use of products containing recycled materials. Products that can be procured with recycled materials include paper and paper products, lubricating oil, retread tires, construction materials, landscaping products, and non-paper office products.
- *Pollution Prevention Program:* The Pollution Prevention Program identifies opportunities to reduce or eliminate hazardous or other pollutants at the source. The source can be the purchase of a consumable product, service, piece of equipment, or a process. The opportunities typically target those sources with established reduction goals by identifying changes to existing operations (process modification), product substitution, recycling, energy and water conservation, and alternative power sources.

Reuse is the practice of using a product more than once, either for the same purpose or a different one. Reuse is preferable to recycling because the item does not need to be reprocessed before it can be used again. U.S. military activities actively employ reuse under the auspices of the Defense Logistics Agency Disposition Services. Examples of reused items include computers, printers, appliances, furniture, office equipment, and etc. By taking advantage of the Defense Logistics Agency reuse program, U.S. military agencies can reduce procurement costs and eliminate unnecessary repairs. The responsible military command would implement reuse practices such as double-sided printing, reuse of empty product containers, and re-distribution of furniture during the CJMT proposed action. Other reuse opportunities include reduction of packaging; procurement of material that generates less solid waste; process modifications; and any reasonable mechanism that avoids, prevents, or reduces solid waste at the source. These reuse practices have been standard operating procedure throughout U.S. military bases world-wide, and would be implemented to the extent possible in the CNMI.

3.2 RECYCLING

Recycling is a key element of the solid waste management process involving the conversion of solid waste into reusable materials rather than disposing of it as waste. The potential to fully capitalize on recycling opportunities during the CJMT construction, and continuing after all military facilities are built, is significant. Items that can be recycled include scrap metal, green waste, wood waste, plastic containers, aluminum cans, glass bottles, used tires, and concrete rubble. Collection of source-separated recyclables would have the added benefit of enhancing diversion levels.

Although the military activity would generate recycling opportunities, the future private sector operators would need a financial incentive to invest in recycling on Tinian. At present, the only significant recycling activity on Tinian consists of scrap metal recycling, which is handled by Triple Star, a private company that has a contract with the CNMI. Triple Star ships the collected scrap metal to their warehouse facility on Saipan.

The proposed CJMT base camp and training ranges on Tinian would require a recycling center to meet the regulatory standards outlined in Chapter 2. The recycling center would function as a collection point within the base camp to conduct sorting, packaging, storage, and preparation before the processed waste is shipped to other governmental or commercial recycling operations. The recycling center would be required regardless of the final destination of the CJMT-generated MSW (e.g., landfill disposal, off-island shipment, or incineration/waste to energy [WTE]).

Unified Facilities Criteria 2-000-05N, *Facility Planning for Navy and Marine Corps Shore Installations* (Department of Defense 2005), has no specific design criteria applicable to recycling center facilities. Therefore, the recycling center planning was based on USEPA (2011) Publication 530-F-13-001, entitled: *Municipal Solid Waste Generation, Recycling and Disposal in the United States: Facts and Figures for 2011*. The facility requirements were based on standard facilities with two recycling locations, one for reusing pallets to support warehousing operations, and one to collect and sort recycled materials. The recycled materials would be stored at this facility until follow-on shipment is determined. The following square footages were assigned to each of the recycling functions to derive the recycling center facility requirement (Table 3.2-1).

Table 3.2-1. Recycling Center Functional Area Requirements

Recycling Function	Assigned Area
Pallet Reuse and Storage	800 Net SF (74.3 m ²)
Truck Load/Unload Area	600 Net SF (55.7 m ²)
Processing Area	
• Process aerosol cans	60 Net SF (5.6 m ²)
• Sort/crush aluminum cans	200 Net SF (18.6 m ²)
• Sort glass by color and use	100 Net SF (9.3 m ²)
• Sort/bale cardboard	700 Net SF (65 m ²)
• Sort paper (rolling bins)	600 Net SF (55.7 m ²)
• Shredder and wrapping devices	400 Net SF (37.24 m ²)
• Demilitarize small arms expended brass casings	500 Net SF (46.4 m ²)
• Process food waste (compost/dehydrate)	300 Net SF (27.9 m ²)
Storage	800 Net SF (74.3 m ²)
Total Net Area Required	5,060 Net SF (470 m ²)
Total Gross Area Required (Net to Gross = X 1.25)	6,325 Gross SF (587.6 m ²)

Legend: m² = square meter(s); SF= square foot/feet.

Source: USEPA 2011.

3.3 GREEN WASTE MANAGEMENT

The green waste expected to be generated during the CJMT construction phase would consist of wood waste and biodegradable green waste (e.g., brush, grass, palm fronds, and smaller organic materials). After construction, green waste would continue to be generated, but at a much decreased rate (e.g., associated with grounds maintenance and training range maintenance). Wood waste can be readily chipped to produce mulch that can be used as soil cover, erosion control, and soil amendments. The biodegradable green waste can be readily composted using aerobic methods. The composted products could be used for landscaping and agricultural purposes. Composting can also be performed using anaerobic methods (e.g., in-vessel [digestion]) technology that can capture gases to produce energy. The in-vessel technology would be more

expensive because the digestion containers would need to be procured and shipped, whereas aerobic composting would only require an open area for the compost piles.

The green waste generated during the construction phase of the base camp, training areas, and other support facilities would be diverted into mulch and compost by the utilities and site improvements (U&SI) contractor as part of the assigned contractual scope of work. Joint Region Marianas has successfully used this method of green waste diversion on U.S. military projects at Andersen Air Force Base and Naval Base Guam. The composting operation would require that separate composting piles be set up near each of the construction sites (i.e., base camp and training ranges). The composting piles would require adequate watering and turning to facilitate the composting process. Wood chipping equipment to process the larger green waste would need to be set up near the compost sites. The composted and mulched end product would be used for military purposes and any excess amounts could be provided for use by the general public.

The amount of green waste projected to be generated during construction of the CJMT base camp and each of the training range alternatives on Tinian and Pagan is summarized in Table 3.3-1, and the areas to be cleared are shown as "ID numbers" (on Figure 3.3-2, Figure 3.3-3, and Figure 3.3-4) and "acres" (on Figure 3.3-5 and Figure 3.3-6). The "Percent Cleared" columns in Table 3.3-2 and Table 3.3-3 contain the percentage of vegetation to be cleared within each of the identification numbers (Tinian) and identified areas (Pagan). The calculated quantities for each of the applicable cleared areas are shown on Table 3.3-2 and Table 3.3-3.

Table 3.3-1. Projected Green Waste Quantities

<i>Tinian</i>	<i>Green Waste in Volume</i> ¹	<i>Green Waste in Tons (metric tons)</i> ²
Tinian Base Camp	243,936 CY (186,501 m ³)	60,984 tons (55,324 metric tons)
Tinian Training Range Alternative 1	1,302,080 CY (995,511 m ³)	325,520 tons (295,307 metric tons)
Tinian Training Range Alternative 2	1,431,608 CY (1,094,543 m ³)	357,902 tons (324,683 metric tons)
Tinian Training Range Alternative 3	1,401,205 CY (1,071,298 m ³)	350,301 tons (317,788 metric tons)
Pagan Alternative 1	309,545 CY (236,664 m ³)	77,386 tons (70,203 metric tons)
Pagan Alternative 2	307,970 CY (235,460 m ³)	76,993 tons (69,847 metric tons)

Notes:

¹ Green waste quantities represent cleared areas shown on Figure 3.3-1 through Figure 3.3-6.

² Per USEPA guidelines, 1 CY of green waste weighs approximately 500 pounds, or 0.25 tons (0.76 m³, 227 kilograms, 0.22 metric tons).

Legend: CY = cubic yard; m³ = cubic meter.

Source: DoN 2014.

Table 3.3-2 and Table 3.3-3 contain the calculated quantity in spreadsheets using the following formulas:

- *Tinian*: Total square yards of cleared area was multiplied by the percentage cleared, then multiplied by 2 yards (1.85 meters) (average height of vegetation), then 10% of the volume was used to estimate the amount of green waste generated (based on the TEC-AECOM Technical Services, Inc. Joint Venture site visit to Tinian in December 2013).
- *Pagan*: Total square yards of cleared area was multiplied by the percentage cleared, then multiplied by 1 yard (0.9 meter) (average height of vegetation), then 10% of the volume was used to estimate the amount of green waste generated (based on photographs taken on Pagan site visit).

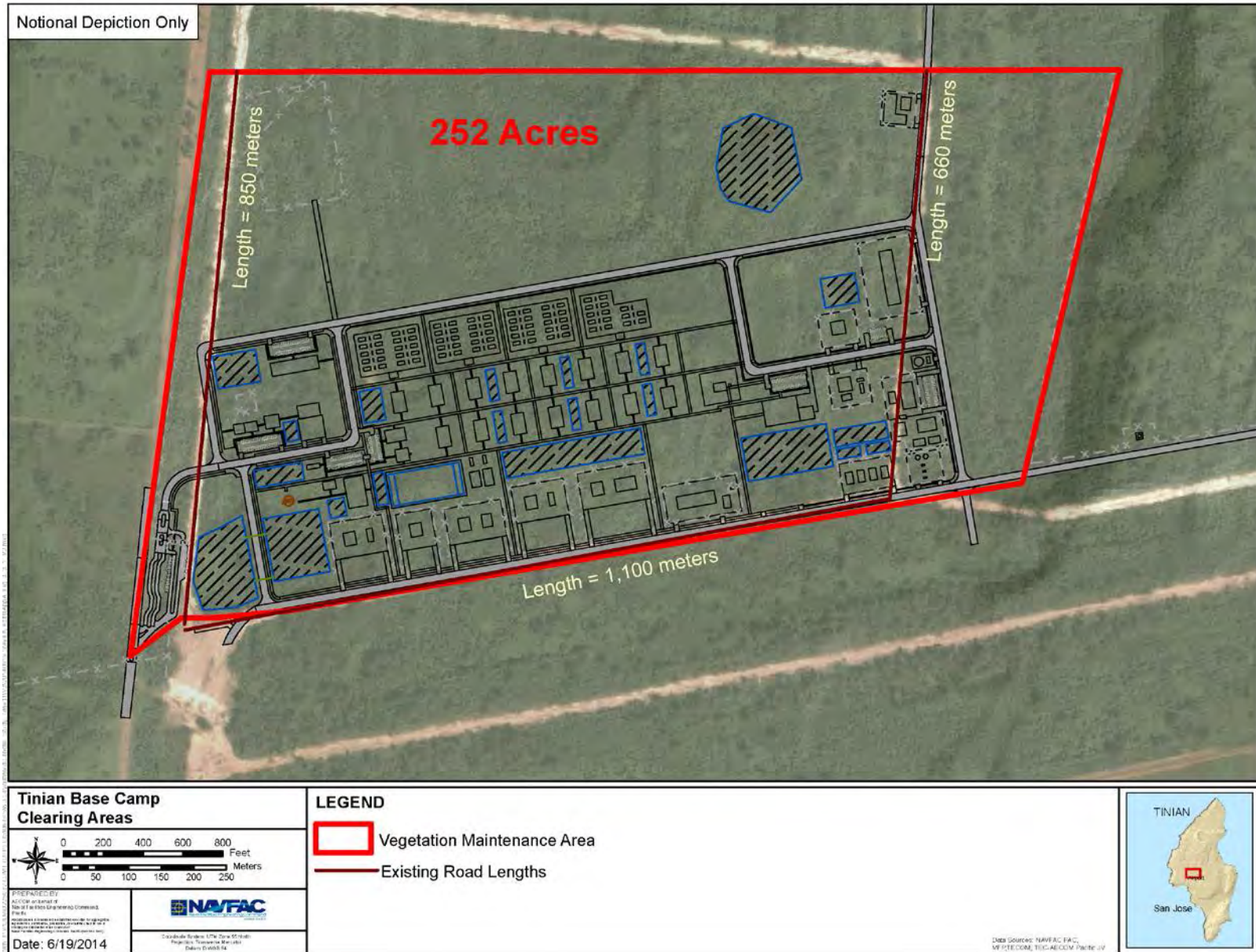


Figure 3.3-1. Tinian Base Camp Clearing Areas
Source: DoN 2014.



Figure 3.3-2. Tinian Alternative 1 Vegetation Maintenance Areas

Source: DoN 2014.



Figure 3.3-3. Tinian Alternative 2 Vegetation Maintenance Areas

Source: DoN 2014.



Figure 3.3-4. Tinian Alternative 3 Vegetation Maintenance Areas
 Source: DoN 2014.

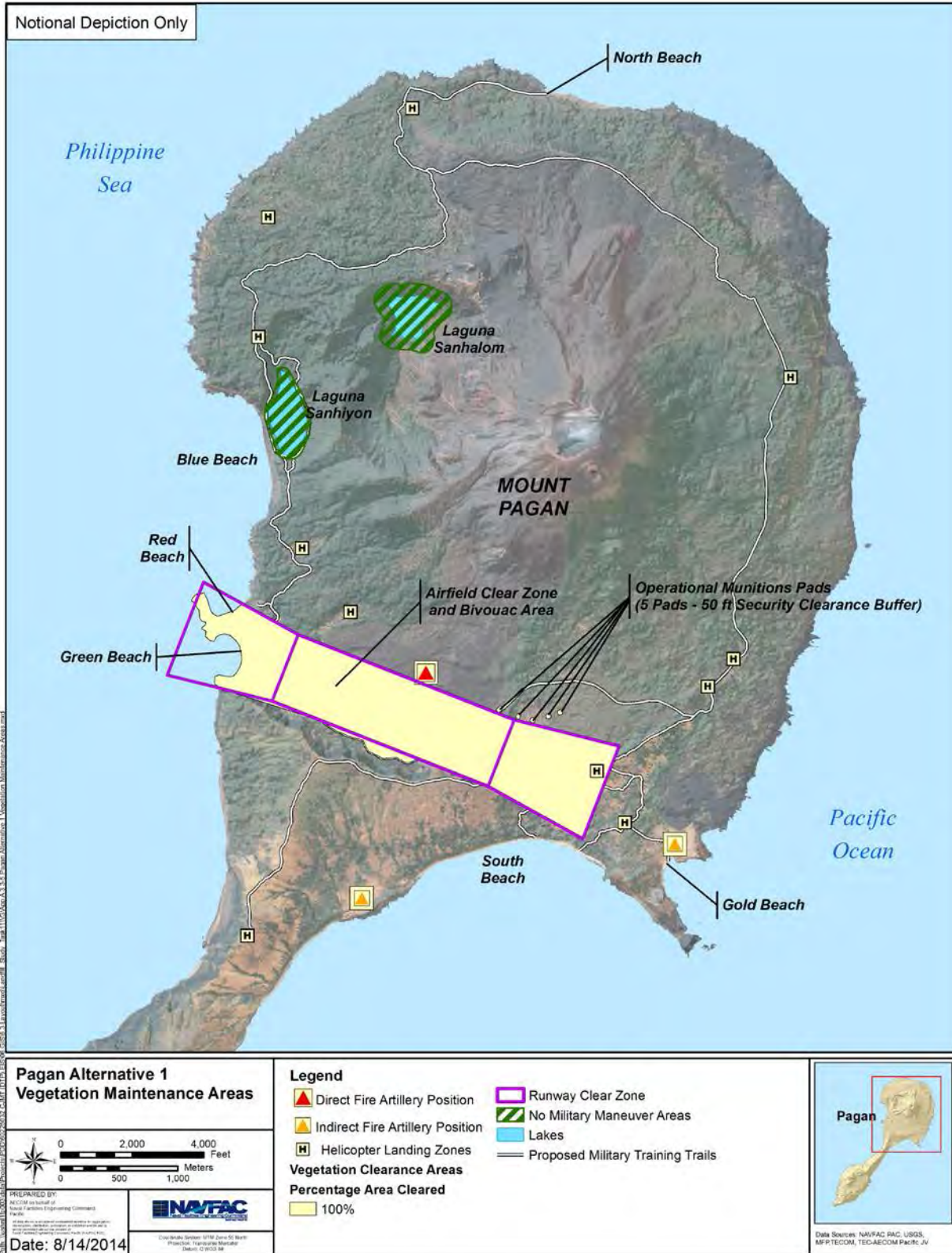


Figure 3.3-5. Pagan Alternative 1 Vegetation Maintenance Areas

Source: DoN 2014.

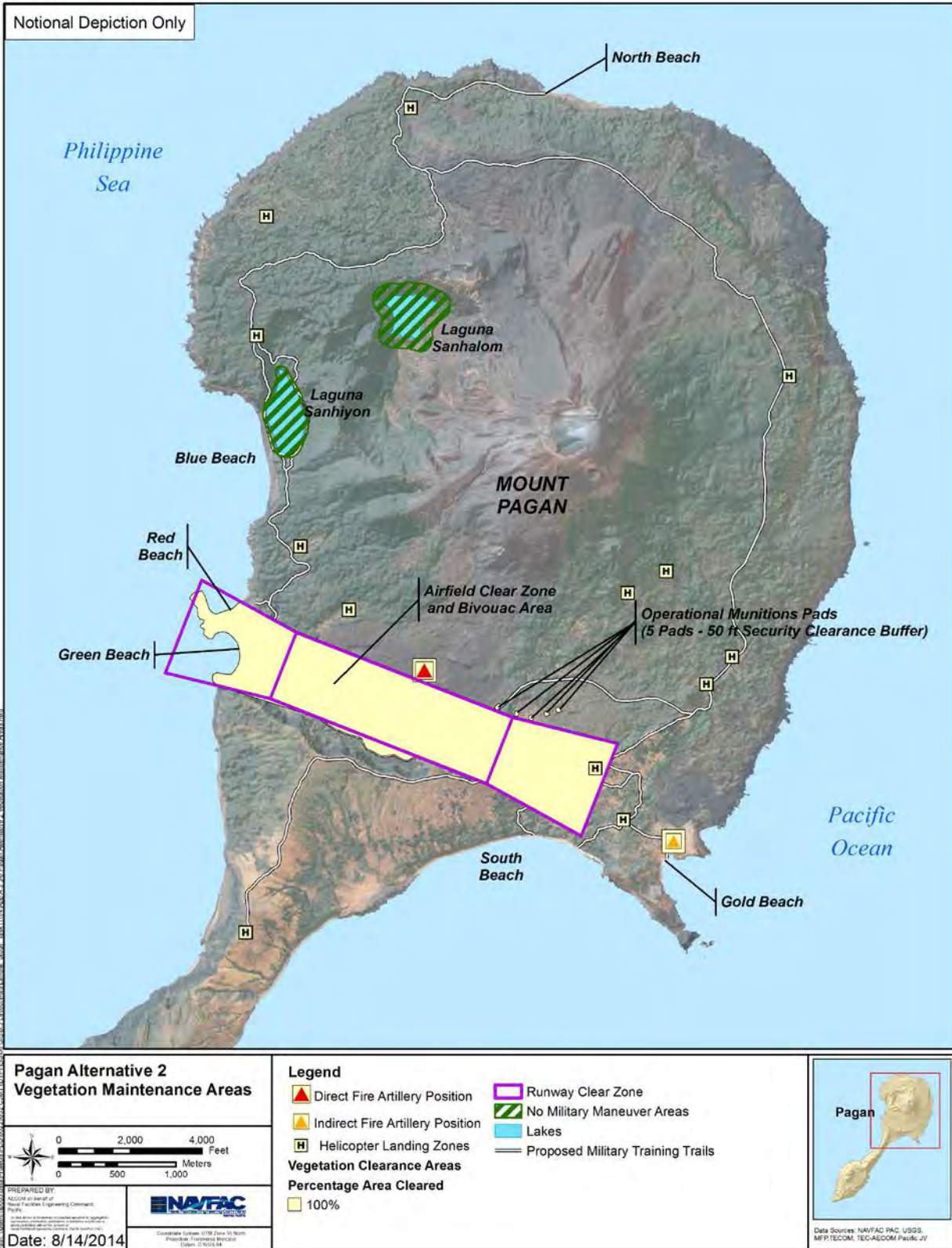


Figure 3.3-6. Pagan Alternative 2 Vegetation Maintenance Areas

Source: DoN 2014.

