Revised Draft Environmental Impact Statement

Commonwealth of the Northern Mariana Islands Joint Military Training

Appendix M: Part 2

June 2025

EISX-007-17-XMC-1747255459

Appendix M - Part 2
Utility Studies

Wastewater Analysis

Solid Waste and Hazardous Waste Study Update

Electrical System Analysis

The appendices of this Revised Draft EIS are compliant with Section 508 of the Rehabilitation Act. This allows assistive technology to be used to obtain the available information from the document. However, accessibility is limited to a descriptive title for some graphics, figures, tables, images, and attachments. Individuals who require assistance may submit a request through the Section 508 link on the project website at CNMIJointMilitaryTrainingEIS.com

LIST OF FIGURES

WASTEWATER ANALYSIS

STORMWATER STUDY

ELECTRICAL SYSTEM ANALYSIS

LIST OF TABLES

WASTEWATER ANALYSIS

SOLID WASTE AND HAZARDOUS WASTE STUDY UPDATE

STORMWATER STUDY

ELECTRICAL SYSTEM ANALYSIS

SOLID WASTE AND HAZARDOUS WASTE STUDY UPDATE

IN SUPPORT OF THE

COMMONWEALTH OF THE NORTHERN MARIANA ISLANDS JOINT MILITARY TRAINING ENVIRONMENTAL IMPACT STATEMENT

Department of the Navy

Naval Facilities Engineering Command, Pacific

258 Makalapa Drive, Suite 100

JBPHH HI 96860-3134

June 2025

This page is intentionally left blank.

1 INTRODUCTION

1.1 PURPOSE

The purpose of this study is to present solid and hazardous waste management requirements associated with the construction and operational phases of the Proposed Action presented in the Revised Draft Commonwealth of the Northern Mariana Islands (CNMI) Joint Military Training (CJMT) Environmental Impact Statement (EIS).

1.2 STUDY GOALS AND OBJECTIVES

This *Solid and Hazardous Waste Study* was prepared to evaluate waste management and disposal options for all solid and hazardous waste streams generated by the Proposed Action. The study objectives are summarized as follows:

- Identify existing and planned CNMI waste management options.
- Characterize and quantify waste streams of the Proposed Action.
  - Municipal Solid Waste
  - Construction and Demolition Waste
  - Green Waste
  - Hazardous Waste, Non-Hazardous Industrial Wastes, Universal Waste and E-waste
- Evaluate solid and hazardous waste management/disposition options for the Proposed Action.

The Proposed Action anticipates that approximately 30-50 permanent staff will be required to maintain and operate the facility. Table 1 summarizes the facilities to be developed and the anticipated construction timeframe.

Table 1. Proposed Action Project Phasing

Year	*Description*
2026	Helicopter Landing Zones Cleared (1/3 of total area cleared)
	North Field Drop Zone Cleared (1/3 of total area cleared)
	Landing Zones Access Roads Cleared (1/3 of total area cleared)
2027	Helicopter Landing Zones Cleared (1/3 of total area cleared)
	North Field Drop Zone Cleared (1/3 of total area cleared)
	Landing Zones Access Roads Cleared (1/3 of total area cleared)
2028	Helicopter Landing Zones Cleared (1/3 of total area cleared)
	North Field Drop Zone Cleared (1/3 of total area cleared)
	Landing Zones Access Roads Cleared (1/3 of total area cleared)
	Base Camp Potable Water Services Facilities
	Communications Area Distribution Node (ADN)
	Electrical Distribution Building / Switching Station
	Fuel Storage and Distribution Facility
	Potable Water Well Field
	Combined Electrical and Communication Lines Inside and Outside of the Military Lease Area
	Water line from Well Field (final field location TBD; assume largest area disturbed with Option A)
2030	Two Surface Radar Tower
	Base Camp Ammunition Holding Area
	Multi-Purpose Maneuver Range Ammunition Holding Area
	Multi-Purpose Maneuver Range Water Wells and Tanks
	Multi-Purpose Maneuver Range: Center Access Road/UKD Range (vegetation clearing and regular maintenance)
	Multi-Purpose Maneuver Range: Interim Firebreak
	Multi-Purpose Maneuver Range: Perimeter Road and Firebreak
	Multi-Purpose Maneuver Range: Target/Objective Areas
2031	Range Support Maintenance Shop
	Port Biosecurity/Wash Rack
2033	General Purpose Warehouse and Hazardous Materials Storage and Transfer Building
2036	Aircraft Shelter
2038	Camping Concrete Tent Pads
	Base Camp Biosecurity/Wash Rack
	Base Camp Motor Pool
	Base Camp Public Works Shop
	Base Camp Security Fencing
	Base Camp Training Unit Vehicle Parking
2039	Explosives Training Range (ETR)
	Explosives Training Range Access Road
	Wastewater/Restrooms/Showers

2 EXISTING AND PLANNED CNMI WASTE DISPOSAL OPTIONS

The purpose of this section is to evaluate the existing conditions of solid and hazardous waste management infrastructure on Tinian. This section describes the existing solid waste infrastructure, the potential future solid waste management options on Tinian, and the current tonnage of solid waste generated.

In this study, solid waste generation refers to the quantities of solid waste generated that requires management. Management is composed of two parts:

- Diversion/recycling; and
- Disposal – landfilling and incineration.

The solid waste quantities associated with each of these two management components will produce an impact on the existing solid waste infrastructure. Successful implementation of local re-use/diversion/recycling programs will positively impact final disposal facilities by reducing waste quantities requiring management. The Tinian diversion/recycling infrastructure currently consists of the newly constructed Tinian Transfer Station.

The existing CNMI disposal infrastructure consists of the unpermitted and non-compliant Tinian Puntan Diablo disposal facility located on Tinian and the permitted Marpi Landfill located on Saipan. The permitted landfill on Saipan would be utilized to dispose of waste that cannot be diverted from disposal. The estimated solid waste quantities of the Proposed Action are compared to recent CNMI solid waste generation quantities to evaluate the impacts of the Proposed Action on the existing solid waste infrastructure. The recent annual disposal tonnage estimated at the Tinan Puntan Diablo disposal facility, and the Marpi Landfill are discussed in subsequent sections.

To ensure the United States (U.S.) Marine Corps' (USMC's) waste management plans align with the CNMI's local waste management goals and their Integrated Solid Waste Management Plan, the USMC will develop an integrated waste management plan (ISWMP) in accordance with Marine Corps Order (MCO) 5090.2, Volume 17 for the CJMT project, in coordination with the CNMI municipal government. The ISWMP would be developed to address both construction activities and the ongoing training activities, and would be prepared prior to the commencement of construction.

If it is determined that the local solid waste infrastructure is not adequate to permit proper management of the Proposed Action-generated waste, the alternative to transport the waste to one or more off-island facilities where the recyclables could be recovered and the residual waste disposed of in compliant disposal facilities authorized to accept Department of Defense (DoD) waste.

2.1 TINIAN PUNTAN DIABLO DISPOSAL FACILITY

Solid waste on Tinian is currently transported by residents and business entities to the Tinian Puntan Diablo disposal facility located adjacent to 8th Avenue near San Jose and the southwest coast. The facility is operated by the CNMI Department of Public Works. The existing disposal facility is unlined and not presently in compliance with the design and operating requirements of the Resource Conservation and Recovery Act Subtitle D regulations (40 Code of Federal Regulations [CFR] Part 258) governing municipal solid waste landfills. The facility also does not

comply with the CNMI regulations (Title 65, Division of Environmental Quality, Chapter 65-80, Solid Waste Management Regulation), which substantially follow the Subtitle D regulations.

CNMI intends to convert the disposal facility to a permitted landfill by demonstrating compliance with the small community exemption available in Resource Conservation and Recovery Act Subtitle D regulations 40 CFR Part 258.1(f)(1) (CNMI 2023). The anticipated timeline to complete the permitting process is 6 to 12 months. See Section 6.2.1. for a summary of the small community exemption. To receive this permit, the state-owned Small Community Exempt Landfill will still require a Closure and Post-Closure Plan that includes a Final Cover Design developed with Bureau of Environmental and Coastal Quality per 40 CFR 258.60. All components of 40 CFR 258 – Subpart C – Operating Criteria will need to be designed, constructed, and fully operational. The Facility Operations Plan, or other comparable documents, will include the following operating requirements or demonstrations that fully implement the 40 C.F.R. 258 – Subpart C – Operating Criteria:

- Demonstrated compliance with Resource Conservation and Recovery Act Subtitle D Regulation 40 CFR Part 280.1(f)(1)
- Hazardous waste exclusion;
- Landfill cover material requirements;
- Disease vector control;
- Explosive gases control;
- Demonstrate compliance with the Clean Air Act;
- Facility access control requirements;
- Run-On/Run-Off control systems;
- Surface water requirements; and
- Recordkeeping requirements.

Additionally, any future permitted Tinian Puntan Diablo Landfill will require the revised Facility Operations Plan to include other content/requirements so that staff can be trained to operate the facility and maintain compliance with the applicable sections of 40 CFR 258.

Conversion of the disposal facility and operation of the new landfill under the small community exemption would be for 10 years or until a new Atgidon Landfill can be permitted, constructed, and opened (CNMI 2023). The Puntan Diablo landfill will only be utilized to manage CJMT solid waste if the site is permitted as a landfill and in compliance with Resource Conservation and Recovery Act Subtitle D regulations (40 CFR Part 258) and local regulations. Reference to the Tinian Puntan Diablo Landfill in subsequent Chapters 3 through 5 is to the planned, permitted, and compliant landfill and not the current unpermitted disposal facility.