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Table 3.3-2. Tinian Green Waste Calculations, CJMT Training Range Alternatives

ID	Narrative	Percent Cleared (%)	Area		Alt 1	Alt 2	Alt 3	Green Waste (Alt 1)		Green Waste (Alt 2)		Green Waste (Alt 3)	
			(Acres)	(Hectares)				(Cubic yards)	(Cubic meters)	(Cubic yards)	(Cubic meters)	(Cubic yards)	(Cubic meters)
1	Multipurpose Sniper Range	100.00%	22.6	9.1	1	1	1	21872	16723	21872	16723	21872	16723
2	BZO Range	100.00%	2.1	0.9	1	1	1	2037	1557	2037	1557	2037	1557
3	Pistol Range	100.00%	2.1	0.9	1	1	1	2063	1577	2063	1577	2063	1577
4	Automated Unknown Distance Range	100.00%	31.0	12.5	1	1	1	30000	22937	30000	22937	30000	22937
5	MPRC Targets	15.00%	17.6	7.1	1	1	1	2558	1956	2558	1956	2558	1956
6	MPRC Targets	15.00%	14.6	5.9	1	1	1	2121	1622	2121	1622	2121	1622
7	MPRC Targets	15.00%	8.1	3.3	1	1	1	1174	897	1174	897	1174	897
8	MPRC Targets	15.00%	13.4	5.4	1	1	1	1940	1484	1940	1484	1940	1484
9	MPRC Targets	15.00%	11.0	4.4	1	1	1	1594	1218	1594	1218	1594	1218
10	MPRC Targets	15.00%	18.6	7.5	1	1	1	2697	2062	2697	2062	2697	2062
11	IDF Artillery Position	100.00%	9.9	4.0	1	1	1	9568	7315	9568	7315	9568	7315
12	IDF Artillery Position	100.00%	9.9	4.0	1	1	1	9568	7315	9568	7315	9568	7315
13	IDF Artillery Position	100.00%	9.9	4.0	1	1	1	9568	7315	9568	7315	9568	7315
14	IDF Artillery Position	100.00%	9.9	4.0	1	1	1	9568	7315	9568	7315	9568	7315
15	IDF Artillery Position	100.00%	9.9	4.0	1	1	1	9568	7315	9568	7315	9568	7315
16	IDF Artillery Position	100.00%	9.9	4.0	1	1	1	9568	7315	9568	7315	9568	7315
17	IDF Artillery Position	100.00%	9.9	4.0	1	1	1	9568	7315	9568	7315	9568	7315
18	MPRC Firing Points	100.00%	0.6	0.3	1	1	1	598	457	598	457	598	457
19	MPRC Firing Points	100.00%	0.6	0.3	1	1	1	598	457	598	457	598	457
20	MPRC Firing Points	100.00%	0.6	0.3	1	1	1	598	457	598	457	598	457
21	MPRC Firing Points	100.00%	0.6	0.3	1	1	1	598	457	598	457	598	457
22	MPRC Firing Points	100.00%	0.6	0.3	1	1	1	598	457	598	457	598	457
23	MPRC Firing Points	100.00%	0.6	0.3	1	1	1	598	457	598	457	598	457
24	MPRC Firing Points	100.00%	0.6	0.3	1	1	1	598	457	598	457	598	457
25	MPRC Firing Points	100.00%	0.6	0.3	1	1	1	598	457	598	457	598	457
26	MPRC Firing Points	100.00%	0.6	0.3	1	1	1	598	457	598	457	598	457
27	MPRC Firing Points	100.00%	0.6	0.3	1	1	1	598	457	598	457	598	457
28	MPRC Firing Points	100.00%	0.6	0.3	1	1	1	598	457	598	457	598	457
29	MPRC Firing Points	100.00%	0.6	0.3	1	1	1	598	457	598	457	598	457
30	BAX-Fire-Maneuver Targets	100.00%	7.7	3.1	0	1	1	0	0	7464	5706	7464	5706
31	BAX-Fire-Maneuver Targets	100.00%	7.7	3.1	0	1	1	0	0	7464	5706	7464	5706
32	BAX-Fire-Maneuver Targets	100.00%	7.7	3.1	0	1	1	0	0	7464	5706	7464	5706
33	BAX-Fire-Maneuver Targets	100.00%	7.7	3.1	0	1	1	0	0	7464	5706	7464	5706
34	IPBC Targets	100.00%	2.9	1.2	1	1	1	2822	2157	2822	2157	2822	2157
35	BAX-Fire-Maneuver Targets	100.00%	7.7	3.1	0	1	1	0	0	7464	5706	7464	5706
36	BAX-Fire-Maneuver Targets	100.00%	7.7	3.1	0	1	1	0	0	7464	5706	7464	5706
37	BAX-Fire-Maneuver Targets	100.00%	7.7	3.1	0	1	1	0	0	7464	5706	7464	5706
38	BAX-Fire-Maneuver Targets	100.00%	5.2	2.1	0	1	1	0	0	5046	3858	5046	3858
39	BAX-Fire-Maneuver Targets	100.00%	7.7	3.1	0	1	1	0	0	7464	5706	7464	5706
40	BAX-Fire-Movement Targets	100.00%	2.4	1.0	1	1	0	2355	1801	2355	1801	0	0
41	BAX-Fire-Movement Targets	100.00%	2.4	1.0	1	1	0	2355	1801	2355	1801	0	0
42	BAX-Fire-Movement Targets	100.00%	13.4	5.4	1	1	0	13007	9945	13007	9945	0	0
43	BAX-Fire-Movement Targets	100.00%	2.4	1.0	1	1	0	2355	1801	2355	1801	0	0
44	BAX-Fire-Movement Targets	100.00%	2.4	1.0	1	1	0	2355	1801	2355	1801	0	0
45	MPRC Targets	100.00%	1.2	0.5	1	1	1	1196	914	1196	914	1196	914
46	MPRC Targets	100.00%	1.2	0.5	1	1	1	1196	914	1196	914	1196	914
47	MPRC Targets	100.00%	1.2	0.5	1	1	1	1196	914	1196	914	1196	914
48	MPRC Targets	100.00%	1.2	0.5	1	1	1	1196	914	1196	914	1196	914
49	MPRC Targets	100.00%	1.2	0.5	1	1	1	1196	914	1196	914	1196	914
50	MPRC Targets	100.00%	1.2	0.5	1	1	1	1196	914	1196	914	1196	914
51	IPBC Targets	100.00%	5.7	2.3	1	1	1	5557	4249	5557	4249	5557	4249
52	IDF Artillery Position	100.00%	9.9	4.0	1	1	1	9568	7315	9568	7315	9568	7315
53	IDF Artillery Position	100.00%	9.9	4.0	1	1	1	9568	7315	9568	7315	9568	7315

ID	Narrative	Percent Cleared (%)	Area		Alt 1	Alt 2	Alt 3	Green Waste (Alt 1)		Green Waste (Alt 2)		Green Waste (Alt 3)	
			(Acres)	(Hectares)				(Cubic yards)	(Cubic meters)	(Cubic yards)	(Cubic meters)	(Cubic yards)	(Cubic meters)
54	IDF Artillery Position	100.00%	9.9	4.0	1	1	1	9568	7315	9568	7315	9568	7315
55	Base Camp	100.00%	256.2	103.7	1	1	1	248012	189619	248012	189619	248012	189619
56	Airfield Operations	100.00%	227.7	92.2	1	1	1	220456	168551	220456	168551	220456	168551
57	Live-Fire Convoy Course Engagement Areas	100.00%	0.6	0.3	0	1	1	0	0	598	457	598	457
58	Live-Fire Convoy Course Engagement Areas	75.00%	5.5	2.2	0	1	1	0	0	4026	3078	4026	3078
59	Live-Fire Convoy Course Engagement Areas	100.00%	3.7	1.5	0	1	1	0	0	3588	2743	3588	2743
60	Live-Fire Convoy Course Engagement Areas	75.00%	4.2	1.7	0	1	1	0	0	3044	2328	3044	2328
61	Live-Fire Convoy Course Engagement Areas	100.00%	2.5	1.0	0	1	1	0	0	2392	1829	2392	1829
62	Live-Fire Convoy Course Engagement Areas	75.00%	8.3	3.4	0	1	1	0	0	6052	4627	6052	4627
63	Live-Fire Convoy Course Engagement Areas	100.00%	0.6	0.3	0	1	1	0	0	598	457	598	457
64	Live-Fire Convoy Course Engagement Areas	100.00%	0.6	0.3	1	1	1	598	457	598	457	598	457
65	Live-Fire Convoy Course Engagement Areas	75.00%	1.6	0.7	1	1	1	1177	900	1177	900	1177	900
66	Live-Fire Convoy Course Engagement Areas	100.00%	0.6	0.3	1	1	1	598	457	598	457	598	457
67	Munitions Storage Area (Road)	100.00%	1.3	0.5	1	1	1	1281	979	1281	979	1281	979
68	IPBC Approaches	15.00%	10.0	4.1	1	1	1	1456	1113	1456	1113	1456	1113
69	IPBC Targets	100.00%	1.6	0.6	1	1	1	1502	1148	1502	1148	1502	1148
70	IPBC Targets	100.00%	1.3	0.5	1	1	1	1243	950	1243	950	1243	950
71	Munitions Storage Area (Facility)	100.00%	37.8	15.3	1	1	1	36566	27957	36566	27957	36566	27957
72	BAX-Fire-Maneuver Approaches	15.00%	27.4	11.1	0	1	1	0	0	3984	3046	3984	3046
74	BAX-Fire-Maneuver Approaches	15.00%	39.3	15.9	0	1	1	0	0	5700	4358	5700	4358
75	BAX-Fire-Maneuver Approaches	15.00%	34.1	13.8	0	1	1	0	0	4957	3790	4957	3790
76	BAX-Fire-Maneuver Approaches	15.00%	13.5	5.5	0	1	1	0	0	1958	1497	1958	1497
77	BAX-Fire-Maneuver Approaches	15.00%	35.4	14.3	0	1	1	0	0	5144	3933	5144	3933
78	BAX-Fire-Maneuver Approaches	15.00%	29.7	12.0	0	1	1	0	0	4307	3293	4307	3293
79	BAX-Fire-Maneuver Approaches	15.00%	27.5	11.1	0	1	1	0	0	3991	3051	3991	3051
80	BAX-Fire-Maneuver Approaches	15.00%	19.7	8.0	0	1	1	0	0	2858	2185	2858	2185
81	BAX-Fire-Movement Approaches	15.00%	4.9	2.0	1	1	0	714	546	714	546	0	0
82	IPBC Targets	100.00%	14.1	5.7	1	1	1	13618	10411	13618	10411	13618	10411
83	IPBC Approaches	15.00%	42.9	17.3	1	1	1	6225	4759	6225	4759	6225	4759
84	BAX-Fire-Movement Approaches	15.00%	3.8	1.5	1	1	0	552	422	552	422	0	0
85	BAX-Fire-Movement Approaches	15.00%	3.8	1.5	1	1	0	548	419	548	419	0	0
86	BAX-Fire-Movement Approaches	15.00%	4.3	1.7	1	1	0	619	473	619	473	0	0
87	BAX-Fire-Movement Approaches	15.00%	16.1	6.5	1	1	0	2335	1785	2335	1785	0	0
88	Helicopter Landing Zone	100.00%	3.3	1.3	1	1	1	3209	2453	3209	2453	3209	2453
89	Helicopter Landing Zone	100.00%	3.3	1.3	1	1	1	3209	2453	3209	2453	3209	2453
90	Helicopter Landing Zone	100.00%	3.3	1.3	1	1	1	3209	2453	3209	2453	3209	2453
91	Helicopter Landing Zone	100.00%	3.3	1.3	1	1	1	3209	2453	3209	2453	3209	2453
92	Helicopter Landing Zone	100.00%	3.3	1.3	1	1	1	3209	2453	3209	2453	3209	2453
93	Helicopter Landing Zone	100.00%	3.3	1.3	1	1	0	3209	2453	3209	2453	0	0
94	Range Control Observation Post	100.00%	0.0	0.0	1	1	1	24	18	24	18	24	18
95	Range Control Observation Post	100.00%	0.0	0.0	1	1	1	24	18	24	18	24	18
96	Range Control Observation Post	100.00%	0.0	0.0	1	1	1	24	18	24	18	24	18
97	Range Control Observation Post	100.00%	0.0	0.0	1	1	1	24	18	24	18	24	18
98	Range Control Observation Post	100.00%	0.0	0.0	1	1	1	24	18	24	18	24	18
99	Range Control Observation Post	100.00%	0.0	0.0	1	1	1	24	18	24	18	24	18
100	Range Control Observation Post	100.00%	0.0	0.0	1	1	1	24	18	24	18	24	18
101	Range Control Observation Post	100.00%	0.0	0.0	1	1	1	24	18	24	18	24	18
102	Range Control Observation Post	100.00%	0.0	0.0	1	1	1	24	18	24	18	24	18
103	Range Control Observation Post	100.00%	0.0	0.0	1	1	1	24	18	24	18	24	18
104	Live-Fire Convoy Course Engagement Areas	100.00%	2.5	1.0	0	1	1	0	0	2392	1829	2392	1829
105	Live-Fire Convoy Course Engagement Areas	75.00%	7.9	3.2	0	1	1	0	0	5759	4403	5759	4403
106	Live-Fire Convoy Course Engagement Areas	100.00%	0.6	0.2	1	1	1	598	457	598	457	598	457
107	Live-Fire Convoy Course Engagement Areas	75.00%	2.7	1.1	1	1	1	1947	1489	1947	1489	1947	1489
108	Live-Fire Convoy Course Engagement Areas	75.00%	6.8	2.8	0	1	1	0	0	4951	3785	4951	3785
109	Live-Fire Convoy Course Engagement Areas	75.00%	6.6	2.7	1	1	1	4822	3687	4822	3687	4822	3687

ID	Narrative	Percent Cleared (%)	Area		Alt 1	Alt 2	Alt 3	Green Waste (Alt 1)		Green Waste (Alt 2)		Green Waste (Alt 3)	
			(Acres)	(Hectares)				(Cubic yards)	(Cubic meters)	(Cubic yards)	(Cubic meters)	(Cubic yards)	(Cubic meters)
110	Live-Fire Convoy Course Engagement Areas	100.00%	2.5	1.0	0	1	1	0	0	2392	1829	2392	1829
111	Live-Fire Convoy Course Engagement Areas	75.00%	9.0	3.7	0	1	1	0	0	6559	5015	6559	5015
113	IPBC Approaches	15.00%	18.2	7.4	1	1	1	2639	2018	2639	2018	2639	2018
115	IPBC Approaches	15.00%	8.8	3.6	1	1	1	1281	979	1281	979	1281	979
117	IPBC Approaches	15.00%	7.5	3.0	1	1	1	1083	828	1083	828	1083	828
120	100% Vegetation Clearance within HHIA	100.00%	527.0	213.2	1	1	1	510089	389991	510089	389991	510089	389991
121	BAX-Fire-Maneuver Approaches	15.00%	22.5	9.1	0	1	1	0	0	3260	2493	3260	2493
127	Live-Fire Convoy Course Engagement Areas	100.00%	0.6	0.3	1	0	0	598	457	0	0	0	0
128	Live-Fire Convoy Course Engagement Areas	75.00%	4.8	1.9	1	0	0	3480	2661	0	0	0	0
129	Live-Fire Convoy Course Engagement Areas	100.00%	0.6	0.2	1	0	0	598	457	0	0	0	0
130	Live-Fire Convoy Course Engagement Areas	75.00%	5.4	2.2	1	0	0	3940	3013	0	0	0	0
131	Live-Fire Convoy Course Engagement Areas	100.00%	0.6	0.2	1	0	0	598	457	0	0	0	0
132	Live-Fire Convoy Course Engagement Areas	75.00%	6.2	2.5	1	0	0	4523	3458	0	0	0	0
Total Volume of Green Waste								1,302,080	995,511	1,431,608	1,094,543	1,401,205	1,071,298

Legend: Alt = Alternative; BAX = Battle Area Complex; BZO = Battle Sight Zero; HHIA =High Hazard Impact Area; ID = identification; IDF =Indirect Fire; IPBC = Infantry Platoon Battle Course; MPRC = Multi-Purpose Range Complex.

Source: DoN 2014.

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Table 3.3-3. Pagan Vegetation Clearance Areas

Type	Number of Features	Area/Feature		Percent Cleared	Green Waste ¹	
		Acres	Hectares		Cubic Yards	Cubic Meters
Alternative 1						
Airfield Clear Zone and Bivouac Area	1	571.1	231.1	100%	276,425	211,342
DF Artillery Position	1	9.9	4.0	100%	4,784	3,658
IDF Artillery Position	2	9.9	4.0	100%	9,568	7,315
Helicopter Landing Zone	11	3.3	1.3	100%	17,648	13,493
Operational Munitions Pad	5	0.5	0.2	100%	1,120	857
Total Volume of Green Waste					309,545	236,664
Alternative 2						
Runway Clear Zone and Bivouac Area	1	571.1	231.1	100%	276,425	211,342
DF Artillery Position	1	9.9	4.0	100%	4,784	3,658
IDF Artillery Position	1	9.9	4.0	100%	4,784	3,658
Helicopter Landing Zone	13	3.3	1.3	100%	20,856	15,946
Operational Munitions Pad	5	0.5	0.2	100%	1,120	857
Total Volume of Green Waste					307,970	235,460

Note:

¹ Green waste (GW) volume calculated as follows: number of features × Acres per feature × 4,840 SY per acre × 1-yard average height × 0.10 (GW generation %) = GW volume.

Source: DoN 2014.

3.3.1 Tinian Green Waste

The assigned contractor would clear and grub the designated areas of the base camp, ranges, and supporting infrastructure. For purposes of this study, separate 18-month durations were estimated for the base camp and training range construction periods. The estimated durations could overlap; however, the green waste generation estimates are based on 18-month durations. The assigned contractor would need to process the green waste at the rates shown below.

- *CJMT Base Camp Construction:* 60,984 tons (55,324 metric tons) divided by 18 months = 3,388 tons (3,074 metric tons) per month. Working 8 hours per day, 5 days per week, the required production rate = 3,388 divided by 200 hours per month = 17 tons (15 metric tons) per hour.
- *Training Range Construction:* Taking the largest amount of green waste among the three alternatives, 357,902 tons (324,687 metric tons) divided by 18 months = 19,883 tons (18,038 metric tons) per month. Working 8 hours per day, 5 days per week, the required production rate = 19,883 divided by 200 hours per month = 99 tons (90 metric tons) per hour.

Based on the green waste generation rates estimated above, the assigned contractor would be required to set up wood chipping and composting operations at the base camp and selected training range alternative sites. Optimally, the green waste processing site would be near the designated laydown area to support the base camp construction, and similarly located areas near the training range locations.

The projected green waste generation would largely occur during the utilities and site improvement period. Upon completion of the base camp and training ranges, much less green waste would be generated during the operational use of the ranges and base camp. Maintenance of the training ranges would generate a reduced quantity and rate of green waste generation; therefore, the composting operation would be scaled down to meet this need. The optimal composting operation would depend on the usage of each of the ranges (e.g., live-fire versus maneuver) and the maintenance requirements for each range.

3.3.2 Pagan Green Waste

For Pagan, the assigned contractor would clear and grub the designated areas of the bivouac area, airfield, helipads, and artillery positions. For purposes of this study, a clearing and grubbing period of 18 months was estimated, during which time the green waste would be generated. From Table 3.3-3, the volume of green waste projected for both Alternatives 1 and 2 would be about the same (i.e., 309,545 cubic yards [236,664 cubic meters]). Per USEPA guidelines, 1 cubic yard (0.76 cubic meter) of green waste weighs around 500 pounds, or 0.25 tons (0.23 metric tons). Therefore, the total quantity in weight of the Pagan-generated green waste is estimated to be 77,386 tons (70,204 metric tons). Divided by 18 months, the monthly green waste generated would be 4,299 tons (3,900 metric tons) per month. Working 8 hours per day, 5 days per week, the required production rate = 4,299 tons (3,900 metric tons) per month divided by 200 hours per month = 22 tons per hour (20 metric tons per hour).

Based on the green waste generation rates estimated above, the assigned workforce would be required to set up wood chipping and composting operations near the bivouac area and airfield. Separate laydown areas would need to be established depending on the construction sequence. The composted and mulched product would be reused elsewhere on Pagan as cover material for erosion control and to support future military operations. Since the amount of green waste would exceed the future reuse requirement, the unusable green waste would need to be placed in selected areas and allowed to biodegrade.

Upon completion of the bivouac area and training ranges, much less green waste would be generated during the operational use of the bivouac area, airfield, and supporting ranges. Maintenance of these areas would generate a reduced quantity and rate of green waste generation. The optimal composting operation would depend on the usage of each of the ranges (e.g., live-fire versus maneuver) and would be accomplished by the pre- and post-live personnel teams preceding and following the training cycles.

3.4 CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT

C&D waste is projected to be generated throughout the construction of the CJMT facilities and training ranges. The types and quantities of C&D waste on Tinian are summarized in this section. At present, there are no C&D sites on Tinian that can accept C&D waste, and the only significant recycling resource is Triple Star, a private company under contract with the CNMI to collect scrap metal. C&D waste generated during the facility construction phase is estimated to be 3.89 pounds per square foot (18.99 kilograms per square meter) (USEPA 1998) multiplied by the total square footage of all base camp and planned U.S. military facilities at the Port of Tinian. Per the *Tinian Training Base and Expeditionary Camp Stage I DD 1391* (DoN 2014a), the total projected facility footprint would generate the C&D waste summarized below in Table 3.4-1. Because there would be no permanent facilities built and no existing facilities would be demolished on Pagan, no C&D waste is projected to be generated on Pagan.

Table 3.4-1. Estimated C&D Waste from CJMT-Related Construction

Source	Total Size of Facilities ¹	C&D Generation Rate	Total C&D Waste	
Base Camp	393,968 square feet (36,600 square meters)	3.89 pounds/square foot (18.99 kilogram/square meter)	1,532,536 pounds (696,607 kilograms)	766 tons (695 metric tons)
Port of Tinian	15,255 square feet (1,417 square meters)	3.89 pounds/square foot (18.99 kilograms/square meter)	59,342 pounds (26,974 kilograms)	29.7 tons (26.9 metric tons)
Total C&D Generated from CJMT-Related Construction:			1,591,878 pounds (1,444,535 kilograms)	796 tons (722 metric tons)

Note:

¹ The total facilities area shown does not include the munitions storage area or airport facilities. Facility square footage requirements for these additional facilities have not yet been determined.

Legend: C&D = construction and demolition; CJMT = Commonwealth of the Northern Mariana Islands Joint Military Training.

Source: DoN 2014.

Additional C&D waste generation estimates are identified below.

- Two aboveground fuel storage tanks in the International Broadcasting Bureau (IBB) compound (Figure 3.3-2) for alternatives 2 and 3 requiring IBB relocation.
- The existing asphalt surfaced roads within the proposed CJMT base camp footprint (Figure 3.3-1).

The estimated amount of C&D waste resulting from the demolition of the two fuel tanks is summarized in Table 3.4-2 and based on information in Table 3.4-3.

Table 3.4-2. Estimated C&D Waste from Fuel Tank Demolition

Facility	Steel Debris in Tons ¹	Concrete Debris in Tons ¹
Tank No. 1 500,000 gallons (1,892,706 liters) of diesel	70.9 tons (64.3 metric tons)	227.8 tons (206.6 metric tons)
Tank No. 2 63,000 gallons (238,481 liters) of gasoline	21.8 tons (19.8 metric tons)	227.8 tons (206.6 metric tons)
Total C&D Waste IBB Training Range Alternatives 1 and 3	92.7 tons (84.1 metric tons)	455.6 tons (413.3 metric tons)

Note:

¹ Steel and concrete debris quantities were calculated based on Table 3.4-3 backup documentation and assumptions. The C&D debris is assumed to be non-hazardous (i.e., the demolition contractor would be responsible for decontamination and/or remediation if required).

Legend: C&D = construction and demolition; IBB = International Broadcasting Bureau; No. = number.

Source: DoN 2014b.

Table 3.4-3. C&D Waste Backup Calculation, IBB Aboveground Fuel Storage Tanks

Tank	Volume	Diameter	Height	Surface Area	Weight of Steel	Weight of Steel	Volume of Column to Hold Roof in Place	Weight of Steel for Column	Column Weight	Total Weight
Tank 1	500,000 gal (1,892,700 liters)	40 ft (12.2 m)	55 ft (16.8 m)	9,425 SF (876 SM)	94,248 lbs (42,840 kg)	47.1 tons (42.7 metric tons)	97.2 CF (2.8 CM)	47,625 lbs (21,202 kg)	23.8 tons (21.6 metric tons)	70.9 tons (64.3 metric tons)
Tank 2	63,000 gal (238,481 liters)	40 ft (12.2 m)	8.7 ft (2.7 m)	3,606 SF (335 SM)	36,065 lbs (16,359 kg)	18.0 tons (16.3 metric tons)	15.4 CF (0.4 CM)	7,533 lbs (3,416 kg)	3.8 tons (3.5 metric tons)	21.8 tons (19.8 metric tons)

Foundation	Surface Area	Depth	Volume Concrete	Weight Concrete	Weight of Concrete
Tank 1	2,025 SF (188 SM)	1.5 ft (0.46 m)	3,037.5 CF (86.0 CM)	455,625 lbs (206,668 kg)	227.8 tons (206.7 metric tons)
Tank 2	2,025 SF (188 SM)	1.5 ft (0.46 m)	3,037.5 CF (86.0 CM)	455,625 lbs (206,668 kg)	227.8 tons (206.7 metric tons)

Assumptions:

Diameter approximated by measuring the tank width on Google Earth image.

Height assumes a 2-foot (61-centimeter) headspace.

Weight for steel assumes 0.25-inch (0.6-centimeter) width 3 gauge steel plate with 10 pounds per square foot (48.8 kilograms per square meter).

A cast/rolled steel column in the center of the tank holds the roof in place.

Weight of cast/rolled steel = 490 lbs/ft³ (7,849 kilograms per cubic meter).

A 45 ft × 45 ft (14 × 14 meter) slab foundation under each tank.

18-inch (46-centimeter) thick concrete slab assumed.

Weight of reinforced concrete using standard aggregates is 150 lbs/ft³ (2,403 kilograms per cubic meter).

Legend: CF = cubic foot; CM = cubic meter; ft = foot; gal = gallon; kg = kilogram; lbs = pounds; m = meter; SF = square foot.

Source: NAVFAC Pacific 2013.

The calculated C&D waste quantities above would only be generated if either Training Range Alternative 2 or 3 were selected for implementation. The steel debris would be recycled or disposed of by a qualified contractor. The concrete debris would be recycled by the demolition contractor producing grade B aggregate.

Table 3.4-4 summarizes the asphalt debris projected to be generated from demolishing the existing roads within the proposed base camp footprint. Similar to the concrete debris, the asphalt debris would be recycled by the demolition contractor, producing grade B aggregate.

Table 3.4-4. Construction and Demolition Backup Calculation, CJMT Base Camp Road Demolition

<i>Road Length</i> ¹	<i>Width</i>	<i>Thickness</i>	<i>Volume</i>	<i>Weight</i> ²
8,563 feet (2,610 meters)	25 feet (7.62 meters)	0.5 feet (0.15 meters)	107,038 cubic feet (3,031 cubic meters)	6,668 tons (6,049 metric tons)

Notes:

¹ From Figure 3.3-1, 2,610 meters of existing roads equates to 8,563 feet.

² Density of asphalt debris is 2.2 tons/cubic yard (2,610 kilograms per cubic meter).

Source: DoN 2014.

3.5 LANDFILL DISPOSAL

The CNMI Capital Improvements Program Office completed environmental assessments and planning studies to build a Subtitle D (solid waste)-compliant landfill to replace the currently non-compliant Tinian Municipal Dump. The U.S. Army Corps of Engineers (USACE) study (USACE 2005) determined the requirements for the permanent closure of the Tinian Municipal Dump and evaluated sites to construct a new RCRA Subtitle D-compliant landfill for the Municipality of Tinian. The study recommended that the future landfill be located at the Atgidon site within the Military Lease Area (MLA) (Figure 3.5-1). The USACE study projected an on-island residential population growth of 5% per annum through calendar year 2035. The planned landfill footprint was determined to require 45 acres (18 hectares), consisting of an impermeable liner, leachate collection and treatment system, environmental monitoring, and separate areas to dispose of C&D, asbestos-containing material, and dewatered septage. Siting criteria considered limitations imposed by USEPA, DEQ, Federal Aviation Administration, areal geology, aquifer significance, endangered species, conservation areas, and critical habitats.

Since the completion of the USACE (2005) study, the CNMI Capital Improvements Program Office completed geotechnical and hydrogeologic investigations of the Atgidon site (Tetra Tech 2013). These studies are part of the landfill design scheduled to be completed in 2014. The report included supporting technical studies to include a bird study and permitting provisions dictated by Federal Aviation Administration regulations.

The proposed Atgidon site is located within the MLA. The U.S. military has stated that this site is not suitable as a landfill because it would conflict with proposed training ranges at the same location. Therefore, only locations outside of the MLA were considered as part of this planning report, and a Landfill Siting Study is included in Appendix B. Two technically viable locations were identified at Carolinas and Pina in Appendix B that could serve as alternative landfill locations in addition to the previously identified Atgidon site.

The USACE (2005) study was based on an overall population growth of 5% per annum for the succeeding 30 years applied to the 2005 baseline population of 4,500 persons on Tinian to arrive at the design capacity of the landfill. Since 2005, the actual population decreased to 3,100 per the 2010 census (U.S. Census Bureau 2010), representing a 31% decrease over the preceding 5-year period and equating to a per annum decrease of 6%. This discrepancy in projected versus actual only represents the residential population and does not address the transient (mostly tourism) population, but the overall on-island population trend since 2005 has been downward. The downward trend is generally attributed to the decrease in tourism-related businesses and a drastic reduction in the garment industry on Saipan. The CJMT military growth would add a maximum number of 3,100 persons for up to 45 weeks per year under the long range training scenario, which represents a much smaller population growth increment when compared to the design population of the Atgidon landfill.



Figure 3.5-1. Tinian Proposed Landfill Location from USACE (2005)

Source: DoN 2014.

3.6 SOLID WASTE TRANSFER FACILITY

3.6.1 CNMI Civilian Solid Waste Transfer Station Planning

At present, there are no permanent transfer station facilities on Tinian. The CNMI DEQ completed a final environmental assessment in 2012 of the proposed site locations of the solid waste transfer station intended to support the Tinian population (Figure 3.6-1) (DCA 2012). The environmental assessment recommended “Site C,” identified as the area next to the Commonwealth Utilities Corp. Power Plant, west of San Jose as the preferred location for the CNMI transfer station. Along with the proposed Atgidon landfill, the CNMI transfer station would replace the existing non-compliant Tinian Municipal Dump.

3.6.2 CJMT Military Solid Waste Generation Estimate

The estimated MSW generated by the CJMT-supported population was based on actual solid waste generation rates recorded at the Pohakuloa Training Area (PTA), Hawaii operated by the U.S. Army. PTA functions as a military training facility supporting all service components, similar to the functions planned for the CJMT proposed action. The PTA solid waste generation and supported population data collected over a 6-month period resulted in a per capita generation rate of 7.0 pounds (3.2 kilograms)/person/day. Using the 7.0 pounds (3.2 kilograms) per person per day rate, the peak daily rate of MSW generated by the 3,100 CJMT population would amount to 21,700 pounds (9,864 kilograms) per day. The generation rate is summarized in Table 3.6-1.

Table 3.6-1. CJMT Military MSW Generated in Pounds

<i>MSW Generated in Pounds</i>	<i>Time Period</i>
21,700 pounds (9,864 kilograms)	Per Day
151,900 pounds (69,045 kilograms)	Per Week

Legend: MSW = municipal solid waste.

Source: DoN 2014.

The approximate amount of MSW estimated above was used to determine the size of the proposed CJMT transfer station. Per USEPA’s (1993) document, *Business Guide for Reducing Solid Waste*, the range of solid waste volume varies from 150 pounds per cubic yard (CY) (89 kilograms per cubic meter) for cardboard to 600 pounds per CY (356 kilograms per cubic meter) for plastics. For this analysis, a factor of 350 pounds per CY (208 kilograms per cubic meter) was selected, which falls roughly within the halfway point between the low and high density figures, resulting in the following volumes of MSW:

- 62 CY (47 cubic meters) per day (21,700 divided by 350 pounds per CY)
- 434 CY (332 cubic meters) per week

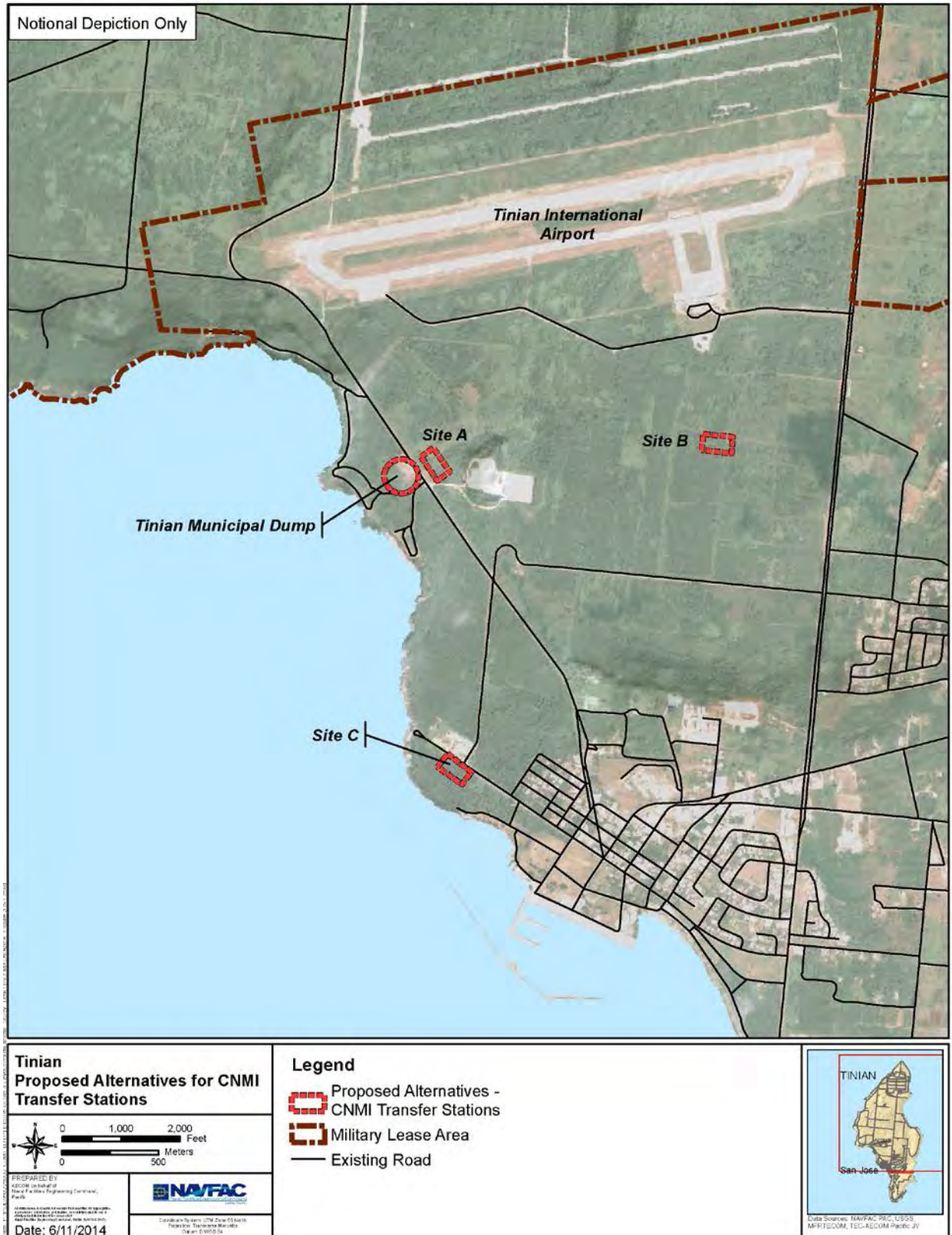


Figure 3.6-1. Tinian Proposed Alternatives for the CNMI Transfer Stations
 Source: DoN 2014.

3.6.3 CJMT Solid Waste Transfer Station Planning

The CJMT solid waste transfer station would need to collect, process, and prepare MSW. In the event that the planned CNMI landfill or incinerator is not available, the CJMT transfer station would perform the following functions:

- *Collection Function:* The solid waste collection trucks would return to the transfer station after picking up the MSW and unload the waste for processing.
- *Separation Function:* The MSW would be sorted to separate non-recyclable items that need to be shredded to facilitate volume reduction.
- *Shredding Function:* The identified waste would be shredded and then transferred to the baling equipment.
- *Baling Function:* The MSW would be processed through the baling machine and the packaged MSW placed on pallets.
- *Putrescible Waste Function:* Food waste would be placed in dehydration units to reduce the disposal quantity, and would be wrapped and placed in watertight containers.
- *Storage Function:* The baled waste on pallets would be transported with material handling equipment to the storage area and prepared for shipment.

3.6.3.1 Transfer Station Waste Processing Equipment

The following equipment would be required based on the previously estimated MSW generation rates:

- *Shredding Equipment:* The following capabilities are provided by a typical shredding machine based on research of various manufacturers:
 - Motor: 50 –75 horsepower
 - Power: low speed, high torque
 - Cutting: intermeshing cutters on twin shafts
 - Cutters: standard 2-inch (5-centimeter) alloy steel
- *Baling Equipment:* The following capabilities are provided by a typical baling machine based on research of various manufacturers:
 - Clear Top Opening: 45 inches × 56 inches (114 × 142 centimeters)
 - Motor: 50 horsepower, 460 volt, 3 phases, 60 hertz, totally enclosed, fan-cooled motor
 - Bale Size Produced: 4 feet high × 5 feet long × 2 feet 6 inches wide (1.2 × 1.5 × 0.8 meters)
- *Dehydration Equipment:* Food waste would be processed in dehydrator units to reduce the volume and facilitate subsequent handling.
- *Weighing Equipment:* A platform scale would be required to weigh incoming and outgoing solid waste collection trucks and containers.
- *Sorting Equipment:* Solid waste would be sorted in the tipping floor area using mechanical conveyor equipment to facilitate operations.

- *Material Handling Equipment:* Rubber-tired loaders and forklift trucks would be needed to separate incoming waste and move baled waste to designated storage areas.

3.6.3.2 Transfer Station Estimated Size Requirement

The CJMT transfer station would need to perform the following functions:

- *Shredding and Processing:* 200 square feet (18.6 square meters) is estimated to be required to operate the shredding machine and segregate recyclable waste that had not been previously disposed of in designated containers (and hence not taken directly to the recycling center).
- *Baling and Wrapping:* 2,500 square feet (232 square meters) is estimated to be required to operate the baling machine, which includes space for the solid waste collection trucks to drop off loads and forklift trucks to move the processed bales to the storage area. Wrapping and placement of putrescible waste into water-tight containers would also be performed in this area.
- *Storage:* Assuming that each baled pallet would occupy 36 square feet (6 feet x 6 feet) (3.3 square meters) and estimating a daily processed solid waste footprint of 62 pallets (1 CY [0.76 cubic meter]) of MSW per pallet, a total of 2,232 square feet (207 square meters) of storage area would be needed on a daily basis (this assumes the peak CJMT personnel count of 3,100). Adding a 10% factor to allow forklift trucks to move the pallets, a total of 2,455 square feet (228 square meters) per day of storage is projected. Assuming a maximum holding time of 7 days, a total of 17,185 square feet (1,597 square meters) of storage is projected. The storage area would be on a concrete or paved surface and enclosed within a fenced area. Assuming a rectangular shape, a 100 foot x 172 foot (30 x 53 meter) storage footprint would suffice to meet this need.

3.7 INCINERATION

Incineration of MSW has been successfully used at Navy facilities in Diego Garcia by Pennram Diversified Manufacturing Corporation. Information obtained from Pennram (Andrew Hooker, President and General Manager, Pennram, April 3, 2014) was used to develop the planning estimates associated with incineration as the MSW disposal method in support of the CJMT proposed action. The following incineration equipment is projected to be required:

- One 1,000 pound (454 kilogram) per hour incinerator rated at 10.9 tons (9.9 metric tons) per day
- Diesel fuel tank with 1,160 gallons (4,391 liters) capacity
- One 100 kilowatt generator (480 volt, 3-phase)
- Air pollution control equipment (heat recovery boiler, ductwork, piping, bypass stack, and wet scrubbing system)

Incineration would also require air emission control permits regulated by the CNMI DEQ. Site selection of the incinerator would also require approval from the CNMI and would be tied to the air emissions permit. The air pollution control equipment would need to be tailored to meet the specific emission limits.

The 1,000 pound (454 kilogram) per hour incinerator and associated supporting equipment described above would require a paved surface area of 4,800 square feet (446 square meters). The incinerator

equipment would require a building; however, the incinerator exhaust stacks would extend vertically 48 feet (14.6 meters).

The incineration process would generate ash at a rate of 1% to 5% in weight of the solid waste throughput, depending on the waste stream. From Section 3.6.2, 21,700 pounds (9,864 kilograms) of MSW would be generated per day. Assuming a conservative diversion rate of 40%, 13,020 pounds (5,918 kilograms) of MSW would require disposal per day. Using 5% as a planning figure, 651 pounds (296 kilograms) of ash would be generated per day. This ash quantity would need to be packed in containers and shipped off island to a permitted disposal facility.

3.8 WASTE TO ENERGY AND CONVERSION TECHNOLOGIES

WTE is defined as the process of generating energy in the form of electricity and/or heat by utilizing waste as the base fuel. WTE processes produce electricity through direct combustion of the waste, or produce a combustible fuel commodity, such as methane, methanol, or other synthetic fuel that is then combusted to produce electricity and/or a useable heat source. WTE facilities can utilize processes for the conversion of waste, in the absence of oxygen, to produce a synthesis gas, usually methane and carbon monoxide. The synthesis gas can then be combusted as a fuel and converted into heat or mechanical energy. Waste to energy and other conversion technologies in general require a large amount of solid waste to make them economical. Also since there is currently a surplus of electrical energy production on Tinian, introducing additional generation capacity could adversely impact the economics of the existing power generation arrangement. Due to the relatively small amount of solid waste generation on Tinian, this technology was not studied in detail.

The conversion technology of thermal decomposition from the Terragon Environmental Technologies trademarked Micro Auto Gasification System Model V7 unit was previously identified as a possible means of solid waste disposal that would require less space than landfills and reduce off-island transportation. At present, the Micro Auto Gasification System technology is considered to be experimental and requires further development before it can be accepted for use by the U.S. military.

CHAPTER 4. WASTE CHARACTERIZATION

4.1 INTRODUCTION

Waste characterization is the process by which the composition of waste streams is analyzed. For the CJMT ISWMP, the waste characterization process involved developing a template of waste streams based on the methodology contained in the *NAVFAC Marianas Department of Defense Integrated Solid Waste Management Plan*, developed for the U.S. military bases on Guam (NAVFAC Marianas 2013).