The Tinan Puntan Diablo disposal facility is operated without scales and, as a result, definitive historical disposal tonnage records are not available. The Integrated Solid Waste Management Plan assumes an average daily waste disposal rate of 3.8 pounds per person for the Tinian population (CNMI 2023). The 2020 population for Tinian is reported as 2,044 in the Integrated Solid Waste Management Plan (CNMI 2023). The 2010 population was reported in the Integrated Solid Waste Management Plan as 3,136, indicating a reduction of approximately 34 percent. For the purposes of estimating the 2023 annual disposal tonnage, it is assumed that the population has remained

flat/unchanged since 2020. Table 2 presents the estimated average annual and average daily disposal tonnage at the disposal facility (CNMI 2023).

Table 2. Estimated 2023 Tinian Puntan Diablo Disposal Tonnage

	Disposal Tonnage
Population[a]	2,044
Solid Waste Generation Rate[a] (pound (lb) /Person/Day)	3.8
Annual Solid Waste Generation[a] (Tons/Year)	1,418
Average Daily Generation (Tons/Day)[b]	3.9

Notes: [a] – 2023 CNMI Draft Comprehensive ISWMP
[b] – Assumes site is open 365 days/year

2.2 PROPOSED ATGIDON LANDFILL

CNMI is initiating permitting efforts for a new landfill at the Atgidon site, located north of 86th Street and between Riverside Drive and 10th Avenue (CNMI 2023). The CNMI plans to permit this new site under the small community exemption as discussed previously. CNMI anticipates permitting will take 5 years to complete, with site development commencing shortly thereafter to ensure disposal capacity at the new Atgidon Landfill is available prior to cessation of operations at Puntan Diablo (CNMI 2023). The design capacity for this landfill is not known at this time.

2.3 MARPI LANDFILL

The Marpi Landfill is located on the island of Saipan and is the only active disposal facility in Saipan. The Marpi Landfill operating permit was renewed by the Bureau of Environmental and Coastal Quality in 2016, subject to the completion of site upgrades and remedial measures. Per the CNMI Department of Public Works Solid Waste Management Feasibility Study, December 2019 (GHD, Inc./Gershman, Brickner, & Bratton, Inc. 2019), the 26-acre permitted and lined disposal area of the Marpi Landfill had an estimated remaining operational life of approximately 29 years (approximately 2045). Lined disposal Cells 1 and 2 were constructed with an estimated remaining cell life of approximately 6.7 years at the time of the 2019 study. Therefore, the next disposal cell will need to be operational in 2025 to ensure available disposal capacity for continued use. At this time, CJMT has not received formal authorization from CNMI to utilize the Marpi Landfill.

The Marpi Landfill annual disposal tonnage records for the period of 2020 through 2022 is reported in the Integrated Solid Waste Management Plan (CNMI 2023). Annual average disposal tonnage can be calculated from the tonnage reported in the Integrated Solid Waste Management Plan. According to US Census data, the island of Saipan has experienced a reduction in population between 2010 and 2020. As stated in the Integrated Solid Waste Management Plan, the 2010 population was reported as 48,220 and the 2020 population was 43,385, indicating a reduction of approximately 10 percent. For purposes of estimating the current (2023) annual disposal tonnage disposed of at Marpi Landfill, it is assumed the population has remained unchanged since 2020. Table 3 presents the average annual and average daily disposal tonnage at the Marpi Landfill.

Table 3. Estimated Existing (2023) Marpi Landfill Disposal Tonnage

Year	*2020*	*2021*	*2022*	*Average*
Annual Disposal Tonnage[a]	32,810	30,241	32,206	31,752
Average Daily Disposal Tonnage[b]	90	83	88	87

Notes: [a] – 2023 CNMI Draft Comprehensive Integrated Solid Waste Management Plan
[b] – Assumes site is open 365 days/year

The operational capacity of the landfill was evaluated to determine whether the landfill has the equipment and personnel required to accept additional waste from the Proposed Action. The term operational capacity refers to the daily landfill operation requirements and not the overall site life capacity of the landfill. The average daily disposal tonnage for the 2020 through 2022 time period is 87 tons/day and ranges between 83 and 90 tons/day (CNMI 2023). It is assumed that the landfill is operating sufficiently within this capacity range.

Based on population data, it is reasonable to assume that past annual and daily average disposal tonnage was higher than current levels due to the population decline of approximately 10 percent between 2010 and 2020. To estimate the upper level of the landfill's operational capacity, an additional 10 percent was added to the current annual disposal rates. The 2010-era annual disposal quantity based on the population at the time would have been approximately 35,000 tons/year (96 tons/day). The 96 tons/day represents a daily operational capacity for the landfill, which is higher than its current operating range. The ability of the landfill to manage larger volumes of waste historically indicates that the landfill may have a daily operational capacity to support solid waste disposal generated by the Proposed Action.

2.4 TINIAN TRANSFER STATION

The Tinian Transfer Station is currently permitted to receive only source-separated recyclable materials such as cardboard/paper, plastic bottles, and aluminum cans (CNMI 2023). These materials are shipped off the island for processing and sale, and the cost of handling and transportation exceeds the revenue generated by the sale of the recyclables.

The facility was originally designed to function as a transfer station to receive municipal solid waste generated on Tinian and package it and transport it to the Marpi Landfill on Saipan (CNMI 2023). If disposal capacity is available on Tinian, the facility will continue its current operational scope of handling source-separated recyclables. If no disposal option is available on Tinian, the transfer station operation could be expanded, with the appropriate solid waste permit modification, to receive, package, and transport both recyclables and municipal solid waste. Municipal solid waste would be transported to Marpi Landfill for disposal.

Currently, there is no historical data available regarding the quantities or composition of materials diverted at the transfer station. Contractors take possession of recycled materials collected at the Tinian Transfer Station under a CNMI contract. Details of this contract are not available; it is assumed the recyclables are being transported and sold to off-island industries. At this time, CJMT has not received formal authorization from CNMI to utilize the Tinian Transfer Station.

2.5 CONSTRUCTION AND DEMOLITION WASTE

There is currently no permitted construction and demolition landfill on Tinian or Saipan. There are no current efforts to segregate or divert construction and demolition waste; hence, construction and demolition waste is currently disposed of at the Tinian Puntan Diablo disposal facility.

The CNMI is planning to develop and operate a municipally-owned site to accept construction and demolition waste generated on Tinian. Site assessment and planning stages of development were projected to begin in late 2023 (CNMI 2023). If permitted and available, this facility will be considered a potential management option for construction and demolition waste generated by the Proposed Action that is not recycled or diverted.

2.6 GREEN WASTE

Green waste generated by residents on Tinian is managed at the Tinian Organics Processing Site operated by the Department of Public Works. The site does not accept green waste from commercial generators. It was permitted in June 2022 for green waste disaster debris. It is equipped with a wheel loader and a chipper for green waste processing and storage. It receives approximately 660 cubic yards per year (CNMI 2023). The Tinian Organics Processing Site will not be evaluated as a solution for green waste diversion for CJMT.

2.7 HAZARDOUS, INDUSTRIAL, UNIVERSAL WASTES AND E-WASTES

There are an estimated 70—80 generators of hazardous waste within the CNMI. It is unknown how many reside on Tinian. The majority of these generators are Resource Conservation and Recovery Act very small quantity generators or small quantity generators. Hazardous waste generators on Tinian contract with certified hazardous waste contractors to meet disposal requirements. Hazardous waste generators must procure disposal services off-island because CNMI does not have a permitted disposal facility for hazardous, industrial, universal, and electronic waste (CNMI 2023).

Hazardous, industrial, and universal wastes and e-waste generated by CJMT activities on Tinian will be disposed of off-island by DoD per applicable U.S. Environmental Protection Agency regulations.

3 PROPOSED ACTION WASTE GENERATION AND CHARACTERIZATION

The CJMT Proposed Action would generate solid waste associated with construction, maintenance, and operational training concurrently because some training would commence upon the Record of Decision. Training would be conducted while improvements are being made to the training infrastructure. Waste generation would be a combination of construction wastes and wastes generated from training activities. The waste generated would vary depending on the level of training and the construction activities for a given year. This chapter only covers waste generated during construction. This section describes the solid waste generation from construction, which includes solid waste, construction and demolition waste, and green waste.

Waste management practices will be developed with an emphasis on source reduction to minimize the generation of waste thereby reducing the dependence on landfill or incineration for final management. The USMC would develop the CJMT Training Manual and other standard operating procedures to implement waste minimization through source reduction, to mandate and enforce segregation and diversion of recyclables from the waste stream to minimize disposal, to include all waste management requirements as outlined in the CNMI integrated waste management plan, and to include waste management policies and procedures that reference the CNMI zero waste proclamation and applicable regulations. The CJMT Training Manual will address the USMC requirement to ensure municipal solid waste is managed in accordance with USMC Environmental Management and Range Sustainability requirements, which are based on applicable laws, rules, and policies which prohibit illegal dumping. The CJMT Training Manual will address identification of hazardous materials and measures and methods to be employed to prevent improper disposal of these materials with the non-hazardous solid waste.

The USMC will comply with all laws, regulations, and executive orders in the management of solid waste as required.

3.1 SOLID WASTE

Under the Proposed Action, the estimated population increase due to off-island construction workers and support staff is projected to be no more than 50 people at any one time.

Solid waste generation is based on the rates cited for Tinian in the CNMI Draft Integrated Solid Waste Management Plan of 3.8 pounds/person/day. Table 4 presents the estimated solid waste generated for the project construction period.

Table 4. Estimated Solid Waste Generation – Construction Phase

	Input	*Total Tonnage*	*Diverted/Recycled*[b]	*Disposal*
Population (estimated construction-related personnel)	50	N/A	N/A	N/A
Solid Waste Generation Rate (lbs/person/day)[a]	3.8			
Daily Solid Waste Generation (tons/day)	N/A	0.10	0.01	0.08
Annual Solid Waste Generation (tons/year)		35	4	31

Notes: [a] – 2023 CNMI Draft Comprehensive ISWMP
[b] – Assumes site is open 365 days/year
Legend: N/A = Not Applicable

3.1.1 Construction Waste

The construction waste would be produced from the construction or renovation of structures and is estimated from the square footage of the proposed pavement and building footprints (i.e., impervious areas). The estimated generation is derived from the total area of impervious surfaces developed, less areas surfaced with asphalt concrete, in the Proposed Action multiplied by the construction generation rate. Asphalt concrete pavement construction generates essentially no debris or waste and therefore is excluded from the impervious areas that will generate construction waste. Proposed developments, representing those impervious surfaces, which will generate construction waste are summarized in Table 3.1-2. Development areas that do not create impervious surfaces and generate no construction waste or negligible construction waste are also summarized in Table 5.

Construction activities are expected to occur during the 2026 through 2039 timeframe. Table 5 presents the construction phasing of the planned facilities and the projected construction waste generation. The construction waste generation for structures/buildings during the period of project construction is estimated to be 4.34 pounds per square foot (21 kilograms per square meter) of structure/building area, multiplied by the total newly created structure/building square footage (U.S. Environmental Protection Agency 2018). Concrete surfaced areas are estimated to generate approximately 1.09 pounds. square foot (5.3 kilograms per square meter), approximately 25 percent of the generation rate for structures/buildings. The total generated construction waste is summarized in Table 3.1-2.

Table 5. Projected Construction Waste Generation

Year	*Description*	*New Impervious Areas*		*Construction Waste Generated (tons)*[e, f]
		New Structure/Building Construction (sf)	*New Concrete Surfacing (sf)*	
2026	Helicopter Landing Zones Cleared (1/3 of total area cleared)[a]	0	0	0
	North Field Drop Zone Cleared (1/3 of total area cleared)[a]	0	0	0

Year	*Description*	*New Impervious Areas*		*Construction Waste Generated (tons)[e, f]*
		New Structure/Building Construction (sf)	*New Concrete Surfacing (sf)*	
	Landing Zones Access Roads. Cleared (1/3 of total area cleared)[a]	0	0	0
2027	Helicopter Landing Zones Cleared (1/3 of total area cleared)[a]	0	0	0
	North Field Drop Zone Cleared (1/3 of total area cleared)[a]	0	0	0
	Landing Zones Access Roads. Cleared (1/3 of total area cleared)[a]	0	0	0
2028	Helicopter Landing Zones Cleared (1/3 of total area cleared)[a]	0	0	0
	North Field Drop Zone Cleared (1/3 of total area cleared)[a]	0	0	0
	Landing Zones Access Roads. Cleared (1/3 of total area cleared)[a]	0	0	0
	Base Camp Potable Water Services Facilities[b]	7,270	0	16
	Communications Area Distribution Node (ADN)	2,700	0	6
	Electrical Distribution Building / Switching Station	900	0	2
	Fuel Storage and Distribution Facility	0	18,000	10
	Potable Water Well Field	7,200	0	16
	Combined Electrical and Communication Lines Inside and Outside of the Military Lease Area	0	0	0
	Water Line from Well Field (final field location TBD; assume largest area disturbed with Option A)[c]	0	0	0
2030	Two Surface Radar Tower	1,800	0	4
	Base Camp Ammunition Holding Area	0	27,000	15
	Multi-Purpose Maneuver Range Ammunition Holding Area	0	27,000	15
	Multi-Purpose Maneuver Range Water Wells and Tanks[d]	6,210	0	13
	Multi-Purpose Maneuver Range: Center Access Road/UKD Range (vegetation clearing and regular maintenance)	0	0	0
	Multi-Purpose Maneuver Range: Interim Firebreak	0	0	0
	Multi-Purpose Maneuver Range: Perimeter Road and Firebreak	0	0	0
	Multi-Purpose Maneuver Range: Target/Objective Areas	0	0	0
2031	Range Support Maintenance Shop	1,260	0	3
	Port Biosecurity/Wash Rack	0	26,000	14
2033	General Purpose Warehouse and Hazardous Materials Storage and Transfer Building	36,000	0	78
2036	Aircraft Shelter	16,200	40,000	57
2038	Camping Concrete Tent Pads	0	10,120	5
	Base Camp Biosecurity/Wash Rack	0	5,400	3

Year	*Description*	*New Impervious Areas*		*Construction Waste Generated (tons)[e, f]*
		New Structure/Building Construction (sf)	*New Concrete Surfacing (sf)*	
	Base Camp Motor Pool	0	0	0
	Base Camp Public Works Shop	8,700	0	19
	Base Camp Security Fencing	0	0	0
	Base Camp Training Unit Vehicle Parking	0	0	0
2039	Explosives Training Range (ETR)	320	0	1
	Explosives Training Range Access Road	0	0	0
	Wastewater/Restrooms/Showers	3,200	0	7

Notes: a Assume 1/3 of activities conducted each year (2026-2028).
b New structure/building area includes 2-42' diameter tanks (2,770 sf) and assumed 3,600 sf for other structures.
c Two well field location options currently being considered. For purposes of estimating land clearing waste generation the option with the largest impact (Option A) has been assumed.
d New structure/building area includes 2-33' diameter tanks (1,710 sf) and assumed 3,600 sf for other structures.
e Construction waste generation for new impervious surface areas associated with structure/building construction is estimated to be 4.34 pounds per square foot (21 kilograms per square meter)(USEPA 2003).
f Construction waste generation for new impervious surface areas associated with concrete surfaced areas is estimated to be 1.09 lbs per square foot (5.3 kg per square meter).

Construction and demolition waste will be mainly generated from construction activities associated with new development. Construction and demolition waste associated with new structures/buildings is anticipated to be composed primarily of concrete, wood, drywall/plaster, and smaller quantities of other wastes. The average composition of non-residential construction-related construction and demolition waste is presented in Table 6 (United States Environmental Protection Agency 2018).

Table 6. Estimated Construction and Demolition Composition for New Structures/Buildings – Construction Phase

Material Type	*Estimated Percent[a]*
Concrete	77
Wood Products	10
Drywall and Plasters	10
Steel	-
Brick and Clay Tile	1
Asphalt Shingles	3
Asphalt Concrete	-
Total	**100**

[a] – U.S. Environmental Protection Agency 2018.

New areas of development that will be surfaced with concrete pavement will generate debris consisting primarily of residual concrete and wood used to make concrete forms with negligible quantities of other material types. The composition of the construction debris is based on the percentages of concrete and wood presented in Table 7 with all other waste types removed. The

resulting estimated composition of construction debris generated in the construction of new concrete surfaced areas is presented in Table 7.

Table 7. Estimated Construction and Demolition Composition for New Concrete Surfaced Areas – Construction Phase

Material Type	*Estimated Percent*
Concrete	89
Wood	11
Total	**100**

Based on the construction debris material composition presented in Tables 6 and 7, concrete and wood represent 87 percent of the overall construction and demolition waste stream associated with new structures/buildings and 100 percent of construction and demolition waste associated with new concrete paved areas.

For typical construction projects, concrete and wood materials can be diverted from disposal with reasonable efforts by the contractor. Concrete waste, when properly sized, can be used for structural fill, as road base, and for road surfacing. Wood debris can be chipped, similar to green waste, and used as mulch and ground cover. All construction project contracts should establish requirements for the contractor to divert these and other recyclables generated from disposal.

Current DoD Integrated Solid Waste Management policy sets a minimum diversion from landfilling or non-waste to energy incineration of 60 percent for construction and demolition waste (Office of the Assistant Secretary of Defense 2020). Given the majority of construction and demolition is anticipated to be concrete and wood, the mandated diversion rate of 60 percent should be practically and economically achievable if diversion and reuse requirements are included in the construction contracts.

Table 8 presents the estimated annual construction and demolition waste quantities to be generated during the multi-year construction period. Also presented are the estimated recycled/diverted quantities and disposal quantities based on the 60 percent diversion mandate. Generation is assumed to occur over 365 days.