4.2 WASTE STREAM PROJECTIONS

The *NAVFAC Marianas Department of Defense Integrated Solid Waste Management Plan* contained waste characterization statistics from waste streams generated at Naval Base Guam and Andersen Air Force Base. The approximate percentages of waste indicated below (Table 4.2-1) were taken from that study and used to estimate the quantities of waste expected at the CJMT base camp.

Table 4.2-1. CJMT Military Waste Composition Summary Projection

<i>Waste Stream</i>	<i>Estimated Percent</i>	<i>Projected Waste Amount¹</i>
Paper and Cardboard	28.5%	6,185 lbs/day (2,811 kg/day)
Glass	4%	868 lbs/day (395 kg/day)
Plastics and Polystyrene	19.5%	4,232 lbs/day (1,924 kg/day)
Metal (including Aluminum)	6%	1,302 lbs/day (592 kg/day)
Organics	34.5%	7,487 lbs/day (3,403 kg/day)
Construction and Demolition	5%	1,085 lbs/day (493 kg/day)
Electronics	1%	217 lbs/day (99 kg/day)
Remaining/Composite MSW	1.3%	282 lbs/day (128 kg/day)
Household Hazardous Waste	0.2%	43 lbs/day (20 kg/day)
Total	100%	21,700 lbs/day (9,864 kg/day)

Note:

¹ The total projected MSW generated per day is 21,700 lbs (9,864,217 kg) (from Section 3.6).

Legend: kg = kilograms; lbs = pounds.

Source: NAVFAC Marianas 2013.

4.3 WASTE MATERIAL DESCRIPTIONS

The nine waste stream categories were further broken down into the discrete waste material divisions described in the following sections.

4.3.1 Paper

The paper category includes recyclable paper (newsprint, magazines, copy paper), non-recyclable paper (photographs, paper bags with plastic lining), and cardboard (unwaxed cardboard, corrugated cardboard).

4.3.2 Glass

The glass category includes recyclable (bottles, containers) and non-recyclable (i.e., windows, light bulbs) glass.

4.3.3 Plastics

The plastics category includes polyethylene containers (beverage containers with a “#1” in the triangular recycling symbol, to-go cups, deli trays); high density polyethylene containers (bottles with a “#2” in the triangular recycling symbol, milk, juice containers); trash bags (used and unused garbage bags); grocery bags; other recyclable film; other recyclable rigid containers; and Styrofoam.

4.3.4 Metals

The metals category includes ferrous (scrap metal to which a magnet adheres, tinned steel containers, aerosol cans); non-ferrous (aluminum used beverage cans, foil, aluminum food containers); and composite metal (predominantly metal with other materials attached, such as appliances and insulated wire).

4.3.5 Organic Materials

The organics category includes food (bones, rinds, fats, oils grease); leaves and grass (non-woody plant material, grass clippings, weeds, garden wastes); pruning and trimmings (trimmed branches less than 6 inches [15 centimeters] in diameter from bushes, shrubs and trees); branches and stumps (trimmed limbs greater than 6 inches [15 centimeters] in diameter); agricultural residues (plant material, vegetable byproducts from farming, residual fruits and crop remains); textiles (rag stock fabric both natural and synthetic fibers); and carpet and carpet padding (rubber, foam, felt material under carpeting).

4.3.6 Construction and Demolition

The C&D category includes concrete (building foundations, concrete paving, cinder blocks); asphalt (petroleum-based binder mixed with aggregate); wood (milled lumber, pallets, crates); composition shingles (roofing material); and composite C&D (gypsum board, insulation, mixed demolition debris).

4.3.7 Electronics

The electronics category includes cell phones, stereos, radios, video cassette recorders, camcorders, microwaves, computer monitors, television monitors, digital cameras, and other electronic devices.

4.3.8 Remainder/Composite Municipal Solid Waste

The remainder/composite MSW category includes all other materials not classified elsewhere.

4.3.9 Household Hazardous Waste

The household hazardous waste category includes wastes from products that pose a hazard to human health (e.g., batteries, paints, solvents, flammable liquids, toxics, corrosives, pesticides, syringes, and herbicides).

4.4 RECOMMENDED FUTURE WASTE CHARACTERIZATION

The projected waste stream generation percentages identified in Section 4.2 are based on the *NAVFAC Marianas Department of Defense Integrated Solid Waste Management Plan*, developed for the U.S. military bases on Guam (NAVFAC Marianas 2013). This document compiled actual waste characterization metrics at U.S. military bases on Guam housing U.S. military personnel and their

families. The cantonment areas housed U.S. military personnel in a remote island setting, similar to the planned Tinian cantonment. It is recommended that future waste characterization studies be performed once the CJMT base camp achieves full build-out to optimize reuse and recycling.

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CHAPTER 5.

RECORD KEEPING AND REPORTING

Current U.S. military record keeping and reporting of solid waste metrics consist of annual reports required of each installation generating more than 1 ton (0.9 metric ton) per day of solid waste. Upon initiation of the CJMT proposed action, the responsible military command's Environmental Department would exercise control of solid waste reporting and implement the following metrics to track solid waste quantities:

- Disposal logs would be required of the U&SI contractor to track the amount and diversion progress of green waste and C&D waste.
- Recycling records would be required of the construction contractor to track the diversion of scrap metal, wood, and concrete debris generated during construction.
- CJMT U&SI and construction contractors' solid waste management and C&D debris waste reporting would be tracked per their contractual specifications.

Additional record keeping and reporting requirements may be required under the CNMI solid waste permits granted for the processing and disposal facilities.

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CHAPTER 6.

SUMMARY OF INTEGRATED SOLID WASTE MANAGEMENT PLAN ELEMENTS

This ISWMP document follows the recommended outline provided in the *Environmental Compliance and Protection Manual* (DoN 1998) and reflects the solid waste management hierarchy. This chapter summarizes the primary points related to each of the elements in Chapter 3.

6.1 SOURCE REDUCTION AND REUSE

In general, the key issues and U.S. military goals established by the various EOs would be centralized under the unified Marine Corps program at the start of the CJMT proposed action. Included in this effort would be the need to establish a system whereby reduction and reuse are measured and tracked.

6.2 RECYCLING

The recycling function would remain a key element regardless of the final method of waste disposal selected. As such, the proposed recycling facility described in Section 3.2 would remain a key part of the solid waste infrastructure and consist of a 6,325 square foot (587 square meter) facility designed to recycle paper, cardboard, glass, metal, aluminum, spent ammunition casings, etc. The recycling center would be co-located with the transfer station and open storage area within the industrial support footprint of the CJMT base camp.

6.3 GREEN WASTE MANAGEMENT

The primary period of green waste generation would occur during the U&SI phase of the CJMT proposed action. As calculated in Section 3.3, the clearing and grubbing portion of the construction period would generate green waste that would be chipped and composted by the assigned contractor as part of the contracted scope of work. Laydown areas provided to the contractor both at the base camp and training range work sites would be used to conduct the green waste diversion tasks. The estimated green waste projections are summarized in Table 6.3-1.

Table 6.3-1. Green Waste Projections for Tinian and Pagan

<i>Training Range Alternative</i>	<i>Green Waste Projected</i>
Tinian CJMT Base Camp	60,984 tons (55,324 metric tons)
Tinian Range Alternative 1	325,520 tons (295,307 metric tons)
Tinian Range Alternative 2	357,902 tons (324,683 metric tons)
Tinian Range Alternative 3	350,301 tons (317,788 metric tons)
Pagan Alternative 1	77,386 tons (70,203 metric tons)
Pagan Alternative 2	76,993 tons (69,847 metric tons)

Legend: CJMT = Commonwealth of the Northern Mariana Islands Joint Military Training.

Source: DoN 2014.

6.4 CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT

The C&D waste estimated in Section 3.4 would consist of the 796 tons (722 metric tons) generated during construction; the 93 tons (84 metric tons) of steel debris and 456 tons (414 metric tons) of concrete debris attributed to the two IBB fuel storage tanks that would need to be demolished if Alternative 2 or 3 were selected; and the 6,668 tons (6,049 metric tons) of asphalt debris generated during the demolition of the

existing base camp roads. The construction of the airport and munitions storage area facilities would also generate C&D waste; however, the exact sizes of these facilities have not yet been determined.

6.5 LANDFILL DISPOSAL

The proposed Atgidon site is located within the MLA. The U.S. military has stated that this site is not suitable as a landfill because it would conflict with proposed training ranges at the same location. Therefore, any future planning related to the CJMT-generated solid waste must include other forms of disposal beyond the use of any planned Tinian landfill. Alternative locations to site a RCRA-compliant lined landfill outside of the MLA have been identified and included in Appendix B of the Solid Waste Study. The design capacity of the CNMI planned landfill would require 45 acres (18 hectares) of land and would suffice to accept the CJMT-generated MSW if constructed. The option to construct a RCRA-compliant Subtitle D landfill on Tinian was included in the previous version of the CJMT solid Waste Study. This option was removed from consideration based on a meeting between the Marine Forces Pacific and CNMI government agencies in March 2014 which determined that no mutually acceptable site could be agreed upon.

6.6 SOLID WASTE TRANSFER FACILITY

The CJMT proposed action would necessitate the construction of a solid waste transfer station to support the maximum CJMT military population projected (i.e., 3,100 personnel) on Tinian. Along with the recycling center and associated paved storage area, the solid waste handling function would be needed to support both on-island and off-island disposal options. Section 3.6 calculated that a transfer station building size of 2,700 square feet (250 square meters) located next to a 17,185 square foot (1,597 square meter) open storage area would be required to meet the MSW generation requirement of 21,700 pounds (9,864 kilograms) per day.

6.7 INCINERATION

The Pennram Diversified Manufacturing Corporation proposed 1,000 pounds (454 kilograms) per hour incinerator and supporting equipment would require a paved surface area of 4,800 square feet (446 square meters) with a vertical clearance of 48 feet (14.6 meters). An estimated 651 pounds (296 kilograms) of ash per day would be generated via incineration. The ash waste would need to be packed in containers and shipped off island (e.g., to the Marpi solid waste facility on Saipan).

6.8 WASTE TO ENERGY AND CONVERSION TECHNOLOGIES

Waste to energy systems will be considered in the follow-on Technical Memorandum addressing incineration versus WTE methods of disposal in terms of cost, efficiency, and long-term benefit. Other conversion technologies such as Micro Auto Gasification System and WastAway are currently in the experimental stages and not fully developed for Department of Defense implementation.

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Appendix B
Landfill Siting Study

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**FINAL
(VERSION 4)
COMMONWEALTH OF THE NORTHERN MARIANA
ISLANDS JOINT MILITARY TRAINING
SOLID WASTE STUDY**

**APPENDIX B
LANDFILL SITING STUDY**



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August 2014

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**FINAL
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COMMONWEALTH OF THE NORTHERN MARIANA
ISLANDS JOINT MILITARY TRAINING
SOLID WASTE STUDY**

**APPENDIX B
LANDFILL SITING STUDY**



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LIST OF ACRONYMS AND ABBREVIATIONS

BECQ	Bureau of Environmental and Coastal Quality	MLA	Military Lease Area
CFR	Code of Federal Regulations	MSW	municipal solid waste
CJMT	Commonwealth of the Northern Mariana Islands Joint Military Training	MSWLF	municipal solid waste landfill
CNMI	Commonwealth of the Northern Mariana Islands	NAVFAC	Naval Facilities Engineering Command
DCA	Duenas, Camacho & Associates	No.	Number
DoN	Department of the Navy	NOAA	National Oceanic and Atmospheric Administration
DPW	Department of Public Works	PTA	Pohakuloa Training Area
EIS/OEIS	Environmental Impact Statement/Overseas Environmental Impact Statement	RCRA	Resource Conservation and Recovery Act
FEMA	Federal Emergency Management Agency	U.S.	United States
JGPO	Joint Guam Program Office	U.S.C.	United States Code
LOW	limit of waste	USACE	U.S. Army Corps of Engineers
MARFORPAC	Marine Forces Pacific	USEPA	United States Environmental Protection Agency
		USFWS	United States Fish and Wildlife Service
		USGS	U.S. Geological Survey

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CHAPTER 1.

INTRODUCTION

1.1 SCOPE AND PURPOSE

The scope and purpose of this Landfill Siting Study are to identify and analyze potential municipal solid waste landfill (MSWLF) sites that are not constrained by the proposed training ranges on Tinian, in the Commonwealth of the Northern Mariana Islands (CNMI). Areas within the Military Lease Area (MLA) were excluded because the property is needed by the military and is necessary to support training. The siting study further analyzes the proposed sites' feasibility, limitations, and capacity. A checklist analysis is included to ensure compliance with CNMI and federal regulations, laws, instructions, directives, and executive orders pertinent to the siting of a Resource Conservation and Recovery Act (RCRA)-compliant MSWLF.

This Landfill Siting Study for a potential new MSWLF on Tinian was prepared under Naval Facilities Engineering Command Pacific contract N62742-11-D-1801, Task Order Number (No.) 0002, as a stand-alone appendix to the solid waste planning volume supporting the CNMI Joint Military Training (CJMT) proposed action for United States (U.S.) military activities on Tinian and Pagan.

Additional resources used to complete this Landfill Siting Study include previous studies completed for the CNMI, including the *Comprehensive Study Report of Tinian Landfill* (USACE 2005), and the *Final Environmental Assessment for the Siting of a Solid Waste Transfer Station on Tinian, CNMI* (DCA 2012). These studies are referenced as they contain pertinent technical analyses that have been incorporated in this study.

1.2 BACKGROUND INFORMATION

1.2.1 Existing Tinian Municipal Dump

The Tinian Department of Public Works (DPW) operates the existing Tinian Municipal Dump located west of 8th Avenue and south of the Tinian International Airport (Figure 1.2-1); however, this site does not comply with the applicable CNMI or RCRA regulations governing solid waste disposal and creates a flight hazard at the airport. The CNMI Department of Environmental Quality issued a Cease and Desist Administrative Order to the DPW in January 2010 (DEQ 2010) documenting findings of violations regarding the operation and maintenance of the Tinian Municipal Dump. Specific operations and maintenance measures were ordered by the Department of Environmental Quality to more properly mitigate and control potential health hazards. As such, the current Tinian Municipal Dump does not suffice as an option for the U.S. military to dispose of CJMT-generated municipal solid waste (MSW).

No trash pickup service is available on Tinian; therefore, residents take their trash to the Tinian Municipal Dump for disposal. The CNMI offices and private businesses, including the Tinian Dynasty Hotel and Casino, transport their solid waste to the Tinian Municipal Dump as well.



Figure 1.2-1. Tinian Location – Tinian Municipal Dump

Source: DoN 2014.

1.2.2 Previous MSWLF Siting Study

The CNMI Capital Improvements Project Office has conducted environmental assessments and planning studies to build a RCRA-compliant landfill to replace the currently non-compliant Tinian Municipal Dump. The *Comprehensive Study Report of Tinian Landfill* (USACE 2005) recommended that the future MSWLF be located at the Atgidon site within the MLA (see Figure 1.2-2). Since the completion of the U.S. Army Corps of Engineers (USACE) 2005 study, the CNMI Capital Improvements Project Office has implemented design and planning studies via contract with Tetra Tech. The design is scheduled to be completed in calendar year 2014 and would include a bird study and permitting provisions dictated by Federal Aviation Agency regulations.

The proposed Atgidon site is located within the MLA. The U.S. military has stated that this site is not suitable as a landfill because it would conflict with proposed training ranges at the same location. Therefore, only the other locations outside of the MLA would need to be considered, along with solid waste solutions other than landfilling (e.g., off-island transportation, incineration, waste-to-energy, and thermal decomposition) to address the CJMT requirements.

The USACE (2005) study was based on an annual population growth of 5% for the succeeding 30 years applied to the 2005 baseline population of 4,500 persons on Tinian to arrive at the design capacity of the MSWLF. Since 2005, the actual population decreased to 3,100 per the 2010 census (U.S. Census Bureau 2010), representing a 31% decrease over the preceding 5-year period and equating to a per annum decrease of 6%. While this discrepancy in projected versus actual only represents the residential population and does not address the transient (mostly tourism) population, the overall on-island population trend since 2005 has been downward. The downward trend is generally attributed to the overall decrease in tourism-related businesses and drastic reduction in the garment industry on Saipan. The CJMT military growth would add up to 3,100 persons on an interim basis, which would fall well within the design capacity of the Atgidon landfill. Therefore, the planned size of the MSWLF footprint developed in the USACE (2005) study (45 acres [18 hectares]) would be large enough to support the CJMT population growth.

1.2.3 Projected CJMT Municipal Solid Waste Generation

The estimated MSW generated by the CJMT-supported population was based on actual solid waste generation rates recorded at the Pohakuloa Training Area (PTA), Hawaii operated by the U.S. Army. PTA functions as a military training facility supporting all service components, similar to the functions planned for the CJMT proposed action. The PTA solid waste generation and supported population data collected over a 6-month period resulted in a per capita generation rate of 7.0 pounds (3.2 kilograms)/person/day. Using the 7.0 pounds (3.2 kilograms) per person per day rate, the peak daily rate of MSW generated by the 3,100 CJMT population would amount to 21,700 pounds (9,843 kilograms) per day. The generation rate is summarized in Table 1.2-1.

Table 1.2-1. MSW Generated on Tinian

<i>Municipal Solid Waste Generated</i>	<i>Time Period</i>
21,700 lbs (9,864 kg)	Per Day
151,900 lbs (69,048 kg)	Per Week

Legend: lbs = pounds; kg = kilograms.

Source: U.S. Army 2014.



Figure 1.2-2. Tinian Proposed Alternatives for CNMI Transfer Stations

Source: DoN 2014.

CHAPTER 2. REGULATIONS AND GUIDANCE DOCUMENTS

This section summarizes the laws and regulations applicable to MSWLF siting on Tinian. The precedence applicable to regulatory documents is: CNMI Administrative Code; federal regulations; executive orders; and U.S. military, Department of the Navy, Marine Corps Orders and Instructions.

2.1 FEDERAL REGULATIONS AND EXECUTIVE ORDERS

The existing regulations and their pertinent restrictions on siting an MSWLF are listed in Table 2.1-1.

Table 2.1-1. Federal Regulations and Restrictions

<i>Regulation</i>	<i>Restrictions</i>
40 CFR Part 258 – Criteria For Municipal Solid Waste Landfills Subpart B – Location Restrictions	
§258.10 Airport safety. (a) Owners or operators of new MSWLF units, existing MSWLF units, and lateral expansions that are located within 10,000 feet (3 kilometers) of any airport runway end used by turbojet aircraft or within 5,000 feet (1.5 kilometers) of any airport runway end used by only piston-type aircraft must demonstrate that the units are designed and operated so that the MSWLF unit does not pose a bird hazard to aircraft. (b) Owners or operators proposing to site new MSWLF units and lateral expansions within a 5-mile (8-kilometer) radius of any airport runway end used by turbojet or piston-type aircraft must notify the affected airport and the Federal Aviation Administration.	MSWLF would not be sited within 10,000 feet (3 kilometers) of the Tinian International Airport runway, and the owner must notify the affected airport and FAA if the proposed site of the MSWLF is within 5 miles (8 kilometers) and must demonstrate that the units are designed and operated so that the MSWLF unit does not pose a bird hazard to aircraft. The demonstration must be placed in the operating record and the CNMI Bureau of Environmental and Coastal Quality (BECQ, formerly the Department of Environmental Quality) notified.
§ 258.11 Floodplains. (a) Owners or operators of new MSWLF units, existing MSWLF units, and lateral expansions located in 100-year floodplains must demonstrate that the unit will not restrict the flow of the 100-year flood, reduce the temporary water storage capacity of the floodplain, or result in washout of solid waste so as to pose a hazard to human health and the environment. The owner or operator must place the demonstration in the operating record and notify the State Director that it has been placed in the operating record.	MSWLF would not be sited within a 100-year floodplain. If the landfill is sited within the 100-year floodplain, the operator would be required to demonstrate that there is no restriction for flow of the 100-year flood and restrictions to the temporary storage capacity of the floodplain. The operator would also demonstrate through a stormwater protection plan that stormwater would not wash away solid waste from the site and pose a hazard to human health and the environment.