Table 8. Estimated Construction and Demolition Waste Generation, Diversion and Disposal – Construction Phase

Year	*Construction and Demolition Waste*					
	Total Generated		*Total Diverted/Recycled*		*Total Disposal*	
	Annual (tons)	*Daily Average (tons)*	*Annual (tons)*	*Daily Average (tons)*	*Annual (tons)*	*Daily Average (tons)*
2026	0	0	0	0	0	0
2027	0	0	0	0	0	0
2028	49	0.13	29	0.08	20	0.05

Year	Construction and Demolition Waste					
	Total Generated		Total Diverted/Recycled		Total Disposal	
	Annual (tons)	Daily Average (tons)	Annual (tons)	Daily Average (tons)	Annual (tons)	Daily Average (tons)
2030	47	0.13	28	0.08	19	0.05
2031	17	0.05	10	0.03	7	0.02
2033	78	0.21	47	0.13	31	0.09
2036	57	0.16	34	0.09	23	0.06
2038	27	0.07	16	0.04	11	0.03
2039	8	0.02	5	0.01	3	0.01

CJMT will need to obtain CNMI authorization to dispose of construction and demolition waste at the Marpi Landfill, the permitted Tinian Puntan Diablo Landfill, the future/planned Atgidon Landfill, and/or the planned hardfill site.

3.1.2 Green Waste

The construction contractor will clear vegetation during facility construction from the 2026 through 2039 timeframe. The projected quantities of green waste to be generated are presented in Table 9.

Table 9. Projected Green Waste Generation During Construction

Year	Description	Area Cleared (sf)	Green Waste Volume Generated[b] (cy)	Green Waste Tonnage Generated[b] (tons)
2026	Helicopter Landing Zones Cleared (1/3 of total area cleared)[a]	2,280,000	50,667	12,667
	North Field Drop Zone Cleared (1/3 of total area cleared)[a]	1,292,280	28,717	7,179
	Landing Zones Access Roads. Cleared (1/3 of total area cleared)[a]	139,224	3,094	773
2027	Helicopter Landing Zones Cleared (1/3 of total area cleared)[a]	2,280,000	50,667	12,667
	North Field Drop Zone Cleared (1/3 of total area cleared)[a]	1,292,280	28,717	7,179
	Landing Zones Access Roads. Cleared (1/3 of total area cleared)[a]	139,224	3,094	773
2028	Helicopter Landing Zones Cleared (1/3 of total area cleared)[a]	2,280,000	50,667	12,667
	North Field Drop Zone Cleared (1/3 of total area cleared)[a]	1,292,280	28,717	7,179
	Landing Zones Access Roads. Cleared (1/3 of total area cleared)[a]	139,224	3,094	773
	Base Camp Potable Water Services Facilities	0	0	0
	Communications Area Distribution Node (ADN)	0	0	0
	Electrical Distribution Building / Switching Station	0	0	0

Year	*Description*	*Area Cleared (sf)*	*Green Waste Volume Generated[b] (cy)*	*Green Waste Tonnage Generated[b] (tons)*
	Fuel Storage and Distribution Facility	0	0	0
	Potable Water Well Field	412,460	9,166	2,291
	Combined Electrical and Communication Lines Inside and Outside of the Military Lease Area	1,205,820	26,796	6,699
	Water Line from Well Field (final field location TBD; assume largest area disturbed with Option A)	336,000	7,467	1,867
2030	Two Surface Radar Tower	51,200	1,138	284
	Base Camp Ammunition Holding Area	0	0	0
	Multi-Purpose Maneuver Range Ammunition Holding Area	27,000	600	150
	Multi-Purpose Maneuver Range Water Wells and Tanks	65,340	1,452	363
	Multi-Purpose Maneuver Range: Center Access Road/UKD Range (vegetation clearing and regular maintenance)	108,000	2,400	600
	Multi-Purpose Maneuver Range: Interim Firebreak	302,880	6,731	1,683
	Multi-Purpose Maneuver Range: Perimeter Road and Firebreak	504,000	11,200	2,800
	Multi-Purpose Maneuver Range: Target/Objective Areas	531,200	11,804	2,951
2031	Range Support Maintenance Shop	0	0	0
	Port Biosecurity/Wash Rack	0	0	0
2033	General Purpose Warehouse and Hazardous Materials Storage and Transfer Building	0	0	0
2036	Aircraft Shelter	0	0	0
2038	Camping Concrete Tent Pads	0	0	0
	Base Camp Biosecurity/Wash Rack	0	0	0
	Base Camp Motor Pool	0	0	0
	Base Camp Public Works Shop	0	0	0
	Base Camp Security Fencing	313,400	6,964	1,741
	Base Camp Training Unit Vehicle Parking	0	0	0
2039	Explosives Training Range (ETR)	108,900	2,420	605
	Explosives Training Range Access Road	67,200	1,493	373
	Wastewater/Restrooms/Showers	0	0	0

Notes: [a]–Assume 1/3 of activities conducted each year (2026-2028).
[b]–Green Waste Generation: Total square yards of cleared area was multiplied by 2 yards (1.85 meters) (the average height of vegetation); then 10 percent of the volume was used to estimate the amount of green waste generated (based on the site visit to Tinian in December 2013). Average density of green waste is assumed to be 500 pounds per cubic yard (DON 2017).

Table 10 summarizes annual green waste quantities to be generated during the multi-year construction period.

Table 10. Estimated Annual Green Waste Generation - Construction Phase

Year	*Volume (cubic yards)*	*Weight (tons)*
2026	82,478	20,619
2027	82,478	20,619
2028	125,906	31,477
2030	35,325	8,831
2031	0	0
2033	0	0
2036	0	0
2038	6,964	1,741
2039	3,913	978

Green waste generated during construction will be chipped by the contractor. The contractor will be responsible for determining size and location of the chipping area and obtain local permits as required. The contractor will utilize mulch as needed to complete construction. Mulch remaining after completion of construction will be stockpiled and utilized by facility maintenance managers to control vegetation growth and/or for erosion and dust control. Excess mulch will be made available for use by residents of Tinian for the benefit of enriching the island soils and reducing erosion.

Mulched green waste is widely used as alternative daily cover, in place of soil daily cover, in landfill operations in the continental United States; if permitted, the option of using mulch as alternative daily cover would be available to the operator of the local landfill.

The coconut rhinoceros beetle has been reported to have been found in the CNMI. Inspection of green waste generated during the land clearing phase of the work would be conducted to prevent the spread of this invasive species. If inspection of the work area indicates the presence of coconut rhinoceros beetle, methods to control it would include chipping/grinding which kills the majority of the insects during the mechanical size reduction process. If it is determined that additional control is required, enhanced control can be done by subjecting the mulched material to elevated temperatures for a defined period of time which will kill the insects. Elevated temperatures in excess of 130 degrees F for a period of 15 days have been shown to be effective in destroying coconut rhinoceros beetle. Placing the mulched material, with appropriate moisture levels, in windrows and turning them periodically through the 15 day period will produce the required elevated temperatures. Upon completion of the elevated temperature process, the mulch may be utilized.

3.1.3 Hazardous, Industrial, Universal Wastes and E-Wastes

Hazardous, industrial, universal wastes and e-wastes may be generated during the construction phase of the Proposed Action. Quantities of wastes generated cannot be estimated at this time. The types of wastes generated during the construction phase may consist of, but not be limited to the following:

- Used oil from construction equipment maintenance and operation;
- Antifreeze from construction equipment maintenance and operation;

- Diesel and gasoline; and
- Expired or unused paint and paint-related materials.

All construction-related hazardous, industrial, universal wastes, and e-wastes would be stored, collected, shipped off-island, and managed in accordance with applicable regulations. Transportation of all hazardous wastes would be conducted in compliance with U.S. Department of Transportation regulations and CFR Title 49. Since all generated hazardous wastes would be removed from the island and disposed of according to relevant laws and regulations, the proposed construction activities would have no impact with respect to hazardous waste disposal on Tinian.

4 PROPOSED ACTION WASTE GENERATION AND CHARACTERIZATION—TRAINING OPERATIONS

Training operations will generate solid waste due to the presence of personnel undergoing training and permanent facility staff. Ongoing facility maintenance activities will also result in waste during the training operations period.

This chapter presents the following estimated values:

- Solid waste quantities and composition projected to be generated during training operations;
- Construction waste quantities generated from maintenance activities;
- Green waste generation from ongoing grounds maintenance;
- Quantities of waste that will be diverted/recycled;
- Quantities of waste requiring disposal; and
- Types of hazardous wastes generated.

Training operations will vary from year-to-year due to variations in the number and type (i.e., large, medium, or small) of training events and the number of personnel participating in training events. Solid waste generation estimates present quantities of waste for an estimated average training tempo, representing approximately mid-range of number of events/year and mid-range of minimum and maximum personnel per event, and high-range training tempo representing maximum training events permitted per year with maximum number of permitted participants. The range of waste generation presented provides information necessary for evaluating options and selecting final management methods/facilities to manage wastes generated by the Proposed Action.

Waste management practices will be developed with an emphasis on source reduction to minimize the generation of waste thereby reducing the dependence on landfill or incineration for final management. The USMC will develop the CJMT Training Manual and other standard operating procedures to implement waste minimization through source reduction, to mandate and enforce segregation and diversion of recyclables from the waste stream to minimize disposal, to include all waste management requirements as outlined in the CNMI integrated waste management plan, and to include waste management policies and procedures that reference the CNMI zero waste proclamation and applicable regulations. The Training Manual will address the USMC requirement to ensure municipal solid waste is managed in accordance with USMC Environmental Management and Range Sustainability requirements, which are based on applicable laws, rules, and policies which prohibit illegal dumping. The Training Manual will address identification of hazardous materials and measures and methods to be employed to prevent improper disposal of these materials with the non-hazardous solid waste.