Regulation	Restrictions
<p>§ 258.12 Wetlands.</p> <p>(a) New MSWLF units and lateral expansions shall not be located in wetlands, unless the owner or operator can make the following demonstrations to the Director of an approved State:</p> <p>(1) Where applicable under Section 404 of the Clean Water Act or applicable state wetlands laws, the presumption that a practicable alternative to the proposed MSWLF is available which does not involve wetlands is clearly rebutted;</p> <p>(2) The construction and operation of the MSWLF unit will not: (i) Cause or contribute to violations of any applicable state water quality standard, (ii) Violate any applicable toxic effluent standard or prohibition under Section 307 of the Clean Water Act, (iii) Jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of a critical habitat, protected under the Endangered Species Act of 1973, and (iv) Violate any requirement under the Marine Protection, Research, and Sanctuaries Act of 1972 for the protection of a marine sanctuary;</p> <p>(3) The MSWLF unit will not cause or contribute to significant degradation of wetlands. The owner or operator must demonstrate the integrity of the MSWLF unit and its ability to protect ecological resources by addressing the following factors: (i) Erosion, stability, and migration potential of native wetland soils, muds and deposits used to support the MSWLF unit; (ii) Erosion, stability, and migration potential of dredged and fill materials used to support the MSWLF unit; (iii) The volume and chemical nature of the waste managed in the MSWLF unit; (iv) Impacts on fish, wildlife, and other aquatic resources and their habitat from release of the solid waste; (v) The potential effects of catastrophic release of waste to the wetland and the resulting impacts on the environment; and (vi) Any additional factors, as necessary, to demonstrate that ecological resources in the wetland are sufficiently protected.</p> <p>(4) To the extent required under Section 404 of the Clean Water Act or applicable state wetlands laws, steps have been taken to attempt to achieve no net loss of wetlands (as defined by acreage and function) by first avoiding impacts on wetlands to the maximum extent practicable as required by paragraph (a)(1) of this section, then minimizing unavoidable impacts to the maximum extent practicable, and finally offsetting remaining unavoidable wetland impacts through all appropriate and practicable compensatory mitigation actions (e.g., restoration of existing degraded wetlands or creation of man-made wetlands);</p> <p>(5) Sufficient information is available to make a reasonable determination with respect to these demonstrations.</p>	<p>MSWLF would not be sited within wetland areas.</p>
<p>§ 258.13 Fault areas.</p> <p>(a) New MSWLF units and lateral expansions shall not be located within 200 feet (60 meters) of a fault that has had displacement in Holocene time unless the owner or operator demonstrates to the Director of an approved state that an alternative setback distance of less than 200 feet (60 meters) will prevent damage to the structural integrity of the MSWLF unit and will be protective of human health and the environment.</p>	<p>MSWLF would not be sited within 200 feet (60 meters) of a fault line.</p>

Regulation	Restrictions
<p>§ 258.14 Seismic impact zones.</p> <p>(a) New MSWLF units and lateral expansions shall not be located in seismic impact zones, unless the owner or operator demonstrates to the Director of an approved State/Tribe that all containment structures, including liners, leachate collection systems, and surface water control systems, are designed to resist the maximum horizontal acceleration in lithified earth material for the site. The owner or operator must place the demonstration in the operating record and notify the State Director that it has been placed in the operating record.</p>	<p>Containment structures to resist maximum horizontal acceleration in lithified material for the site would be needed.</p>
<p>§ 258.15 Unstable areas.</p> <p>(a) Owners or operators of new MSWLF units, existing MSWLF units, and lateral expansions located in an unstable area must demonstrate that engineering measures have been incorporated into the MSWLF unit's design to ensure that the integrity of the structural components of the MSWLF unit will not be disrupted. The owner or operator must place the demonstration in the operating record and notify the State Director that it has been placed in the operating record. The owner or operator must consider the following factors, at a minimum, when determining whether an area is unstable:</p> <p>(1) On-site or local soil conditions that may result in significant differential settling;</p> <p>(2) On-site or local geologic or geomorphologic features; and</p> <p>(3) On-site or local human-made features or events (both surface and subsurface).</p>	<p>MSWLF would not be sited at slopes greater than 30% (16.7 degree) where landslides could occur. Site-specific engineering measures to counter karst terrain lithology would be required.</p>
<p>Federal Water Pollution Control Act (Clean Water Act), 33 U.S.C. 1251</p>	
<p>Section 402 of the Clean Water Act established the National Pollutant Discharge Elimination (NPDES) program that initially controlled the discharge of pollutants from point sources such as wastewater outfalls. The program has expanded to include the control of stormwater discharges. Under current regulations, an NPDES permit would be required for construction activities that disturb more than 1 acre (0.4 hectare).</p>	<p>The proposed MSWLF construction would require the operator to submit a Notice of Intent to the USEPA and prepare a stormwater pollution prevention plan.</p>
<p>Clean Air Act (CAA), 42 U.S.C. 7401 et seq.</p>	
<p>The CAA includes provisions to ensure that federal actions do not obstruct local efforts to control air pollution. Section 176(c) of the CAA prohibits federal agencies, department, or instrumentalities from engaging in, supporting, licensing, or approving any action that does not conform to an approved state or federal implementation plan.</p>	<p>There are no non-attainment zones in Tinian (DCA 2012). MSWLF construction and operation would have to comply with CAA provisions.</p>
<p>Coastal Zone Management Act (CZMA)</p>	
<p>Federal activities and development projects that directly affect the coastal zone must be conducted or supported in a manner that is, to the maximum extent practicable, consistent with the Coastal Resources Management (CRM) Program. The implementation of these federal consistency provisions will be carried out in accordance with Section 307 of the CZMA and federal regulations at 15 CFR, Part 930.</p>	<p>The proposed MSWLF construction would have to be consistent with the CRM Program, goals and policies in CNMI Public Law 3-47, standards and priorities in CRM regulations, federal air and water quality standards, air and water quality standards of the CNMI, and other applicable policies and regulations.</p>

Regulation	Restrictions
National Historic Preservation Act (NHPA)	
Section 106 of the NHPA requires federal agencies to take into account the effects of their proposed actions on historic properties.	If the MSWLF is sited in an area designated as a historic property, then Section 106 consultation would be needed.
Endangered Species Act of 1973 (ESA), 16 U.S.C. 1531 et seq.	
Under the ESA, federal agencies are required to conduct their actions as to not jeopardize the continued existence of any threatened or endangered species, or result in the destruction or adverse modification of critical habitat. Federal agencies are required to consult with the U.S. Fish and Wildlife Service (USFWS) and/or the National Marine Fisheries Service for actions that would adversely affect a listed species or habitat.	The MSWLF would preferably not be sited in an area where special status species occur (e.g., native limestone forests and preserve areas). If the MSWLF is located in an area where endangered species exist, then consultation would be necessary with the USFWS and National Marine Fisheries Service to ensure that any adverse impacts are avoided or mitigated.
Farmland Protection and Policy Act (FPPA), 7 U.S.C. 4201	
The FPPA was enacted in 1981 to minimize the loss of prime farmland and unique farmlands as a result of federal actions by converting these lands to nonagricultural uses. It ensures that federal programs are compatible with state and local governments, and private programs and policies to protect farmland. Federal agencies that authorize actions that result in the conversion of prime or unique farmland not already committed to urban development or water storage are responsible for compliance with the FPPA. Compliance is coordinated with the U.S. Department of Agriculture Natural Resources Conservation Service.	The MSWLF would not be sited within prime or unique farmland area.
Migratory Bird Treaty Act, 16 U.S.C. 703 and Executive Order 13186, Responsibilities of Federal Agencies to Migratory Bird Treaty Act	
The Migratory Bird Treaty Act prohibits the taking or harming of migratory birds. Under the executive order, a federal agency taking actions that have, or are likely to have, a measurable negative effect on migratory bird populations is directed to develop and implement, within 2 years, a Memorandum of Understanding with the USFWS that promotes the conservation of migratory bird populations.	The MSWLF would not involve the taking or harming of migratory birds.
Executive Order 13112, Invasive Species	
This executive order directs that all federal agencies whose actions may affect the status of invasive species shall, to the extent practicable and permitted by law: <ul style="list-style-type: none"> (a) Identify such actions; (b) Subject to the availability of appropriations and within administration budgetary limits, use relevant programs and authorities to: (i) prevent the introduction of invasive species, and (ii) not authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere unless, pursuant to guidelines that it has prescribed, the agency has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm caused by invasive species; and that all feasible and prudent measures to minimize risk will be taken in conjunction with the actions. 	If importation of fill is required for constructing the MSWLF from other islands, then measures would be instituted to ensure that invasive species are not imported.

Regulation	Restrictions
Executive Order 12898, Environmental Justice in Minority Populations and Low-Income Populations	
Executive Order 12898 requires federal agencies to undertake efforts to achieve environmental justice in minority and low-income populations by “identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities.”	Tinian’s population in the 2000 Census comprised mainly Asians (45%) and Pacific islanders (42%), which would be considered a minority population relative to the U.S. national population. However, they are the majority on the island. A large proportion (41%) of the island residents lives below the federal poverty level and can be considered a low-income population. The MSWLF siting would not disproportionately affect minority or low-income populations as they are not segregated to one area of the island but are distributed throughout the residential areas.
Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks	
Executive Order 13045 acknowledges that children may suffer disproportionately relative to adults from environmental and safety risks attributable to the development of their neurological, immunological, digestive, and other bodily systems. The executive order requires federal agencies to place a high priority on the identification and assessment of environmental health and safety risks to its policies, programs, activities, and standards that may disproportionately affect children.	The new MSWLF would encourage the responsible disposal of solid waste by the public, leading to an overall safer and healthier environment for residents and children of Tinian.
Executive Order 11988, Floodplain Management	
Executive Order 11988 requires federal agencies to avoid to the extent possible the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative.	The MSWLF would not be sited in a 100-year floodplain or in the floodway.
Executive Order 11990, Protection of Wetlands	
Executive Order 11990 requires federal agencies to provide leadership and take action to minimize the destruction, loss, or degradation of wetlands; and to preserve and enhance the natural and beneficial values of wetlands.	The MSWLF would not be sited in a wetland area.
Executive Order 13089, Protection of Coral Reefs	
Executive Order 13089 was signed in 1998 to preserve and protect the biodiversity, health, heritage, and social and economic value of U.S. coral reef ecosystems and the marine environment. As such, all federal agencies whose actions may affect U.S. coral reef ecosystems shall: (a) identify their actions that may affect U.S. coral reef ecosystems; (b) utilize their programs and authorities to protect and enhance the conditions of such ecosystems; and (c) to the extent permitted by law, ensure that any actions they authorize, fund, or carry out will not degrade the conditions of such ecosystems.	The runoff from the MSWLF and any potential pollutants it contains would be addressed by the adherence to the NPDES permit guidelines during construction, while the permanent stormwater system would manage runoff during the operation of the MSWLF.

Legend: CFR = Code of Federal Regulations; DEQ = Department of Environmental Quality; FAA = Federal Aviation Administration; MSWLF = municipal solid waste landfill; NPDES = National Pollutant Discharge Elimination System; U.S. = United States; U.S.C. = United States Code; USEPA = United States Environmental Protection Agency; USFWS = U.S. Fish and Wildlife Service.

Source: DoN 2014.

2.2 OTHER PERTINENT CRITERIA

The following table provides additional criteria to be considered for siting the MSWLF that are not based on existing regulations for Tinian, but are considered as best management practices (Table 2.2-1).

Table 2.2-1. Additional Considerations for MSWLF Siting

<i>Rationale</i>	<i>Considerations</i>
Source water protection (i.e., preventing pollution of drinking water wells and potable surface water sources. See Section 3.12 for further details regarding source water protection and sole source aquifer protection). CNMI Administrative Code 65-140-301 Well Siting Criteria - states that public water supply wellheads should maintain a minimum distance of 1,000 feet (305 meters) downgradient and 2,000 feet (610 meters) upgradient from an MSWLF. The Landfill Study used a 1,000-foot (305-meter) buffer without adjusting for upgradient and downgradient measurements.	MSWLF would not be located within 1,000 feet (305 meters) of groundwater wells and potable surface water intakes/sources. For the Tinian Municipal Well, the buffer radius was increased to 1,700 feet (518 meters) to include the infiltration trenches and horizontal well field associated with the system.
Tsunami inundation zones	MSWLF would not be sited in an area that could be prone to tsunami hazard.
Nuisance hazard from noise, odor, birds, flies, etc.	MSWLF would not be sited within 0.5 mile (0.8 kilometer) of urban development. This criterion may further reduce any adverse impacts that could affect Executive Order 12898 and Executive Order 13045.

Legend: MSWLF = municipal solid waste landfill.

Source: Department of Defense 2004.

CHAPTER 3.

ANALYSIS OF AVOIDANCE AREAS

This section presents a geographic information system-based analysis to evaluate areas on Tinian that are suitable to site a potential MSWLF. The analysis applied geospatial overlays of areas where regulatory restrictions described in Chapter 2 occur and identified such areas to be avoided in selecting a landfill site. The analysis completely avoids these areas to determine a site where the least amount of regulatory resistance is likely. The analysis steps are described below. Figures referred to throughout are compiled at the end of the chapter, in Section 3.16.

3.1 MILITARY TRAINING AVOIDANCE AREA

The scope and purpose of this siting study include the consideration of sites that are not constrained by the proposed training ranges on Tinian. Therefore, all areas within the MLA (Figure 3.16-1) are excluded from siting the MSWLF.

3.2 AIRPORT SAFETY AVOIDANCE AREA

A 10,000-foot (305-meter) buffer around the existing Tinian International Airport runway is the avoidance area for airport safety (Figure 3.16-2). The potential new MSWLF cannot be sited within this area. The 10,000-foot (305-meter) buffer zone can be waived if the “owner or operator can demonstrate that the units are designed and operated so that the MSWLF unit does not pose a bird hazard to aircraft” (40 CFR Part 258.10).

3.3 FLOODPLAIN AVOIDANCE AREA

The 1% annual flood (100-year flood) is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Special Flood Hazard Areas (except V and VE) were digitized from the Federal Emergency Management Agency Digital Flood Insurance Rate Map (FEMA 2006) (#6900000095C, #6900000180C, #6900000115C, #6900000085C, #6900000160C, #6900000105C) for the island of Tinian (Figure 3.16-3). Zones V and VE correspond to the coastal flood zone with velocity hazard and were present outside of the land area. These areas were not digitized or shown on Figure 3.16-3 as the MSWLF would obviously not be sited on water.

3.4 POTENTIAL WETLAND AVOIDANCE AREA

The potential wetland avoidance areas are shown on Figure 3.16-4. The potential wetland areas were identified from maps for the 2010 EIS (JGPO 2010) and the 2014 CJMT EIS/OEIS.

3.5 GEOLOGIC FAULT AVOIDANCE

High-angle or vertical faults and zones of vertical joints or minor high-angle fault were digitized from a scanned copy of the geologic fault map presented in the U.S. Geological Survey (USGS) Water

Resources Investigations Report 02-4077 (USGS 2002). Figure 3.16-5 illustrates a 200-foot (60-meter) buffer area around the digitized fault lines as avoidance area for fault zones.

3.6 SEISMIC IMPACT ANALYSIS

Tinian and other Northern Mariana Islands are located in a zone of high seismic activity. Probabilistic seismic hazard maps for Guam and the Northern Mariana Islands (including Tinian) were presented in USGS open-file report 2012-1015 (USGS 2012). The Mariana Islands arc has formed in response to the northwestward subduction of the Pacific plate beneath the Philippine Sea plate, and this process controls seismic activity in the region.

For 2% probability of exceedance in 50 years, probabilistic peak ground acceleration is approximately 0.6 at Tinian (USGS 2012). The peak ground acceleration changes minimally throughout Tinian, with the acceleration slightly higher along the east coast compared to the west coast. Therefore, any MSWLF sited on Tinian would need to be designed to withstand seismic impacts. No avoidance areas have been mapped, and seismic impacts would be accounted for in the MSWLF design.

3.7 UNSTABLE AREAS – POTENTIAL LANDSLIDE AVOIDANCE AREA

Earthquakes could cause slope failures and landslides, predominantly in limestone terrain. The weather on Tinian, mainly tropical, rapidly weathers and easily erodes the volcanic rock on the island. Slope destabilization and landslides often occur from a combination of natural events and seismic activity. Tinian does not have a Hazard Mitigation Plan. However, the Guam Hazard Mitigation Plan uses slope angles to develop qualitative ratings for the potential for an area to landslide. The risk for potential for landslides to occur is rated as moderate to high for slopes > 30% (Guam Hazard Mitigation Plan). Therefore, slopes greater than 30% are excluded from siting the MSWLF, and this avoidance area is illustrated on Figure 3.16-6.

3.8 UNSTABLE AREAS – KARST GEOLOGY AVOIDANCE AREA ZONE

Karst is a distinctive topographic feature formed by the dissolution of underlying soluble rocks by surface water or groundwater. Karst geology occurs when rainwater dissolves carbonate rocks, such as limestone, causing voids including epikarst, sinkholes, and caves in the surface and subsurface. Limestone is a soluble rock, primarily composed of calcium carbonate.

Tinian is composed mainly of coralline and algal limestone overlying volcanic tuff and breccias. The limestone tends to be highly permeable due to its high porosity (JGPO 2010). There are two main limestone formations on Tinian: Tagpochau and Mariana (Figure 3.16-7). Tagpochau Limestone covers approximately 16% of Tinian's surface and is composed of three rock types: detrital (the majority of the formation), argillaceous, and sandy. It is composed mainly of biogenic calcium carbonate fragments and calcite cement. The Mariana Limestone covers approximately 83% of Tinian's surface and is composed of seven rock types: constructional coralliferous, constructional algal, detrital coralliferous, detrital shelly, detrital Halimeda, detrital argillaceous, and detrital undifferentiated. In the coastal regions, these deposits are overlain by Holocene limestone, developing sands and gravels, and reefs (Stafford et al. 2005).

Surface karst features on Tinian include epikarst, closed depressions, caves, and freshwater discharge features (Stafford et al. 2005). Epikarst is present in all carbonate rocks, such as limestone, on Tinian and

its characteristics vary based on proximity to the coast. Coastal epikarst is jagged as a result of the effects of sea spray; surface features become less extreme moving inland (Stafford et al. 2005).

Three main types of closed depressions are found on Tinian: dissolutional, constructional, and human made or modified. Dissolutional depressions are the result of carbonate rock dissolving in surface water. Constructional depressions are formed during carbonate rock formation or as a result of faulting. Human-made or modified depressions are the result of excavations such as quarries, borrows pits, and landfills. A karst survey identified 20 closed depressions on Tinian: 7 dissolutional, 8 constructional, and 5 human made or modified (Stafford et al. 2005). Construction activities are major sources of karst collapse, which occurs when material overlying the karst geologic formations subsides down along the karst cavity, forming sinkholes. Sinkholes can occur as a result of excavation, change of drainage patterns, and lowering of groundwater (JGPO 2010). Soil disturbance from construction causes deposits to form in openings near the bedrock surface that get heavier when saturated, causing the underlying structure to collapse. Sinkholes are not only relevant to geological processes; they can potentially be of cultural significance, housing archaeological resources.

Subsurface karst on Tinian includes three types of caves: mixing zone, fissure, and contact. Mixing zone caves, the most common form on Tinian, are globular interconnected chambers that form where different waters meet, such as the interface of the fresh groundwater lens and the underlying salt water. Fissure caves form along fault fractures and joints and may act as a conduit for infiltration of surface water to groundwater. Contact caves develop when surface water is channeled into the subsurface (Stafford et al. 2005).

Because Tinian is almost entirely made of limestone, karst geology could occur at most locations. MSWLF construction on Tinian would require careful investigation of site-specific conditions for karst features. Site-specific analysis should be made to decide if sinkhole risks are too great to allow construction of the disposal facility or that the sinkhole risks are acceptable provided the site is properly stabilized and the facility properly engineered. No avoidance area is mapped for karst geology, and the factor should be considered during site-specific evaluation.

3.9 ARCHAEOLOGICAL AND HISTORIC PROPERTY AVOIDANCE AREA

Important archaeological and historic properties occur all over Tinian. If inadvertent finds, which may occur anywhere on island, are discovered, then appropriate recovery measures would be implemented.

3.10 THREATENED AND ENDANGERED SPECIES AVOIDANCE AREA

According to the U.S. Fish and Wildlife Service (USFWS), the following species, designated as threatened or endangered under the U.S. Endangered Species Act (USFWS 2011), are potentially located on Tinian:

- The Mariana fruit bat (*Pteropus mariannus mariannus*) is threatened throughout its habitat range which includes Tinian.
- Three species of birds are listed as endangered on Tinian:
 - Mariana swiftlet (*Aerodramus bartschi*)
 - Mariana crow (*Corvus kubaryi*)
 - Mariana common moorhen (*Gallinula chloropus guami*)

- Two species of reptiles are listed as endangered:
 - Green sea turtle (*Chelonia mydas*)
 - Hawksbill turtle (*Eretmochelys imbricate*). Only the green sea turtles are known to nest on Tinian.

The humped tree snail (*Partula gibba*) is a federal candidate species. The Micronesian gecko (*Perochirus scutellatus*) is endemic to Micronesia and native to Tinian (MARFORPAC and NAVFAC 2009) and is the only CNMI-listed gecko in the CNMI.

Locations where special status species have been observed on Tinian are illustrated on Figure 3.16-8. A buffer zone of 500 feet (152 meters) is established around these known locations as an avoidance area to protect special status species. Conservation lands provided by the Department of Public Lands were included as an avoidance area. Additionally, all native limestone forests are included in the avoidance area for threatened and endangered species. The native forests and wetlands (Figure 3.16-4) are critical habitats for threatened and endangered species. Additional site-specific investigations would be conducted to evaluate the potential for threatened and endangered species habitat before the selection of the potential MSWLF site. The avoidance areas shown in Figure 3.16-4 would involve additional cost to mitigate impacts on endangered species if considered further to site an MSWLF.

3.11 PROTECTION OF PRIME FARMLAND AVOIDANCE AREA

Prime farmlands as defined by the U.S. Department of Agriculture are soils best suited to producing food, seed, forage, fiber, and oilseed crops. These soils produce the highest yields with minimal energy input and economic resources, and result in the least damage to the environment. Less than 4% of the soils in the CNMI are classed as prime farmland. The three soil types that meet the criteria for this classification are Dandan-Saipan clay, 0 to 5% slopes; Kagman clay, 0 to 5% slopes; and Saipan clay, 0 to 5% slopes. Of the 3,355 acres (1,358 hectares) of prime farmland in the CNMI, about 1,547 acres (626 hectares) are located on Tinian, primarily on the Carolinas plateau and in the central and western parts of the northern plateau (USACE 2005). The prime farmland areas for Tinian are illustrated on Figure 3.16-9, and the potential MSWLF would avoid these prime farmland avoidance areas.