4.1 SOLID WASTE

4.1.1 Solid Waste Generation Rates

This section describes the anticipated solid waste generation rates for two different conditions on Tinian. One condition would be during training periods where both permanent on-island staff are present and training personnel are present. The second condition is in-between training events when only permanent personnel are on island.

Solid waste generated from active training operations is estimated based on documented waste generation data collected over a 6-month period by the Army at the Pohakuloa Training Area (Pohakuloa) in Hawaii County, Hawaii, from November 2013 through April 2014 (Duwall, L., Pohakuloa Solid Waste Contract Program Evaluator 2014). The Pohakuloa operation involves military personnel conducting temporary-duty training similar to that planned for CJMT. The Pohakuloa solid waste generation rate is 7.0 pounds (lbs) per person per day which is higher than the non-training generation rate of 4.9 lbs per person per day described below. During active training periods, CJMT will host personnel undergoing active training in addition to the permanent staff. The number of active training events per year, training event sizes, and training event duration will vary.

Solid waste generation for permanent personnel is expected to be 4.9 lbs per person per day (USEPA 2020). Only permanent staff will be present during non-training periods. The population during these periods will vary little and will be considered the baseline population. Solid waste generated during these periods is very low compared to active training periods.

4.1.2 Solid Waste Composition and Diversion

Waste composition data from US military bases in Guam (NAVFAC Marianas 2013) is a reasonable approximation of the composition of solid waste generated by the Proposed Action because it is based on solid waste data from similar types of activities, climate conditions, and geographical location. Waste composition data is presented in Table 11.

Table 11. Tinian Training Area - Solid Waste Composition During Training

Material Type [a,b]	***Estimated Percent by Weight*** [a,b]
Paper/Cardboard	30.4
Glass	4.0
Plastics/Polystyrene	21.0
Metal	6.0
Organics/Food Waste	37.2
Remaining/Composite municipal solid waste	1.4
Total	**100.0**

Notes: [a]–NAVFAC Marianas 2013.
[b]–Composition modified to remove non-municipal solid waste components of construction and demolition, electronic waste, and hazardous waste.

The current DoD Integrated Solid Waste Management policy sets a minimum diversion from landfilling or non-waste to energy incineration of 40 percent for non-hazardous waste, excluding

construction and demolition debris (Office of the Assistant Secretary of Defense 2020). CJMT is unlikely to meet the 40 percent solid waste diversion goal due to its remote location, which has limited recycling services and no domestic consumption of diverted materials. An estimated waste diversion rate for the project will be based on an estimated recovery rate from the waste stream for the recyclable materials received and processed at the Tinian Transfer Station. Currently, the Tinian Transfer Station receives and processes source-separated cardboard/paper, plastic bottles, and aluminum cans (CNMI 2023).

The Tinian Transfer Station receives and processes source-segregated cardboard/paper, plastic bottles, and aluminum. Therefore, if the Tinian Transfer Station is utilized, CJMT will be required to segregate these recyclable materials prior to delivery to the Tinian Transfer Station. Recycling facilities that receive source-separated materials, such as the Tinian Transfer Station, have a low tolerance for unsorted materials and material contamination because they lack material sorting equipment and site capacity for sorting. Contaminated recyclables will likely be rejected by the transfer station, which would necessitate landfill disposal.

The requirement to segregate the recyclables with minimal contamination will impact the degree of recovery of recyclables at CJMT. Segregation is a labor-intensive process and will be largely dependent upon the sorting of materials by the individual generator which, in this case, is the individual soldier undergoing training, unless personnel, space, and equipment are dedicated to the sorting/segregation process. Diversion of recyclables can be maximized by educational programs and recycling receptacles that are clearly labeled and protect recyclables from contamination. However, even at established military bases and military housing units where training is frequent and oversite is more consistent, observations of recycling and diversion programs indicate modest to low rates of segregation and capture of recyclable materials with the majority of recyclables being discarded into the waste receptacles rather than the recyclables collection containers. For this reason it is not unreasonable to expect a relatively low rate of diversion for any recycling/diversion program implemented at CJMT.

Estimated recovery rates for the targeted recyclables is based on the 2018 averages for the United States (USEPA 2020) with an adjustment of these rates to reflect the site-specific challenges to recycling, outlined above. A conservative adjustment of 50 percent reduction from the 2018 US average (USEPA 2020) for the CJMT diversion rates is utilized based on the assumption of CJMT implementing a recycling program for the targeted materials. Table 12 presents the assumed waste composition, the 2018 average diversion rate for the United States, and the adjusted diversion rate for the project.

Table 12. Tinian Training Area – Estimated Recyclable Diversion Rates

Material Type	*Estimated Percent of Total Waste Stream*[a,b]	*2018 US Average Diversion Percentage*[c]	*Adjusted CJMT Diversion Percentage*	*Overall CJMT Diversion Percentage*
Paper/Cardboard	30.4	64	32	10
Glass	4.0	N/A	N/A	N/A
Plastics/Polystyrene	21.0	14	7	1
Metal	6.0	35	17	1
Organics	37.2	N/A	N/A	N/A
Remaining/Composite municipal solid waste	1.4	N/A	N/A	N/A
Total	100.0			12

Notes: [a] – NAVFAC Marianas 2013
[b] – Composition modified to remove non-municipal solid waste components of construction and demolition, electronic waste, and hazardous waste
[c] – USEPA 2020

Based on the above outlined assumptions, the overall aggregate diversion rate for the solid waste stream is estimated to be 12 percent.

These modest diversion rates for the individual material types are based on assumed low levels of diversion due to the following reasons:

- Frequent turnover of participating personnel can result in difficulty implementing an effective segregation program;
- Potential contamination of paper products due to food residue and other contamination; and
- Portions of the plastics, polystyrene, and metal categories cannot be recycled at the Tinian Transfer Station.

The following sections use a 12 percent diversion rate to estimate the overall municipal solid waste diversion for the project.

4.1.3 Solid Waste Quantities

The quantities of solid waste generated are dependent upon the frequency of training events, total personnel participating in the training, the presence of construction workers, as well as the permanent facility staff. Table 13 presents Alternative 1, which entails the highest expected training intensity, with the projected training frequencies, the expected population of various sizes of training sessions, and the anticipated population of permanent staff and construction workers.

Table 13. Alternative 1 Training Events, Duration, Frequency and Projected Headcount

Description	*Projected Personnel Headcount*	*Event Duration*	*Estimated Training Frequency*
Permanent Staff	50	365	
Construction Workers	50	365	
Training Events			
Small Training Events	up to 100	1-2 Weeks	Routinely occurring throughout the year
Medium Training Events	up to 250	1-2 Weeks	Once per quarter
Large Training Events	up to 1,000	2-4 Weeks	2-4 times per year

Notes: [1] 30 of the 50 permanent staff positions area expected to be filled by Tinian residents, with the balance being filled by off-island personnel. For estimation solid waste impacts, only the additional 20 off-island positions will be considered.
[2] For estimation of solid waste impacts associated with small training events, and annual total number 12 of events is assumed (average of one event per month, year round).
[3] Maximum personnel participating in training at any one time is 1,000.

Permanent staff is projected to be 50 persons with approximately 30 of those positions to be filled by current Tinian residents. Solid waste generation projections for the project will include the 20 additional positions that will be filled by personnel not presently residing on Tinian.

The range of training frequency, total training days, and personnel headcount is presented in Table 14.

Table 14. Training Event Frequency and Personnel Headcount

Activity Description	*Personnel Headcount/Event*		*Event Frequency* (events/year)		*Event Duration* (days)		*Total Maximum Training Days/Year*	*Personnel Days/Year*
	Event Size Range	*Maximum Headcount*	*Frequency Range*	*Maximum*	*Duration Range*	*Maximum*		*Maximum*
Permanent Staff		20			365			7,300
Construction Workers		50			365			18,250
Training Personnel								
Small Training Events	up to 100	100	12	12	7-14	14	168	16,800
Medium Training Events	up to 250	250	4	4	7-14	14	56	14,000
Large Training Events	up to 1,000	1,000	2-4	4	14-28	28	112	112,000
Total Training Personnel				20		56	336	142,800
Average Training Personnel Headcount/Training Day (Training Personnel Days/Year, Maximum ÷ Total Maximum Training Days/Year)								425

Notes: [1] Assumed small training event frequency to be 12 events/year (average of one per month, year round).
[2] Maximum personnel participating in training at any one time is 1,000.

The maximum personnel participating in training at any one time is 1,000. For the maximum projected annual training events under Alternative 1, the average number of personnel participating in training throughout the course of the training year, total personnel days averaged over the maximum number of training days, is 425, which is shown in Table 14.

The maximum estimated annual solid waste generation is calculated using the estimated personnel days per year, the estimated solid waste generation rates, and estimated diversion rate. Table 15 presents this range.

Table 15. Maximum Solid Waste Generation (per year)

Description	*Solid Waste Generation Rate* (lbs/person/day)[a,b]	*Personnel Days/Year*	*Solid Waste Generated* *(tons/year)*
Permanent Staff	4.9	7,300	18
Construction Workers	4.9	18,250	45
Small Training Events	7.0	16,800	59
Medium Training Events	7.0	14,000	49
Large Training Events	7.0	112,000	392
Solid Waste Generated/Year			562
Solid Waste Diverted/Year[c]			67
Solid Waste Disposal/Year			495

Notes: [a] SW generation rate for permanent staff and construction workers = 4.9 pounds/person/day.
[b] SW generation rate for training personnel = 7.0 pounds/person/day.
[c] Estimated 12 percent diversion rate.