3.12 SOURCE WATER PROTECTION AND SOLE SOURCE AQUIFER AVOIDANCE AREA

The U.S. Environmental Protection Agency defines a sole or principal source aquifer as one that supplies at least 50% of the drinking water consumed in the area overlying the aquifer. These areas can have no alternative drinking water source(s) that could physically, legally, and economically supply all of those who depend on the aquifer for drinking water. For convenience, all designated sole or principal source aquifers are referred to as "sole source aquifers." No aquifers on Tinian are at present designated as a sole source aquifer. Tinian has not been subdivided into smaller aquifer boundaries, and the entire island is treated as one aquifer at the present time. Maui Well No. 2 is the only source of potable water for the island of Tinian; therefore, the sub-aquifer for this well (that completely encompasses the wellhead capture zone for the municipal well) should be a sole source aquifer. However, only general groundwater directions and groundwater contours have been published in Water Resources Investigation Report 02-4077 (USGS 2002). Therefore, the island is not subdivided into an area that could be excluded as a sole source aquifer. Similarly, the wellhead capture zones are not available for Tinian, and a comprehensive groundwater protection program is not yet in place.

Given the limitations in aquifer subdivision and lack of wellhead capture zone delineations for Tinian, the following methodology was followed to protect potable groundwater resources. As a conservative assumption, all wells mentioned above in the USGS (2002) report are assumed to potentially be put into use for potable water supply. For wells other than the horizontal wells, a 1,000-foot (305-meter) buffer was drawn around the well locations to protect groundwater sources from contamination. The avoidance area is illustrated on Figure 3.16-10. For Maui Well No. 1 and Maui Well No. 2, the buffer zone was increased to 1,700 feet (518 meters) to include the length of the horizontal well and the infiltration gallery (Figure 3.16-10).

3.13 TSUNAMI INUNDATION AVOIDANCE AREA

Tsunami hazard for Tinian was provided in the National Oceanic and Atmospheric Administration's *Tsunami Hazard Assessment Special Series: Vol. 3, Tsunami Hazard Assessment of the Commonwealth of the Northern Mariana Islands* (NOAA 2013). The amplitudes and currents published in NOAA (2013) are illustrated on Figure 3.16-11. Tsunami inundation maps have not yet been developed for Tinian. However, based on the maximum amplitude of 43 feet (13 meters), an approximate tsunami inundation zone was derived using the digital terrain model. The U.S. digital terrain features have a root mean square error of 23 feet (7 meters) (i.e., an elevation value could be off by as much as that amount for 90% of the data). The tsunami inundation map excludes all contiguous shoreline areas that are less than 66 feet (20 meters) above mean sea level in elevation (Figure 3.16-12). This is a conservative estimate of areas that may be inundated by a tsunami.

3.14 URBAN AREA AVOIDANCE AREA

Areas that are within 0.5 mile (0.8 kilometer) of densely populated areas are excluded for siting purposes. This avoidance area is to minimize the nuisance from odors, noise, and pests to public. The urban areas were digitized from aerial photographs where existing housing was observed and parcel boundaries. The digitized areas were then buffered by 0.5 mile (0.8 kilometer) (Figure 3.16-13).

3.15 CUMULATIVE AVOIDANCE AREA

The combined overlay of all avoidance areas is illustrated on Figure 3.16-14. Areas outside the avoidance area are potentially suitable for siting the new MSWLF. Two separate areas, one in Carolinas and one in Pina, where the potential MSWLF could be sited are described in further detail in Chapter 4, *Proposed MSWLF Sites*.

3.16 AVOIDANCE AREA MAPS

The avoidance areas generated during the geographic information system analysis are presented in Figure 3.16-1 through Figure 3.16-14, on the following pages.

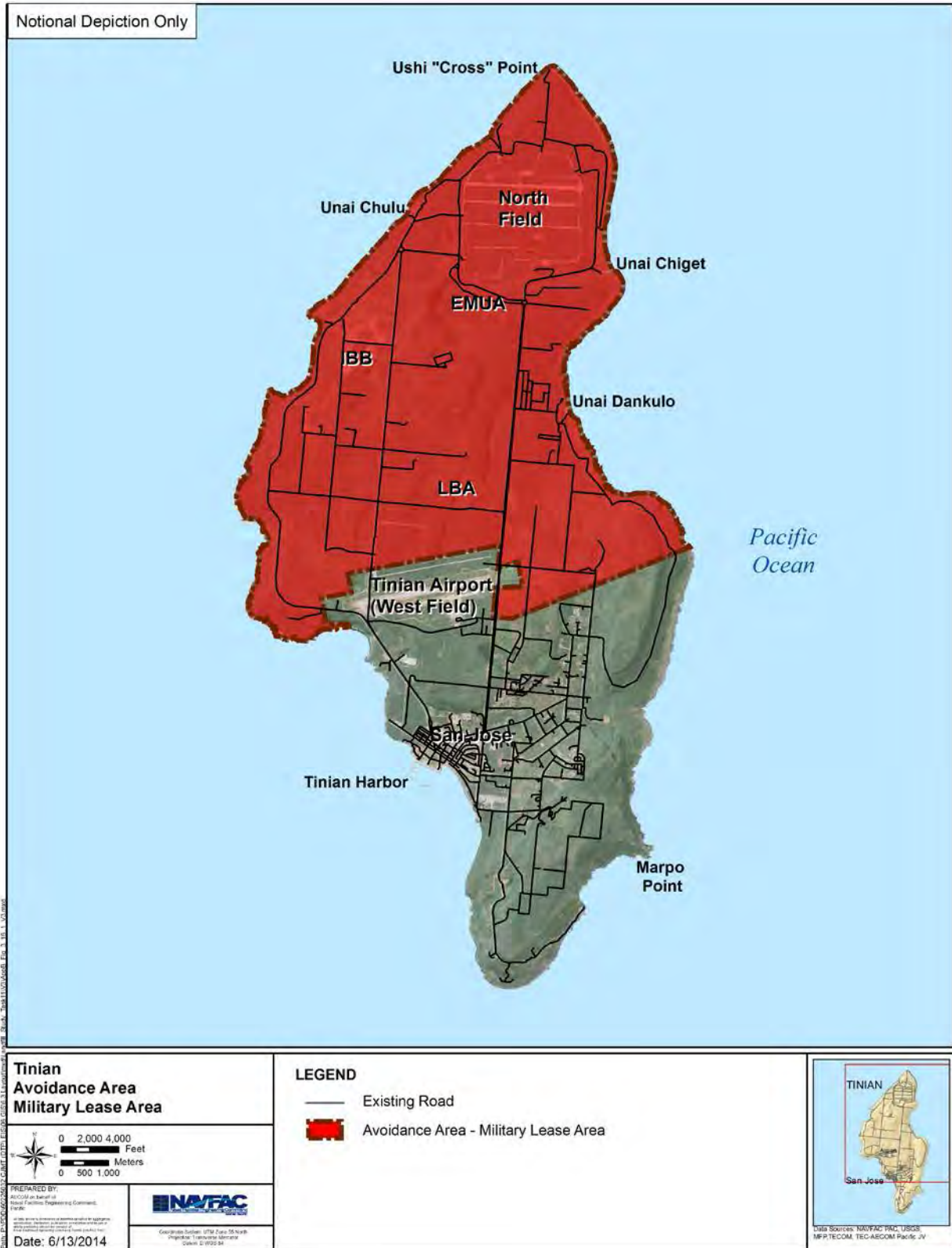


Figure 3.16-1. Tinian Avoidance Area – Military Lease Area
 Source: DoN 2014.

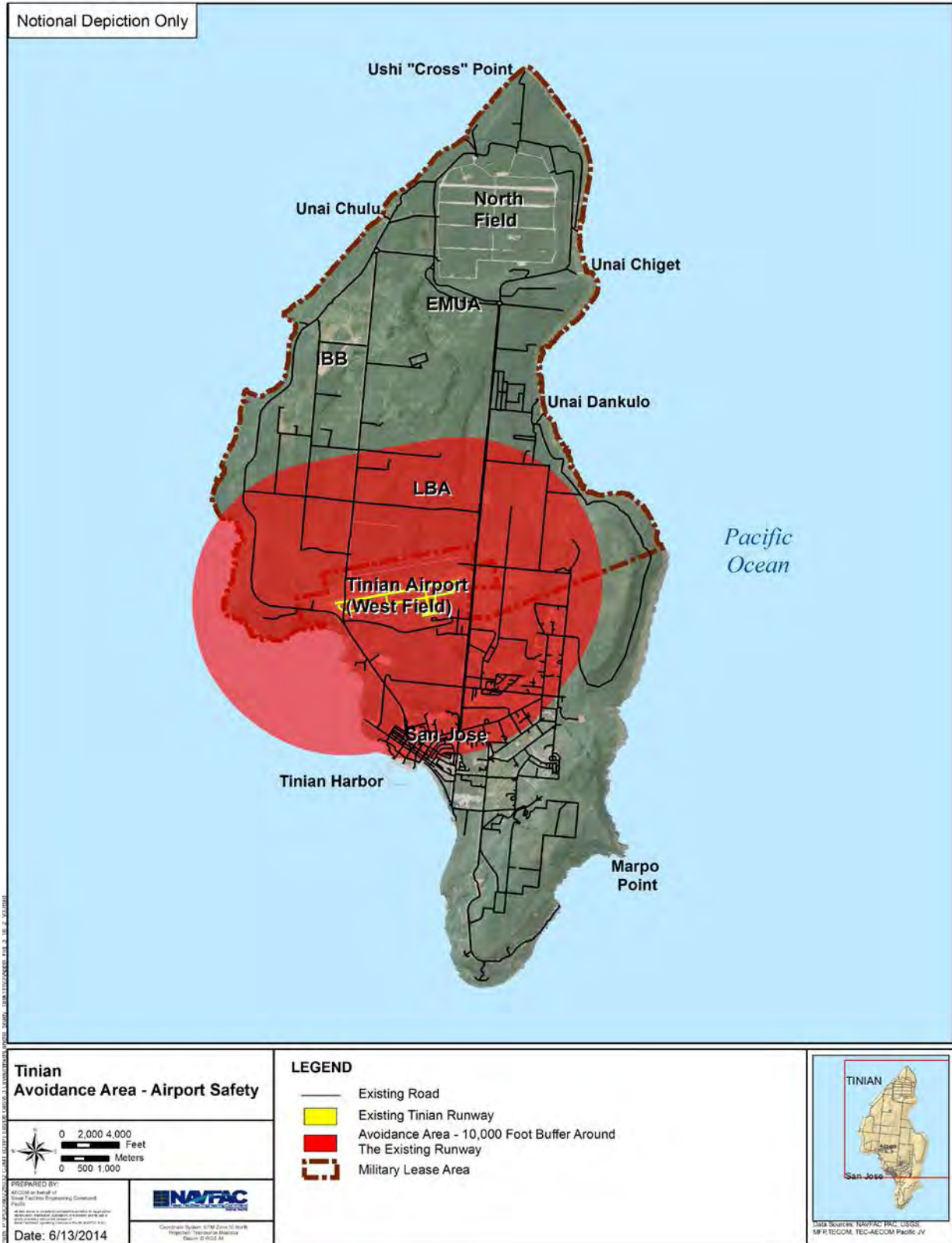


Figure 3.16-2. Tinian Avoidance Area – Airport Safety
 Source: DoN 2014.

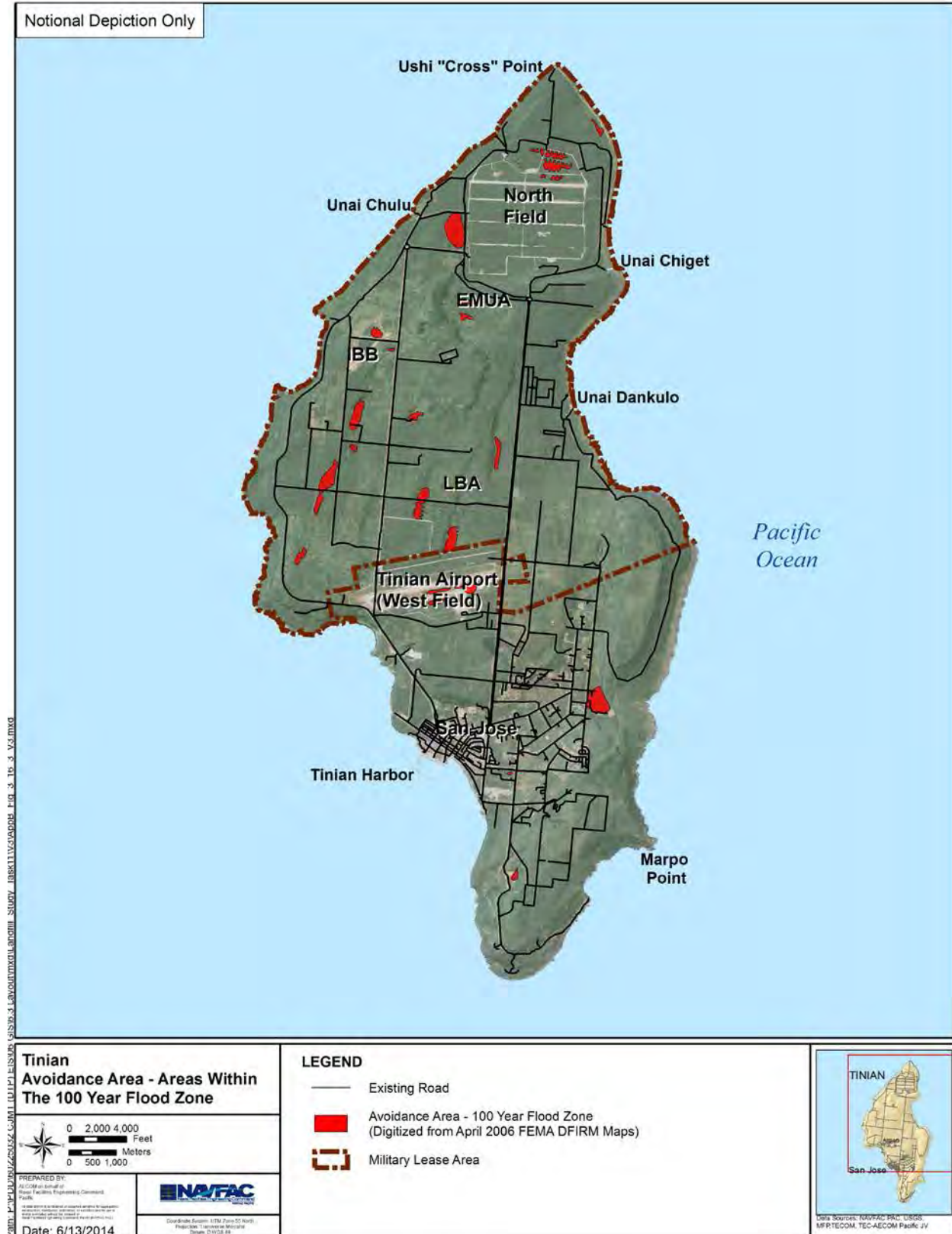


Figure 3.16-3. Tinian Avoidance Area – Areas within the 100-Year Flood Zone

Source: DoN 2014.



Figure 3.16-4. Tinian Avoidance Area – Wetland Areas
 Source: DoN 2014.



Figure 3.16-5. Tinian Avoidance Area – Areas within 200 feet of a Geologic Fault Line

Source: DoN 2014.



Figure 3.16-6. Tinian Avoidance Area – Potential Landslide (Slope >30%)

Source: DoN 2014.



Figure 3.16-7. Tinian Geology
 Source: DoN 2014.

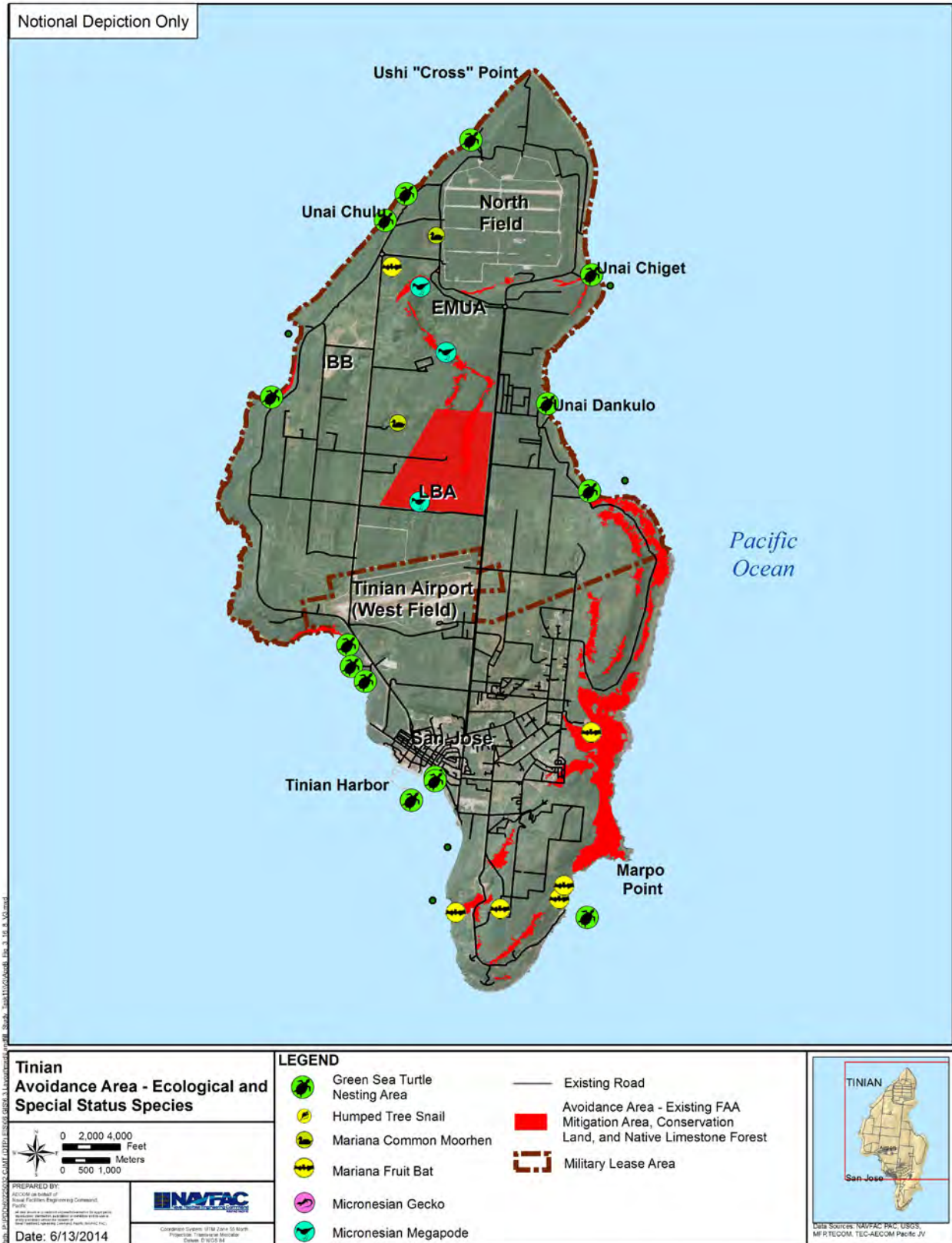


Figure 3.16-8. Tinian Avoidance Area – Ecological and Special Status Species

Source: DoN 2014.

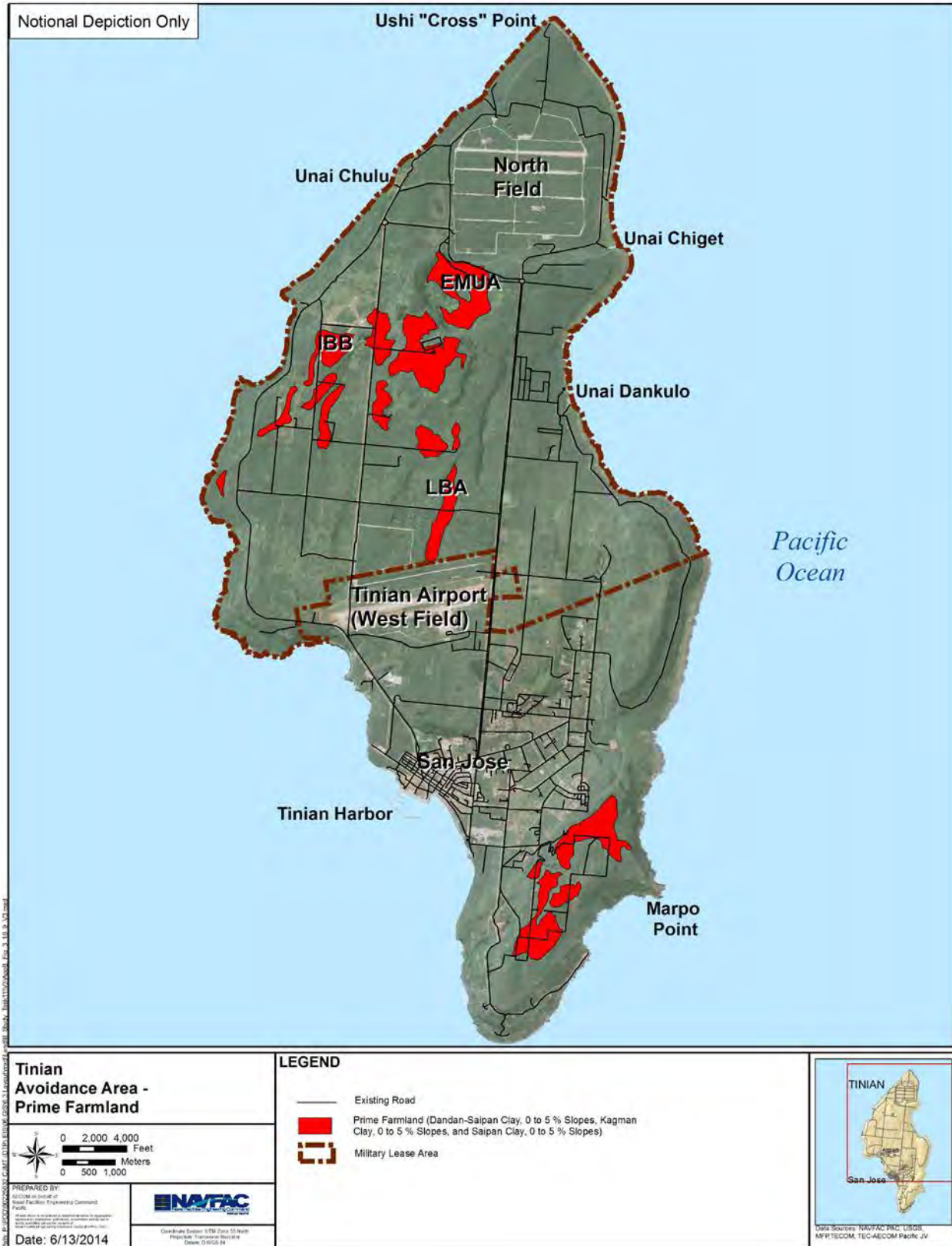


Figure 3.16-9. Tinian Avoidance Area – Prime Farmland

Source: DoN 2014.



Figure 3.16-10. Tinian Avoidance Area – Potential Potable Groundwater Wells
Source: DoN 2014.

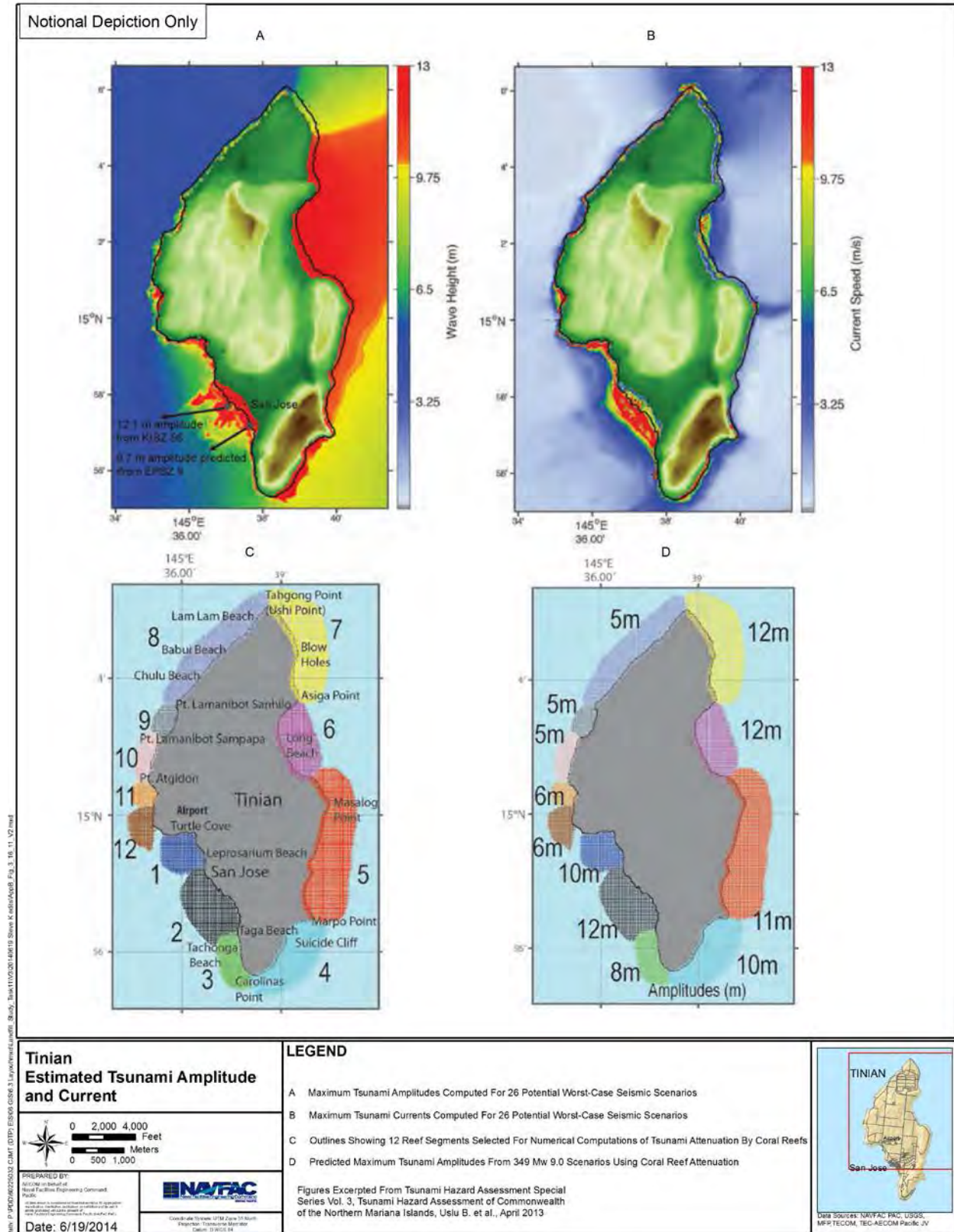


Figure 3.16-11. Tinian Estimated Tsunami Amplitude and Current

Source: DoN 2014.

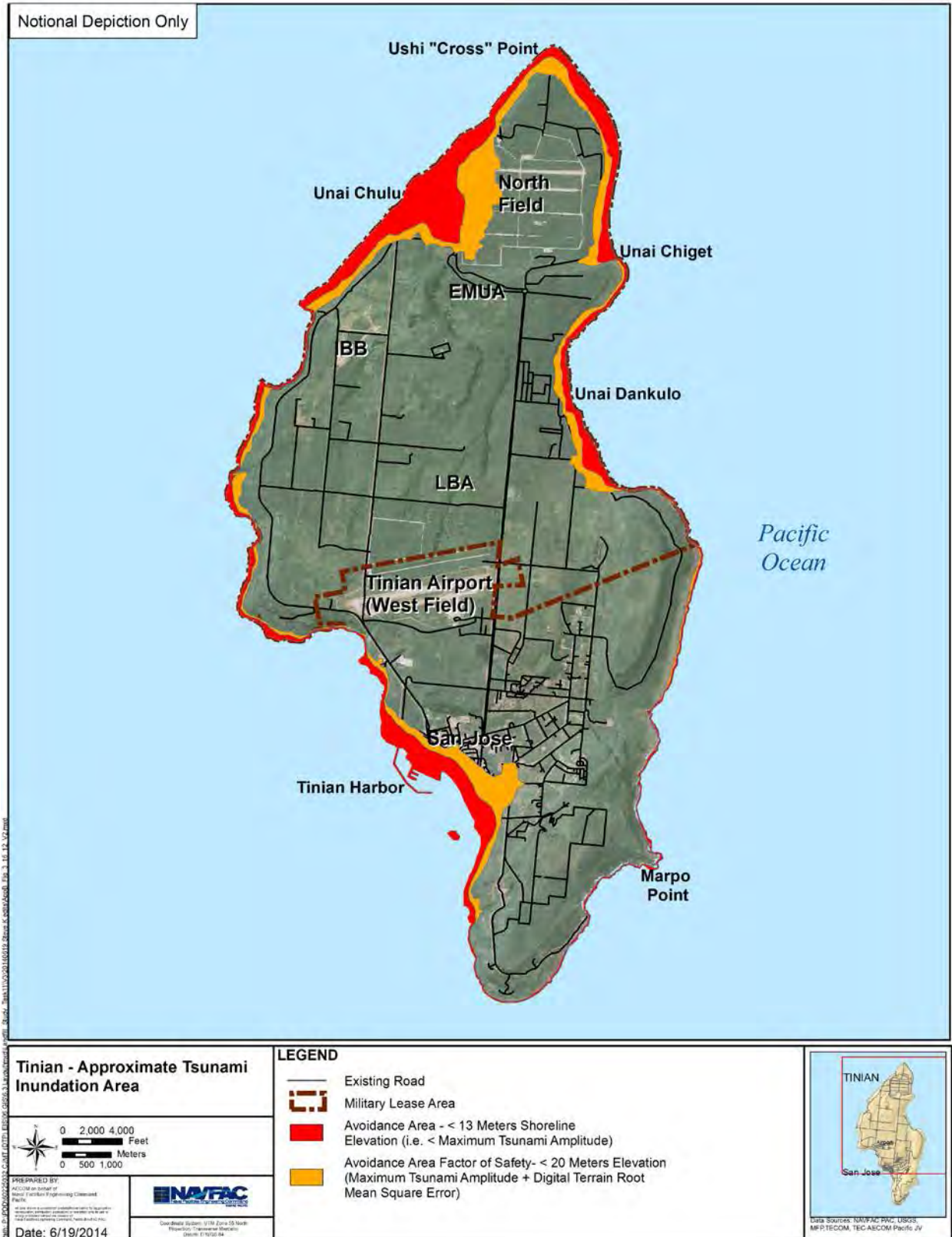


Figure 3.16-12. Tinian Approximate Tsunami Inundation Area

Source: DoN 2014.

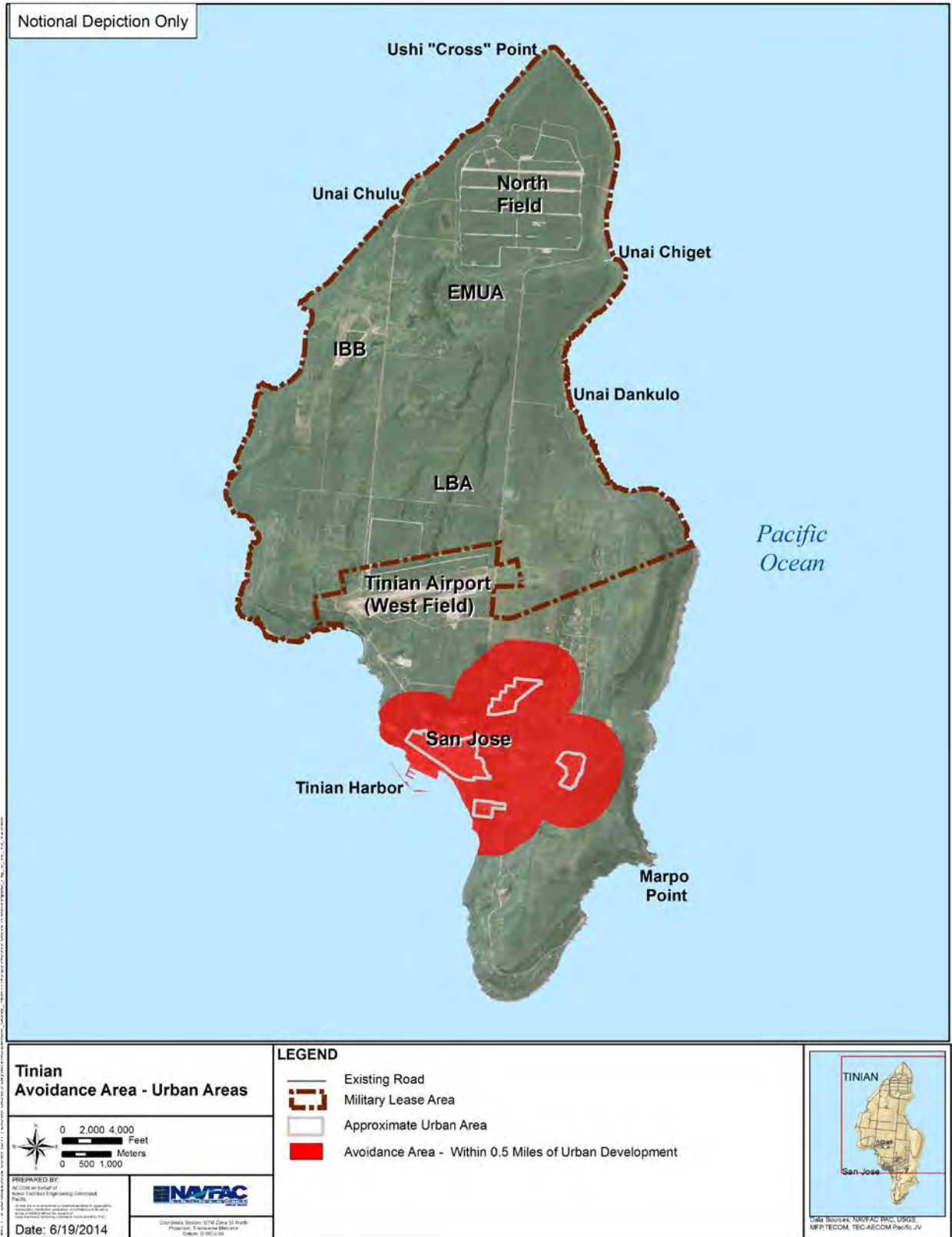


Figure 3.16-13. Tinian Avoidance Area – Urban Areas

Source: DoN 2014.

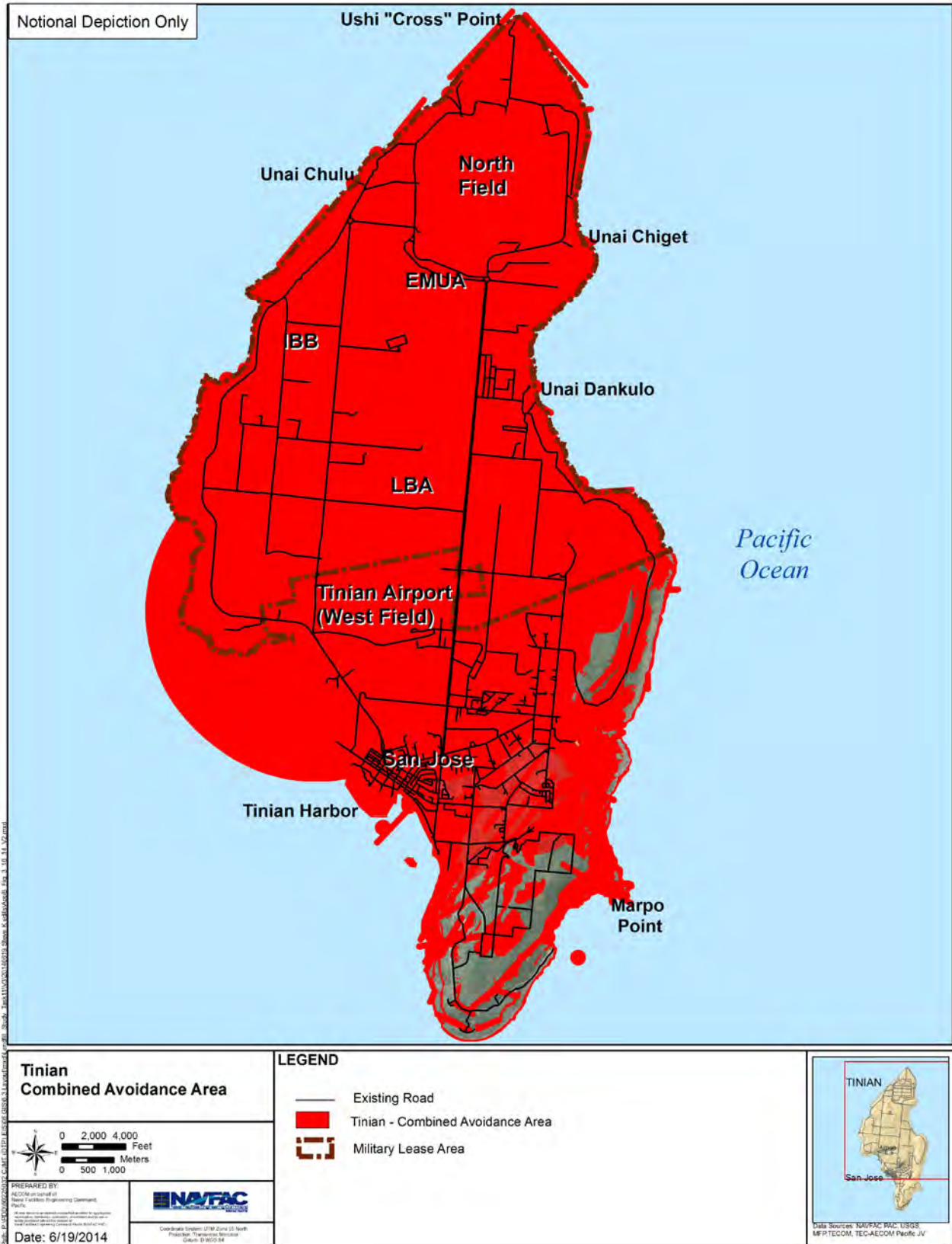


Figure 3.16-14. Tinian Combined Avoidance Area
 Source: DoN 2014.

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CHAPTER 4.

PROPOSED LANDFILL SITES

4.1 POTENTIAL LANDFILL SITES

Even under the most favorable conditions, the successful siting of a new MSWLF is a long, complex process involving negotiations among many stakeholders. The siting effort typically consumes a multitude of resources including time, money, and political goodwill. The avoidance area analysis in Chapter 3 identified areas where an MSWLF site would and would not be excluded by the first set of screening criteria. The following sections identify two sites on the island that are outside of the avoidance areas and potentially suitable for siting the MSWLF. The two potential sites at Carolinas (Figure 4.1-1) and Pina (Figure 4.1-2) are large enough in area to accommodate the 45-acre (18-hectare) MSWLF footprint developed from the USACE (2005) study.

4.1.1 Potential Landfill Site at Carolinas

The primary potential location for the MSWLF at Carolinas in South Tinian is illustrated on Figure 4.1-1. This site is located within an “undesigned public land parcel” as assigned by the CNMI Department of Public Lands. The Carolinas site occupies an area of approximately 134 acres (54.2 hectares). Elevations at the Carolinas site range between 417 feet and 505 feet (127 meters and 154 meters) above mean sea level with a mean elevation of 478 feet (145 meters). The mean slope is 4.97%. The soil composition consists of Chinen clay loam consociation and Dandan-Chinen complex. The site is fairly accessible via the existing roadways located at the southern tip of Tinian.

4.1.2 Potential Landfill Site at Pina

The secondary potential location for the MSWLF at Pina in east-central Tinian is illustrated on Figure 4.1-2. This site is within an “undesigned public land parcel” as assigned by the CNMI Department of Public Lands. The Pina site occupies approximately 112.9 acres (45.7 hectares). Elevations at the Pina site range between 243 feet and 394 feet (74 meters and 120 meters) above mean sea level with a mean elevation of 359 feet (109 meters). The mean slope is 4.64%. The soil composition consists of Banaderu clay loam consociation. A small portion of the site is comprised of the Dandan-Chinen complex and Takpochao-Rock outcrop complex. The site is less accessible than the Carolinas site with fewer access roads in a more remote location on the eastern side of Tinian.