The solid waste generation rates of 4.9 lbs/person/day for permanent staff and construction workers and 7.0 lbs/person/day for training participants were applied to the headcount ranges representative of three population conditions that estimate the range of solid waste generation and associated diversion and disposal occurring over the course of a training year:

1) Minimum daily waste generation – periods during which no training is occurring, and only permanent staff and construction workers are present;
2) Maximum daily waste generation - periods when the maximum training population of 1,000 is present with the permanent staff and construction workers; and
3) Average daily waste generation – represents an overall average disposal tonnage per day for the entire training year under Alternative 1. Average training population over the course of the training year is noted in Table 14 and is used to estimate solid waste generation in the training population which is added to that generated by the permanent staff and construction workers.

The daily solid waste generation, solid waste diversion, and disposal tonnage for these 3 conditions are presented in Table 16.

Table 16. Solid Waste Generation (per day)

Description	*Permament Staff*[a]	*Construction Workers*[a]	*Training Personnel*[b]	*Daily Solid Waste Tonnage*
Solid Waste Generation (lbs/person/day)	4.9	4.9	7.0	
Minimum Daily Waste Generation	20	50	0	
Solid Waste Generation (tons/day)	0.05	0.12	0.00	0.17
Solid Waste Diversion (tons/day)[c]	0.01	0.01	0.00	0.02
Solid Waste Disposal (tons/day)	0.04	0.11	0.00	0.15
Average Daily Waste Generation	20	50	425	
Solid Waste Generation (tons/day)	0.05	0.12	1.49	1.66
Solid Waste Diversion (tons/day)[c]	0.01	0.01	0.18	0.20
Solid Waste Disposal (tons/day)	0.04	0.11	1.31	1.46
Maximum Daily Waste Generation	20	50	1,000	
Solid Waste Generation (tons/day)	0.05	0.12	3.50	3.67
Solid Waste Diversion (tons/day)[c]	0.01	0.01	0.42	0.44
Solid Waste Disposal (tons/day)	0.04	0.11	3.08	3.23

Notes: [a] SW generation rate for permanent staff and construction workers = 4.9 pounds/person/day.
[b] SW generation rate for training personnel = 7.0 pounds/person/day.
[c] Estimated 12 percent diversion rate.

Solid waste tonnage estimates for the three population conditions, outlined above, are summarized in Table 17. Average and maximum training period estimates provide a reasonable range of solid waste generation per day during the varying training periods during the training year. The average daily generation rate can be viewed as the typical average anticipated waste loading over the entire training year, and the maximum generation rate can be viewed as the highest anticipated daily waste loading during training periods with the maximum participating headcount (1,000 persons). The maximum daily condition represents the highest impact on recycling and final disposal facilities utilized. While the average daily solid waste generation rate based on the average training day population is useful in assessing the average daily impact to the local solid waste management infrastructure, it is not used to estimate the annual loading as that is based on the maximum personnel training days for the entire year.

Table 17. Solid Waste Generation

Description	*Permanent Staff and Construction Workers*[a]	*Maximum Training Population Generation*[b]	*Estimate Annual Solid Waste Generation*
Solid Waste Generation (tons/day)[c]	0.17	3.67	
Solid Waste Diversion (tons/day)[d]	0.02	0.44	
Solid Waste Disposal (tons/day)	0.15	3.23	
Annualized MSW Generation, Diversion, and Disposal			
Solid Waste Generation (tons/year)[c]	63	500	562
Solid Waste Diversion (tons/year)[d]	8	60	67
Solid Waste Disposal (tons/year)	55	440	495

Notes: [a] SW generation rate for permanent staff and construction workers = 4.9 pounds/person/day.
[b] SW generation rate for training personnel = 7.0 pounds/person/day.
[c] Estimated 12 percent diversion rate.

Expended ammunition casing metals, aluminum, and brass are projected to be generated in the amount of 1.45 lbs/person/day during active training, and quantities are presented in Table 18 (NAVFAC Marianas 2013).

Table 18. Expended Ammunition Casing Metals

	Average Daily Waste Quantity (tons/day)	*High-Range Daily Waste Quantity (tons/day)*	*Average Annual Tonnage (tons/year)*	*High-Range Annual Tonnage (tons/year)*
Expended Aluminum & Brass Cartridges [a]	0.49	0.72	25	75

Notes: [a] Estimated aluminum and expended brass cartridges occur during training - 1.45 pounds/person/day of training.

Solid waste generation at the ranges is expected to be minimal during operation. Collection bins would be provided at appropriate locations and periodically emptied, with solid waste taken to the most convenient transfer station or recycling center for processing and transfer to the appropriate disposal or recycling facility.

All expended ammunition casings will be collected by training units and returned to be recycled off island, per USMC MCO 4400.201-V7, and not be managed at CNMI municipal recycling or disposal sites.

4.1.4 Construction Waste

During training operations, construction waste would be produced from capital improvements and regular maintenance of the facilities. Documented operational conditions at bases on Guam indicate construction and demolition waste is generated each year by regular maintenance of facilities (NAVFAC Marianas 2013) and has been found to average approximately 5.6 percent of the annual solid waste tonnage. The estimated construction and demolition waste generated through facility maintenance for Alternative 1 is calculated by applying this generation rate to the estimated annual solid waste tonnage. The results of this calculation for the Tinian facility are presented in Table 19.

Table 19. Projected Construction and Demolition Waste Generation During Training Operations

Annual Solid Waste (tons/year)	***Operational C&D Waste***	
	Annual *(tons/year)*	***Daily*** *(tons/day)*
562	31.5	0.09
C&D Tons Diverted (60%)	18.9	0.05
C&D Tons Disposed (40%)	12.6	0.03

Notes: [1] C&D waste generation as a percentage of overall annual solid waste = 5.60%, NAVVFAC Marianas 2013.

4.1.5 Green Waste

Green waste resulting from the ongoing grounds maintenance of the training facilities will be minimal. Areas cleared of vegetation during the construction will be maintained by regular mowing with the cuttings being left on the ground to decompose with no appreciable quantities of green waste generated. Through regular mowing, vegetative growth will be limited to grasses, and re-establishment of larger woody shrubs and trees will be prevented.

4.1.6 Hazardous Waste, Industrial, Universal Wastes, and E-Wastes

Hazardous, industrial, and universal wastes and e-waste may be generated during the training operations. Quantities of wastes generated cannot be estimated based on the information known at this time. The types of wastes generated during the construction phase may consist of, but not be limited to, the following:

- Used oil and grease from equipment maintenance and operation;
- Antifreeze from equipment maintenance and operation;
- Off-spec or contaminated diesel and gasoline;
- Expired, unused, or off-spec paint and paint-related materials;
- E-wastes;
- Mercury-containing equipment;
- Batteries; and
- Fluorescent light bulbs.

Operational-related hazardous wastes, universal wastes (i.e., fluorescent lamps, mercury-containing instruments, batteries), electronic waste (e.g., computer equipment, monitors, televisions, etc.), and non-hazardous industrial waste (i.e., oil, and paint, antifreeze, expired commercial chemical products, etc.) would be collected and transported off the island in accordance with applicable laws and regulations. These wastes would also be managed and stored in accordance with applicable regulations. The proposed operational activities would have no impact with respect to hazardous waste disposal on Tinian.

This page intentionally left blank.

5 SOLID AND HAZARDOUS WASTE MANAGEMENT DISPOSAL OPTIONS

This chapter discusses the three proposed solid waste disposal options and the proposed management method for non-hazardous solid waste being considered for the Proposed Action, which are summarized as follows:

1. Landfill Disposal in the future Tinian Puntan Diablo Landfill, then Future Atgidon Landfill

   The CNMI intends to permit the existing Tinian Puntan Diablo disposal facility by demonstrating compliance with the small community exemption available in Resource Conservation and Recovery Act Subtitle D regulations (40 CFR Part 258.1(f)(1)). Once permitted, the Tinian Puntan Diablo Landfill would qualify as an acceptable disposal site for the Proposed Action.

   The CNMI recognizes the permitted Tinian Puntan Diablo Landfill is not a long-term solution for ensuring ongoing local solid waste disposal. As a result, CNMI intends to proceed with permitting and constructing a replacement landfill at the Atgidon site, located north of 86th Street, between Riverside Drive and 10th Avenue. The CNMI plans to permit this new site under the small community exemption (40 CFR Part 258.1(f)(1)). CNMI anticipates permitting the Atgidon Landfill will take up to 5 years to complete, with site development commencing shortly thereafter. Once operational, the landfill at Atgidon would be an acceptable disposal site for the Proposed Action.

   At this time, CJMT has not received formal authorization to use either of the future permitted landfills on Tinian.

2. Marpi Landfill, Saipan

   In the event landfill disposal is not available on Tinian, the Marpi Landfill on Saipan could be used if approved by CNMI and would require a solid waste accumulation, storage, and transfer facility on Tinian. At this time, CJMT has not received formal authorization to use the Tinian Transfer Station.

3. Incineration

   The final option being considered for the management of CJMT solid waste is the use of an incinerator in the event a local landfill is not available, or if it is determined solid waste volumes need to be further minimized prior to being landfilled. If an incinerator is ultimately selected, it would be a decision by the DoD to manage all DoD solid waste, excluding construction and demolition and green waste, generated on Tinian. Incineration typically decreases the volume of solid waste by 80 to 90 percent.

   DoD Integrated Solid Waste Management policy establishes a hierarchy of preferred methods for solid waste management with incineration of waste preferred over land disposal because of the significant volume reduction.

The incinerator residual/ash will be accumulated in sealed storage containers and periodically transported to the Marpi Landfill, or other permitted Resource Conservation and Recovery Act Subtitle D landfill for final disposal. Based on the anticipated composition of the solid waste, the ash would be expected to be non-hazardous. Ash residue would be required to be periodically sampled and analyzed prior to disposal, and would be managed as hazardous waste in compliance with appropriate regulations if necessary.

If it is determined that use of an incinerator on Tinian is the best solution for management of residual waste, the incinerator will be one which is permitted and approved by the U.S. Environmental Protection Agency and the CNMI in accordance with applicable regulations. The incinerator unit will be tested as required to demonstrate its compliance with all operational and emissions standards.

5.1 SOLID WASTE MANAGEMENT REQUIREMENTS

This section summarizes the estimated daily solid waste management requirements for the construction period and the operational period. Solid waste management facilities supporting diversion/recycling and final disposal used for the Proposed Action must have the capacity to efficiently receive, process, and/or dispose of this range of materials on a daily basis in addition to any other quantities of waste received from other sources not associated with the Proposed Action. The following was estimated with the solid waste data analysis for the Proposed Action:

- The maximum daily solid waste generated under Alternative 1, including solid waste associated with operational training, permanent staff, and construction workers (3.67 tons/day), and the highest average daily construction and demolition waste (0.21 tons/day), is 3.89 tons/day.
- After diversion, the maximum daily solid waste disposal tonnage under Alternative 1 is projected to be 3.32 tons/day.
- Required average daily solid waste recycling for the Alternative 1 operational period to achieve 12 percent diversion is 0.44 tons.
- Required average daily construction and demolition waste recycling to achieve 60 percent diversion is 0.13 tons/day.

Recycling of construction and demolition waste primarily is conducted by the contractor and does not significantly impact local recycling facilities. Small amounts of paper/cardboard, plastics, and aluminum cans may be processed through the Tinian Transfer Station.

5.2 IMPACTS TO EXISTING AND PLANNED SOLID WASTE MANAGEMENT FACILITIES

The above-outlined disposal and diversion/recycling requirements for the construction period and operational period of the Proposed Action can be used to evaluate the impact on the existing and planned solid waste facilities and their capacity to absorb such quantities.

Table 20 presents the current daily disposal at the local landfills and the estimated past daily disposal during recent periods of higher population.

Table 20. Existing Disposal Capacity vs. Required Capacity

Landfill	Current Daily Diposal	Past Estimated Daily Disposal	Assumed Excess Daily Capacity	Project Required Daily Disposal	Capacity Excess/(Deficit)
	(tons)	(tons)	(tons)	(tons)	(tons)
Tinian	3.9	5.2	1.4	3.32	(1.96)
Marpi	87.0	95.7	8.7		5.38

5.2.1 Tinian Puntan Diablo Landfill

The Puntan Diablo Landfill operation may require additional operational assets, equipment and personnel, to supplement the existing daily operational capacity and ensure the facility is capable of efficiently managing the additional disposal tonnage from the Proposed Action. The additional disposal tonnage from the Proposed Action represents an increase of approximately 85 percent over the current average daily disposal tonnage and would be expected to result in a decrease of remaining operational life.

According to the Integrated Solid Waste Management Plan, the remaining disposal capacity at Tinian Puntan Diablo Landfill, once permitted, will be 10 years. The proposed Atgidon Landfill daily operational capacity and permitted disposal capacity should be designed in anticipation of the additional disposal needs presented in this study.

The projected maximum daily solid waste generation of 3.67 tons/day, before any reduction through recycling and diversion, when added to the current average daily disposal tonnage at the Puntan Diablo disposal facility of 3.9 tons results in a total average daily disposal tonnage of 7.57 tons. The small community exemption, under which the CNMI plans to permit the Puntan Diablo facility, limits daily average disposal tonnage to less than 20 tons. The combined Proposed Action waste tonnage and the average daily disposal tonnage at Puntan Diablo of 7.57 tons is significantly below this threshold.

5.2.2 Marpi Landfill

The Marpi Landfill operation has more than adequate daily operational capacity to absorb the additional disposal tonnage from the Proposed Action.

The remaining operational life of the landfill, as previously noted, is approximately 26 years at current disposal rates (GHD, Inc./Gershman, Brickner, & Bratton, Inc. December 2019). The additional disposal tonnage from the Proposed Action, if accepted at Marpi, represents an increase of approximately 3.8 percent and would be expected to result in a decrease of remaining operational life by approximately 1 year from approximately 26 years to 25 years.

5.2.3 Tinian Transfer Station

The Tinian Transfer Station will be impacted in different ways depending on the landfill utilized for disposal. Regardless of which landfill may be used for disposal, only acceptable recyclable materials and municipal solid waste would be processed through the Tinian Transfer Station. If

the Tinian/Atgidon Landfill option is utilized, the transfer station could receive up to 0.44 tons/day of additional recyclables generated by the Proposed Action.

If the Marpi Landfill option is utilized, the facility would be required to be re-permitted to operate as a transfer station and acquire additional equipment and waste transport containers to receive, store, and transport up to 3.32 tons/day of solid waste. The station could also receive up to 0.44 tons/day of additional recyclables.

Additionally, utilization of the Tinian Transfer Station to enable use of the Marpi Landfill for disposal needs will require logistical coordination and equipment for the following tasks associated with the transfer of filled waste containers to the landfill and return of empty containers from the landfill back to Tinian:

- Transport trucks to move filled waste containers to the port of Tinian for loading onto barges/ships outbound to Port of Saipan;
- Barge/ship service to transport the containers to Port of Saipan:
- Transport trucks to receive waste containers at the Port of Saipan and transfer them to the Marpi Landfill;
- Equipment at the landfill to unload the incoming waste containers from the transfer trucks and to load up outgoing empty containers to be returned to Tinian; and
- Trucks and equipment at the landfill to discharge waste at the active landfill face.

5.3 INCINERATION

Development and operation of a new landfill on Tinian has been proposed in the past and to date has not yet been successfully implemented. Uncertainty about adequate funding sources and the adequacy of CNMI government resources to support the planning, design, construction and operation of a new landfill continues. If landfill disposal is not available to support the Proposed Action, an on-site incinerator may be utilized as the method for solid waste disposal which will minimize the volumes of waste requiring landfill disposal. Residual ash volume will be 80 to 90 percent less than the original volume of waste, thus landfill disposal volume required will be reduced by 80 to 90 percent as well.

The incinerator would be sized to process the anticipated daily disposal tonnage (3.32 tons/day), and additional or redundant capacity may be required to accommodate all solid waste estimated to be generated (3.89 tons/day) in the event of a disruption in diversion of solid waste. This may entail the facility being designed with two incinerators to provide the desired capacity and to provide operational flexibility when lower quantities of waste are being generated. The projected daily tonnage is the same as those estimated for landfill disposal and assume 12 percent diversion/recycling of solid waste before incineration.

The quantities of solid waste will often be less than the maximum daily for which the incinerator will be sized because the maximum daily tonnage will only be generated during peak training activities. As a result, during periods of lower waste generation, the incinerator will not be operated regularly. During periods of lower waste generation, waste will be received on a daily basis and

will be stored in sealed containers (to control vectors and odors) until adequate quantity is accumulated to operate the incinerator.

The typical waste incinerator will be composed of a waste in-feed system, closed combustion chamber(s), exhaust/air pollution control system, and ash handling system. Small scale waste incinerators typically require supplemental fuel to start up and to supplement the basal thermal unit-value of the waste to maintain minimum and stable combustion temperatures.

The incinerator facility will be an enclosed or partially enclosed building to shelter the incinerator equipment from the elements. The waste-receiving portion of the building should be sized to receive and store several days of incoming waste in the event of incinerator downtime. The waste handling area will require rolling-stock equipment capable of handling the incoming waste, placing the waste into the incinerator feed system, and placing the waste into storage containers. The facility will need an all-weather access road and staging area for the waste storage containers. The building will require a concrete floor capable of supporting the incoming waste collection vehicles and the rolling-stock operational equipment; the floor should be water-tight and equipped with a sump to collect and manage liquids seeping from the waste.

An on-site incinerator will require local land use and environmental permits issued by the governing CNMI agencies. The incineration and air pollution control equipment design will be required to satisfy the applicable environmental regulations. Ash residue generated by the incinerator will be collected, stored and periodically transported to a lined Resource Conservation and Recovery Act Subtitle D landfill permitted to accept solid waste incinerator ash. If the incinerator ash tests positive for hazardous constituents, it will be managed as hazardous waste and disposed of at an U.S. Environmental Protection Agency permitted hazardous waste disposal facility.

5.4 HAZARDOUS, INDUSTRIAL, UNIVERSAL, AND ELECTRONIC WASTE

Hazardous wastes, non-hazardous industrial wastes, universal wastes (i.e., fluorescent lamps, mercury-containing instruments, batteries), and electronic waste (e.g., computer equipment, monitors, televisions, etc.) will be collected, shipped off the island, and managed in accordance with applicable regulations.