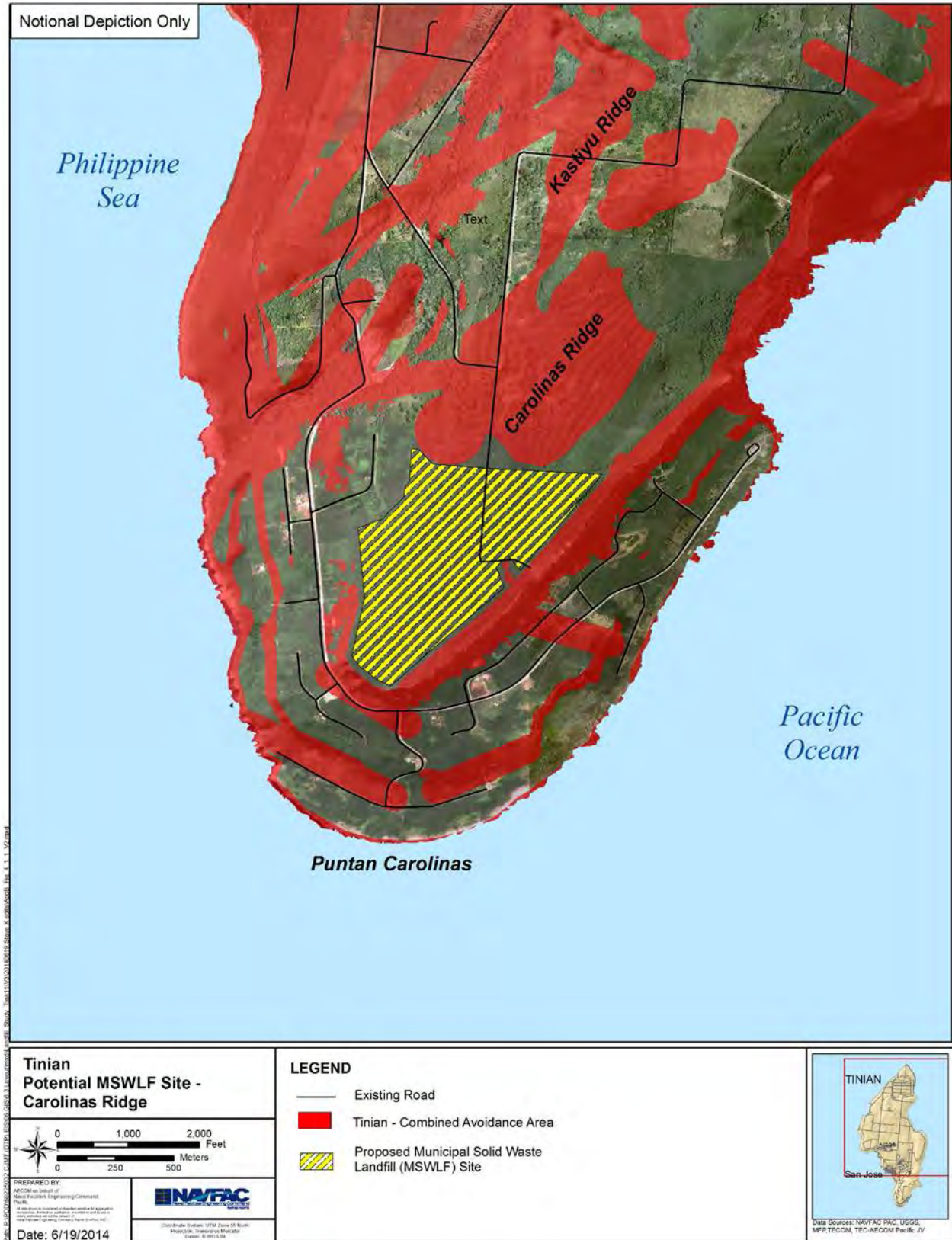


Figure 4.1-1. Tinian Potential MSWLF Site – Carolinas Ridge
 Source: DoN 2014.

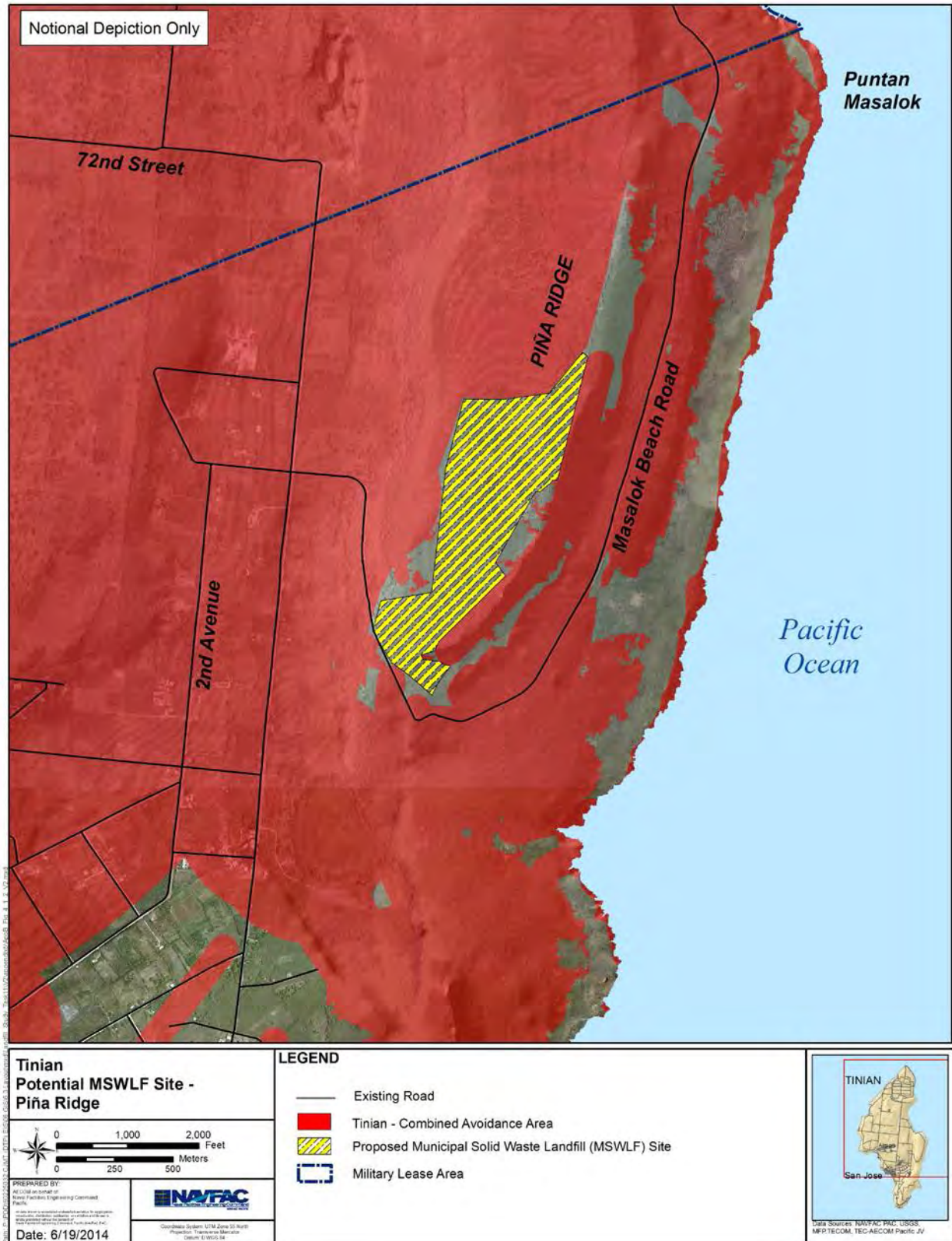


Figure 4.1-2. Tinian Potential MSWLF Site – Pina Ridge
 Source: DoN 2014.

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CHAPTER 5.

NEXT STEPS

If the two sites (Carolinas and Pina) are considered acceptable to the CNMI government, business interests, and the U.S. military, the next step would involve the following tasks:

5.1 PRELIMINARY ENGINEERING EVALUATION

A preliminary engineering evaluation would need to be conducted to consider the following factors:

- MSWLF capacity or site life
- Potential for expansion
- Potential soil needs for liner construction (base and final cover) and daily cover
- Surface water control and site drainage considerations
- Availability of utilities
- Distance from existing major roadways
- Factors influencing site development and operations costs

5.2 CONCEPTUAL SCHEMATICS AND ENGINEERING DATA ESTIMATES

In developing the site conceptual schematics and engineering data estimates, certain uniform assumptions would be needed for each site. Some examples of these assumptions are provided below.

- A 150-foot (46-meter) setback from all site borders to establish a limit of waste (LOW).
- Sites would be excavated to 10 feet (3 meters) below ground surface. This excavated soil is presumed to be available for use as daily cover; additional daily cover would need to be obtained from other sources.
- Side slopes would be: 3:1 (horizontal:vertical) (typical).
- Waste to soil ratio would be: 4:1.
- The annual MSW tonnage for Tinian would need to be estimated for design purposes. The projected tonnage for the civilian population on Tinian would need to be added to the total U.S. military figure to arrive at the design tonnage.
- Waste Mass Density (pounds per cubic yard [CY]): 1,320 pounds/CY (or 783.1 kilograms/cubic meter)(value may be substituted with site-specific estimates later).
- Annual Airspace Consumed by Waste (CY).
- Annual Daily Cover Soil Volume (CY).
- Infrastructure facilities such as the shop area, scalehouse, drop-off area, and internal roadways would be sized to match facilities at the nearest MSWLF (for example, on Saipan).

The maximum MSWLF height, total capacity, and overall useful life would be calculated based on the available site area and geometry, the LOW setback, and the side slopes.

5.3 PLANNING-LEVEL COST ESTIMATES

The following is a description of the major site development features, and the basis for the development of their cost estimates.

- **Clearing and Grubbing** – It is assumed that the gross acreage of each site would require clearing and grubbing.
- **Geotechnical Investigations** – Specialized geotechnical investigations are expected for the MSWLF site to ensure that the limestone formation where the MSWLF is sited is stable. Additional cost for stabilization of the foundation may also be needed.
- **Excavation** – For each site, the LOW acreage would be excavated to 10 feet (3 meters) below ground surface. This soil is assumed to be available for use as daily cover.
- **Temporary Erosion Control, Dust Control, & Best Management Practices Maintenance During Construction** – Each site would require these features, and costs would need to be included for this item.
- **Subgrade Preparation, Install Liner, Landfill Gas, Leachate Systems** – For each site, the LOW acreage would eventually require these construction items prior to operation. While each site has a different final acreage, each site would be assumed to be initially developed with a 5-year “Cell 1.” Therefore, the total lifetime cost would be different for each site, but each site would be assumed to have the same initial cost for Cell 1 preparation, liner, and leachate systems.
- **Construction Management/Construction Quality Assurance** – Construction of an MSWLF requires specialized construction management/construction quality assurance.
- **Leachate Evaporation Pond** – Because leachate generation and handling requirements are primarily a function of the landfilling rate (rather than site-specific factors), we anticipate that leachate can be treated at each site using a leachate evaporation pond. The annual rainfall amounts would need to be compared with the evaporation rates to determine if additional mechanisms to control overflow would be needed.
- **Drainage Improvements** – Each site would require drainage improvements to the active and closed MSWLF areas, as well as to manage run-on and runoff, including such features as diversion berms, grass-lined channels, and riprap energy dissipation outfalls.
- **Infiltration Basin** – Each site is assumed to require an infiltration basin.
- **Office Building** – Each site would have an office building.
- **Shop** – Each site would have a shop.
- **Scale and Scalehouse** – Each site would have a scale and scalehouse.
- **Public Drop-off Facility** – Each site would have a public drop-off facility.
- **Site Work** – Each site would have features such as driveways, minor landscaping and irrigation, parking lots, utility connections at the buildings, drainage, fencing, and site lighting. Grasses would be planted along site peripheries and portions of the sites not in active use to provide for erosion control and limited stormwater control.
- **Access Roads** – Paved roads with curbs and drainage, but no lighting, would be developed from major infrastructure to the existing roadways, and on-site non-paved roads would also need to be included for access to various portions of the MSWLF.
- **Utilities** – Water supply may need to be developed for irrigation, firefighting, and potable water needs; electrical service may need to be provided; and sewage would need to be

managed at each site. The two sites may have different sources (especially for water needs), and require that different distances be developed. It is assumed that telephone landlines would not be required. Each site would require a relatively small septic system for office and shop water disposal.

- **Visual Impact Mitigation** – Each site is assumed to require landscaping for visual impact mitigation. Hedges and taller trees would be planted to mitigate the visual impacts of an MSWLF. Large canopy trees would be avoided as root systems can destroy underground infrastructure.
- **Traffic Flow** – Site-specific features would need to be developed and may include deceleration/acceleration lanes, a left-turn lane, and traffic signals, as appropriate for each site. A detailed traffic analysis would need to be conducted, which may result in different recommendations or mitigation measures.

5.4 SITE OPERATION COST ESTIMATES

A description of the basis for potential site operation costs is provided below.

- **Basic MSWLF Operation Costs** – These costs are for the MSWLF operating firm to make the MSWLF functional. Other items to be considered in this cost include equipment maintenance, equipment rental, utility costs, infrastructure operation, maintenance and repairs, tools, supplies, and office supplies.
- **On-site Labor Costs** – These represent labor costs for CNMI staff that would operate the MSWLF, including fringe benefits and overtime. Similar costs would be incurred by administrative support personnel.
- **Wet Weather Operations** – Sites with higher annual rainfall and more intense storms would require additional costs for wet weather operations, such as maintaining gravel access roads.
- **Semi-annual Groundwater Monitoring and Reporting** – It is assumed that each site would require a semi-annual groundwater detection monitoring program for compliance with applicable regulations.
- **Regulatory Compliance (National Pollutant Discharge Elimination System)** – Each site would require an annual National Pollutant Discharge Elimination System compliance program.
- **Regulatory Compliance (Surface Water & Spill Prevention)** – Each site would require an annual surface water & spill prevention compliance program for compliance with applicable regulations.
- **Daily/Alternate Cover** – It is assumed that the soil initially excavated from the site would be available for use as daily cover, at a constant rate per year of site life, and that the DPW would have to procure the remainder of the soil from off-site locations. During engineering design, these quantity estimates would be further refined, using among other things, the results of the geotechnical investigations at the selected site.
- **Operations Plan and Solid Waste Permit Update (5-year Cycle)** – This cost would need to be updated every 5 years, with costs spread out accordingly.
- **Heavy Equipment Purchase** – It is assumed that most equipment costs would be borne by the site operator; however, a uniform contingency cost item would be added for additional equipment, for planning purposes.

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Appendix C
CNMI Governmental Agency Meeting Minutes (December 2013)

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**Commonwealth of the Northern Mariana Islands (CNMI) Joint Military Training (CJMT)
Environmental Impact Statement (EIS)/Overseas EIS (OEIS)
Project Meeting Notes
December 5, 2013
1000-1100 Chamoran Standard Time (ChST)**

Attendees:

CNMI Capital Improvements Project Office: E. Balajadia, N. Benavente

TEC-AECOM Pacific Joint Venture (JV): S. Keith, P. Ono

Agenda and Notes

1. Introductions
2. Purpose and Scope: PO provided overview of the CJMT EIS process focusing on the ongoing planning efforts related to the solid waste utility. Specific information gathered during the fact-finding process during the CNMI site visit will be used to complete the solid waste planning volume as it relates to specific environmental impacts connected with the proposed military training facilities and action. It was explained that this was only one of several EIS efforts currently under way and that this particular joint training initiative was not related to the other proposed actions.
3. General – completed, on-going, and future projects which could affect solid waste handling on Tinian.
 - a. Tinian Landfill Planning Status: Ms. Balajadia stated that the design contract funded by CNMI is scheduled to be completed in February 2014 by Tetra Tech. The new landfill is planned to be located at the Atgidon site and is designed to meet RCRA Subtitle D sanitary landfill standards. The design includes a bird study and permitting provisions dictated by the FAA. The Atgidon site was recommended per the 2005 Wil Chee Landfill Siting Study; however its location within the military leaseback area requires DoD approval. EB stated that the two alternative sites in the Wil Chee study, i.e. Masalok and Carolinas were considered, along with an additional site (Pina), however none of these sites were selected.
 - b. Tinian Solid Waste Transfer Station Planning Status: Ms. Balajadia stated that the design work connected with the planned Tinian solid waste transfer station is being performed by Hofschneider Engineering. The design is based on data compiled in the Environmental Assessment document prepared by Duenas, Camacho and Associates (June 2012).
 - c. Tinian Dump Site Operations and Maintenance (O&M) Measures: Ms. Balajadia stated that planned O&M improvements to the Tinian Dump are scheduled in 2014 consisting of concrete pads, site improvements and drainage work amounting to \$ 1.5 million.
 - d. Other CIP Projects Planned for CY 2014: Ms. Balajadia mentioned the following CIP projects scheduled for 2014 execution: renovation of the Tinian Health Center and construct ADA compliant facilities within the Tinian Airport.
4. Conclusions - TEC-AECOM JV will utilize the information recorded above to prepare the solid waste planning volume in support of the CJMT SEIS. The specific information related to the past

landfill planning studies will be relied upon to develop the upcoming landfill site location study and other solid waste disposal alternatives.

**Commonwealth of the Northern Mariana Islands (CNMI) Joint Military Training (CJMT)
Environmental Impact Statement (EIS)/Overseas EIS (OEIS)
Project Meeting Notes
December 5, 2013
1330-1430 Chamoran Standard Time (ChST)**

Attendees:

CNMI Department of Environmental Quality: G Reyes, D. Chargualaf, F. Rabauliman

CNMI Department of Public Works: M. Sablan, E. Hofschneider, E. De La Cruz

TEC-AECOM Pacific Joint Venture (JV): S. Keith, P. Ono, M. Spengler, J. Campe

Agenda and Notes

1. Introductions
 - a. TEC-AECOM Introductions: P. Ono provided overview of the CJMT EIS process focusing on the ongoing planning efforts related to the solid waste utility. Information gathered during the fact-finding process associated with the CNMI site visit will be used to complete the solid waste planning volume and assess environmental impacts connected with the planned build-up of military training facilities on Tinian.
 - b. CNMI DEQ Introductions: D. Chargualaf introduced the DEQ members present and explained that DEQ is charged with the environmental compliance and regulatory actions related to solid waste management on Tinian. DC stated that the solid waste function is managed by the Toxic Waste Management branch office of the DEQ organization. F. Rabauliman stated that DEQ was happy to meet with the JV and appreciated efforts to meet as a group rather than individually. F. Rabauliman offered to be the point person for the coordinated effort of obtaining information on hazardous materials/wastes/toxic substances for the EIS. He requested that M. Spengler send him an email requesting the information desired. M. Spengler agreed to do so (and followed up with an email after the meeting). J. Campe inquired about any DEQ noise ordinances; D. Chargualaf indicated that there were no specific noise ordinances in the CNMI.
 - c. CNMI DPW Introductions: Secretary Sablan introduced the DPW members present and explained that DPW is responsible for the operation and maintenance of the Tinian Dump.
2. Purpose and Scope: PO provided overview of the CJMT EIS process focusing on the ongoing planning efforts related to the solid waste utility. Specific information gathered during the fact-finding process during the CNMI site visit will be used to complete the solid waste planning volume as it relates to specific environmental impacts connected with the proposed military training facilities and action. It was explained that this was only one of several EIS efforts currently under way and that this particular joint training initiative was not related to the other proposed actions.
3. General – including completed, on-going, and future projects which could affect solid waste handling on Tinian.

- a. Tinian Dump Administrative Order: Secretary Sablan stated that DPW operates and maintains the Tinian Dump in accordance with the regulatory requirements stated in the July 2010 Administrative Order issued by the CNMI DEQ. The Administrative Order specifies O&M measures and treats the Tinian Dump as a non-RCRA, unlined open dump. A wood chipper has been added to the on-site equipment and new horizontal equipment will be added. Plans are in place to erect a fence around the existing boundary. Secretary Sablan confirmed that \$ 1.5 million in O&M improvements will be awarded by the CNMI CIP Office in CY 2014.
- a. Off-Island Transportation of Solid Waste: DC stated that the only non-hazardous solid waste currently transported off Tinian is scrap metal, which is collected by the metal recycling contractor, Triple Star and transported to its recycling facility on Saipan. DC stated that off-island transportation of solid waste from Tinian to Saipan would involve permitting requirements related to inter island jurisdictional considerations. Hence, no municipal solid waste is currently allowed to be transported off of Tinian island.
4. Conclusions - TEC-AECOM JV will utilize the information recorded above to prepare the solid waste planning volume in support of the CJMT SEIS. Specific information related to past landfill planning and solid waste transfer station studies will be relied upon to develop viable solid waste management alternatives connected with the future build-up of military training facilities on Tinian.

Name	Organization	E-Mail Address	Office Phone
Gregorio Reyes (GR)	CNMI DEQ Admin Services	gregorioreyes@deq.gov.mp	(670) 664-8500
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Frank Rabauliman (FR)	CNMI DEQ Director	frankrabauliman@deq.gov.mp	(670) 664-8500
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James Campe (JC)	TEC-AECOM JV Noise Lead	james.campe@cardnotec.com	(530) 919-3640

ATTENDEES

Appendix D
MSW Generation Rate Worksheet (28 May 2014)

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Data represent solid waste generation at the Pohakuloa Training Area, Hawaii County, from November 2013 through April 2014.¹

<i>Date</i>	<i>Nov-13</i>	<i>Dec-13</i>	<i>Jan-14</i>	<i>Feb-14</i>	<i>Mar-14</i>	<i>Apr-14</i>	<i>6 Month Total</i>
Solid Waste in Tons	30.028	1.42	72.56	66.11	38.56	14.74	223.418 Tons
Solid Waste in Pounds	60,056 lbs	2,840 lbs	145,120 lbs	132,220 lbs	77,120 lbs	29,480 lbs	446,836 lbs
Training Days	24	5	25	22	25	24	—
Median Monthly Headcount	325	40	1,225	863	344	146	—
lbs of SW per Person Per Day	7.7	14.2 ²	4.74	6.96	8.97	8.41	—

Notes:

If the MSW data for December 2013 are not considered, the median MSW generation rate for the remaining 5 months is 6.96 lbs per person per day.

¹Reference: Email dated 22 May 2014 from L. Duwall, PTA Contract Performance Evaluator, Solid Waste Operations.

²The month of December 2013 had very little training activity; therefore the MSW generation rate is skewed.

Prepared: 28 May 2014 (PO).

Legend: — = not applicable; lbs = pounds; SW = solid waste.

Source: DoN 2014.

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