Training will be implemented to address identification of hazardous materials and measures and methods to be employed to prevent improper disposal of these materials with the non-hazardous solid waste.

This page intentionally left blank.

6 REGULATORY SETTING

Solid waste management on Tinian is governed by several federal and CNMI regulations and agencies, as described below.

6.1 COMMONWEALTH OF THE NORTHERN MARIANA ISLANDS

6.1.1 Bureau of Environmental and Coastal Quality

The Bureau of Environmental and Coastal Quality is the lead regulatory agency for solid waste management within the CNMI. Solid waste management regulations have been promulgated and are found in Title 65 Chapter 80 of the CNMI Administrative Code. In this documentation, the municipal solid waste disposal requirements, presented in Part 201, state that the following regulations apply:

- Section 65-80-201, "Municipal Solid Waste Criteria."
- Section 65-10, "Air Pollution"
- 40 CFR section 258 (1999), which is adopted by reference in its entirety and attached as Appendix I to Title 65 Chapter 80. All municipal solid waste Landfills must comply with the provisions of 40 CFR section 258 (1999).

The purpose of the regulations is to establish requirements and criteria for new and existing solid waste management activities and facilities, including municipal solid waste landfills and other landfilling operations, incineration, solid waste collection and transfer, recycling, composting, and salvage. The Solid Waste Management Regulations further require a municipal solid waste landfill to comply with Part 258 ("Criteria for Municipal Solid Waste Landfills") of Title 40 CFR, which the Solid Waste Management Regulations (Northern Mariana Islands Administrative Code 2004) have adopted and incorporated by reference.

6.1.2 Coastal Resources Management

The Bureau of Environmental and Coastal Quality promotes the conservation and wise development of coastal resources. One of the Bureau of Environmental and Coastal Quality functions is to coordinate the site selection permit process, thereby ensuring that permit decisions are consistent with Coastal Resource Management regulations.

A site selection permit process occurs when any proposed project has the potential to affect coastal resources directly and significantly. In accordance with CNMI Administrative Code Title 15, Chapter 10, "Coastal Resources Management Rules and Regulations," the selection of a municipal solid waste landfill site would fall within the purview of this regulation.

An Area of Particular Concern is a geographically delineated area with special management requirements enforced by the Coastal Resource Management Office. There are five areas of particular concern:

- *Shoreline:* The area between the mean high-water mark and 150 feet [46 meters] inland.
- *Lagoon and reef:* The 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 coastal flood hazard zones.

When siting any on-island municipal solid waste facilities, the Municipality of Tinian must avoid areas of particular concern or, if these areas are unavoidable, must ensure that proposed facilities situated within an Area of Particular Concern would comply with the requirements of the Coastal Resource Management coastal permit.

6.1.3 Division of Fish and Wildlife

The CNMI Division of Fish and Wildlife is one of several agencies within the CNMI Department of Land and Natural Resources tasked with ensuring the long-term survival and sustainability of the CNMI's natural resources. Department of Fish and Wildlife reviews development proposals submitted to the Bureau of Environmental and Coastal Quality (e.g., applications for major site location permits and associated environmental assessments) to ensure that the proposed developments would minimize, mitigate, or avoid negative impacts on endangered or threatened species. Additionally, Department of Fish and Wildlife consults with the U.S. Fish and Wildlife Service pursuant to the federal Endangered Species Act (16 U.S. Code [U.S.C.] section 1536) as warranted.

6.1.4 Historic Preservation Office

The CNMI Historic Preservation Office was established by the Commonwealth Historic Preservation Act of 1982 (Northern Mariana Islands Administrative Code 1982) to identify and protect significant archaeological, historic, and cultural resources in the CNMI. Under Public Law 3-39, the Historic Preservation Office is mandated to review proposed developments pursuant to Section 106 of the National Historic Preservation Act of 1982 (Northern Mariana Islands Administrative Code 1982). A Section 106 review must be performed for projects that involve a direct, indirect, or an adverse impact on a property that is included or eligible for inclusion in the National Register of Historic Places. The proponent of a Proposed Action is responsible for initiating and ensuring completion of the Section 106 review. The Historic Preservation Office assists the Coastal Resource Management Office in evaluating applications for major site location permits as well as environmental assessments.

The Historic Preservation Office's input is intended to ensure either that significant prehistoric, historic, and cultural resources at or near a proposed municipal solid waste landfill would be protected from damage, or that sufficient site data would be compiled before such resources are altered or destroyed. The proponent of a Proposed Action may also be required to complete an Application for Historic Preservation Review to include construction plans and location maps.

6.2 UNITED STATES GOVERNMENT

6.2.1 United States Environmental Protection Agency

Subtitle D of the Resource Conservation and Recovery Act, incorporated into the CNMI Solid Waste Management Regulations by reference, uses a combination of design and performance standards for regulating municipal solid waste landfills 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 United States Environmental Protection Agency.

Owners/operators that dispose of less than 20 tons/day based on an annual average, are exempt from subparts D and E of 40 CFR 258, so long as the requirements of 40 CFR 258.1(f) are met. Subpart D -provides liner design criteria where the requirement for a composite liner and leachate collection/removal system is found and Subpart E - provides groundwater monitoring and corrective action requirements. The exemption provided by 40 CFR 258.1(f) is available under the following conditions:

- There is no evidence of groundwater contamination from the landfill, and either of the following is satisfied:

  2.a. The community served by the landfill experiences annual interruptions of at least 3 consecutive months of surface transportation that prevent access to a regional waste management facility or

  2.b. The community has no practical waste management alternative, and the landfill unit is located in an area that annually receives less than or equal to 25 inches of precipitation.

Other Resource Conservation and Recovery Actregulations that apply for management of potential waste streams are as follows:

- Hazardous wastes must be managed per Resource Conservation and Recovery Actregulations are contained in title 40 of the C.F.R. parts 260 through 273.
- Standards for the management of used oil are contained in 40 C.F.R. 279.
- Guidelines for the thermal processing of solid wastes in 40 C.F.R. 240 will be applicable if waste is incinerated.

The management of solid waste through an incinerator will be subject to air pollution emission limitations, air pollution control equipment, and operating permits as required by the Clean Air Act as implemented through 40 C.F.R. Subchapter C.

6.2.2 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. This law prohibits construction or establishment of a new municipal solid waste landfill within 6 miles (9.7 kilometers) of certain public-use airports, as measured between the property lines of the airport and the landfill. Federal Aviation

Administration Advisory Circular AC No.: 150/5200-34A provides compliance guidance with this law.

In its National Plan of Integrated Airport Systems (2001–2005) (Department of Transportation 2002), the Federal Aviation Administration lists Francisco Manglona Borja / 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, 49 U.S.C. Section 44718).

Advisory Circular AC No.: 150/5200-34A, Section 7 provides the following statement in regard to landfills that would be located within 6 miles of an airport:

> "If it is determined that a new municipal solid waste landfill would be located within six miles of such a public airport, then either the municipal solid waste landfill should be planned for an alternate location more than 6 miles from the airport, or the municipal solid waste landfill proponent should request the appropriate state aviation agency to file a petition for an exemption from the statutory restriction. Presumably, the CNMI aviation agency would be responsible and assist in the preparation and submittal of the required exemption request."

7 REFERENCES

CNMI. 2023. *DRAFT Comprehensive Integrated Solid Waste Management Plan for the Commonwealth of the Northern Mariana Islands.*

Department of Environmental quality . 2010. *Cease and Desist/Administrative Order.* Prohibition of Burning of Wastes and Requirement to Maintain Landfill Cover at the Tinian Dump. CASE NO. DEQ SWM 2010-01.

DoN. 2018. *Solid Waste Study Update V2a1 Final in Support of the Commonwealth of the Northern Mariana Islands Joint Military Training Environmental Impact Statement/Overseas Environmental Impact Statement.* JBPHH, HI: Prepared for NAVFAC Pacific. April.

GHD, Inc./Gershman, Brickner, & Bratton, Inc. December 2019. *CNMI Department of Public Works Solid Waste Management Feasibility Study.*

NMIAC. 1982. *Commonwealth Historic Preservation Act of 1982.* Public Law 3-39. December.

Office of the Assistant Secretary of Defense, 2020. *Memorandum for Deputy Assistant Secretary of the Army (Energy and Sustainability) Deputy Assistant Secretary of the Navy (Installations and Facilities) Deputy assistant Secretary of the Air Force (Environment, Safety and Infrastructure) Staff Director, Defense Logistics Agency (Environmental Management). Subject: Revision to the Department of Defense Integrated Sollid Waste Management Metrics.* March 16, 2020.

U.S. Army. 2014. Email from Ms. Lisa Duwall, Pohakuloa Training Area (PTA) Solid Waste Contract Program Evaluator, Solid Waste Generation Rate at PTA. 22 May 2014.

U.S. Congress. 2000. *Wendell H. Ford Aviation Investment and Reform Act for the 21st Century.* 49 U.S.C. Section 44718.

USEPA 2003. *Estimating Building-Related Construction and Demolition Material Amounts.*

USEPA 2018. *Construction and Demolition Generation in the United States.*

USEPA 2020. *Advancing Sustainable Materials Management: 2018 Fact Sheet.*

This page is intentionally left blank