CHAPTER 4. WATER RESOURCES

4.1 AFFECTED ENVIRONMENT

4.1.1 Definition of Resource

Water resources as defined in this Environmental Impact Statement (EIS) are sources of water available for use by humans, flora, or fauna, including surface water, groundwater, nearshore waters, and wetlands. Surface water resources, including but not limited to stormwater, lakes, streams, and rivers, are important for economic, ecological, recreational, and human health reasons. Groundwater may be used for potable water, agricultural irrigation, and industrial applications. Groundwater is classified as any source of water beneath the ground surface, and is the primary source of potable water used to support human consumption. Nearshore waters are defined as waters extending from the shoreline to the offshore zone, usually waters up to 33 feet (ft) (10 meter [m]) deep. Nearshore waters can be directly affected by human activity, and are important for human recreation and subsistence. Wetlands are habitats that are subject to permanent or periodic inundation or prolonged soil saturation, and include marshes, swamps, and similar areas. Areas described and mapped as wetland communities may also contain small streams or shallow ponds, or pond or lake edges. Surface water, groundwater, nearshore waters, and wetlands on the island of Tinian in the Commonwealth of the Northern Mariana Islands (CNMI) are discussed below.

4.1.2 Tinian

4.1.2.1 Surface Water/Stormwater

Surface Water Availability

Rainfall for Tinian averages 82 inches (in) (208 centimeters [cm]) per year, runoff averages 6 in (15 cm) per year, groundwater recharge averages 30 in (76 cm) per year, and the balance (46 in [117 cm]) is evapotranspired. Thus, most of the precipitation on Tinian either evaporates or percolates into the limestone substrata (Gingerich 2002).

Figure 4.1-1 depicts the surface water features on Tinian. Lake Hagoi is 36.3 acres (ac) (14.7 hectares [ha]) of open water/wetland area located in the northern end of the island. Other than Lake Hagoi, there are no perennial or intermittent streams or lakes on Tinian. Most precipitation either evaporates or percolates into the highly permeable limestone substrata. During periods of intense rainfall, runoff approximates 6-12% of total rainfall and flows toward the low-lying coastal areas (Gingerich 2002).

Surface Water Quality

Overall surface water quality data are limited on Tinian. In general terms, stormwater runoff is a factor in the disposal of sewage overflows, animal wastes, and sediment into streams during periods of heavy rainfall.

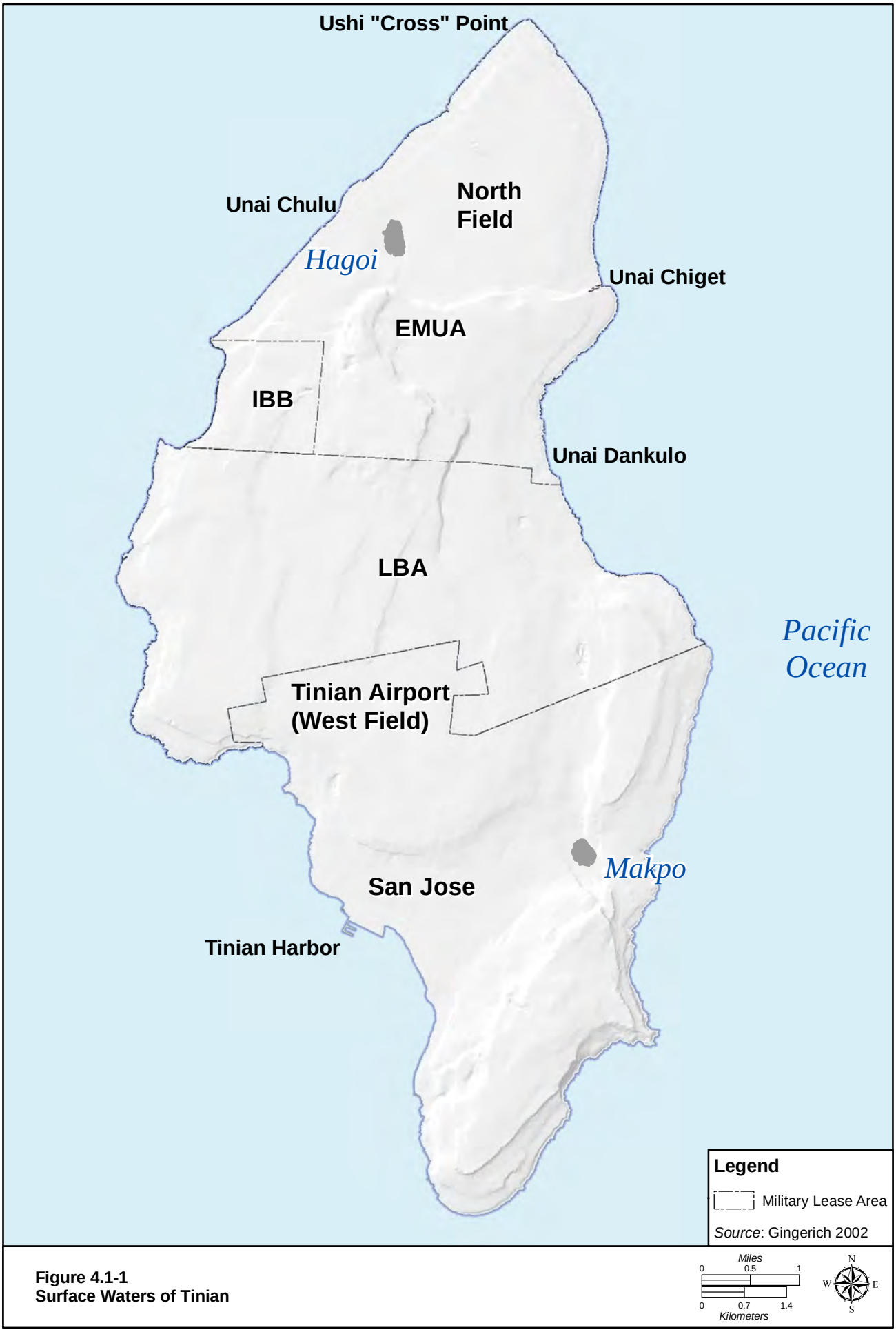

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Figure 4.1-1
Surface Waters of Tinian

Federal Regulations

The Clean Water Act (CWA) of 1972 is the primary federal law that protects the nation's waters, including lakes, rivers, and coastal areas. The primary objective of the CWA is to restore and maintain the integrity of the nation's waters. The United States (U.S.) Environmental Protection Agency (USEPA) Region 9 regulates discharges to surface waters through the issuance of National Pollutant Discharge Elimination System (NPDES) permits that are based on applicable federal standards and policies.

Governing procedures for the use of training areas, ranges, and airspace operated and controlled by the Commander U.S. Naval Forces, Marianas is included in Commander Navy Region (COMNAV) Marianas Instruction 3500.4 (COMNAV Marianas 2000). This guidance identifies specific land use constraints to enable protection of environmental resources during military training.

Local Regulations

The CNMI Division of Environmental Quality (DEQ) is the administrative authority for CWA Section 401 Water Quality Certifications required for validation of CWA Section 402 NPDES permits.

CNMI DEQ Earthmoving and Erosion Control Regulation requires permits for all mechanized earth moving activities as part of their non-point source pollution program.

The CNMI DEQ provides the following classifications to surface waters of Tinian (Bearden et al. 2004):

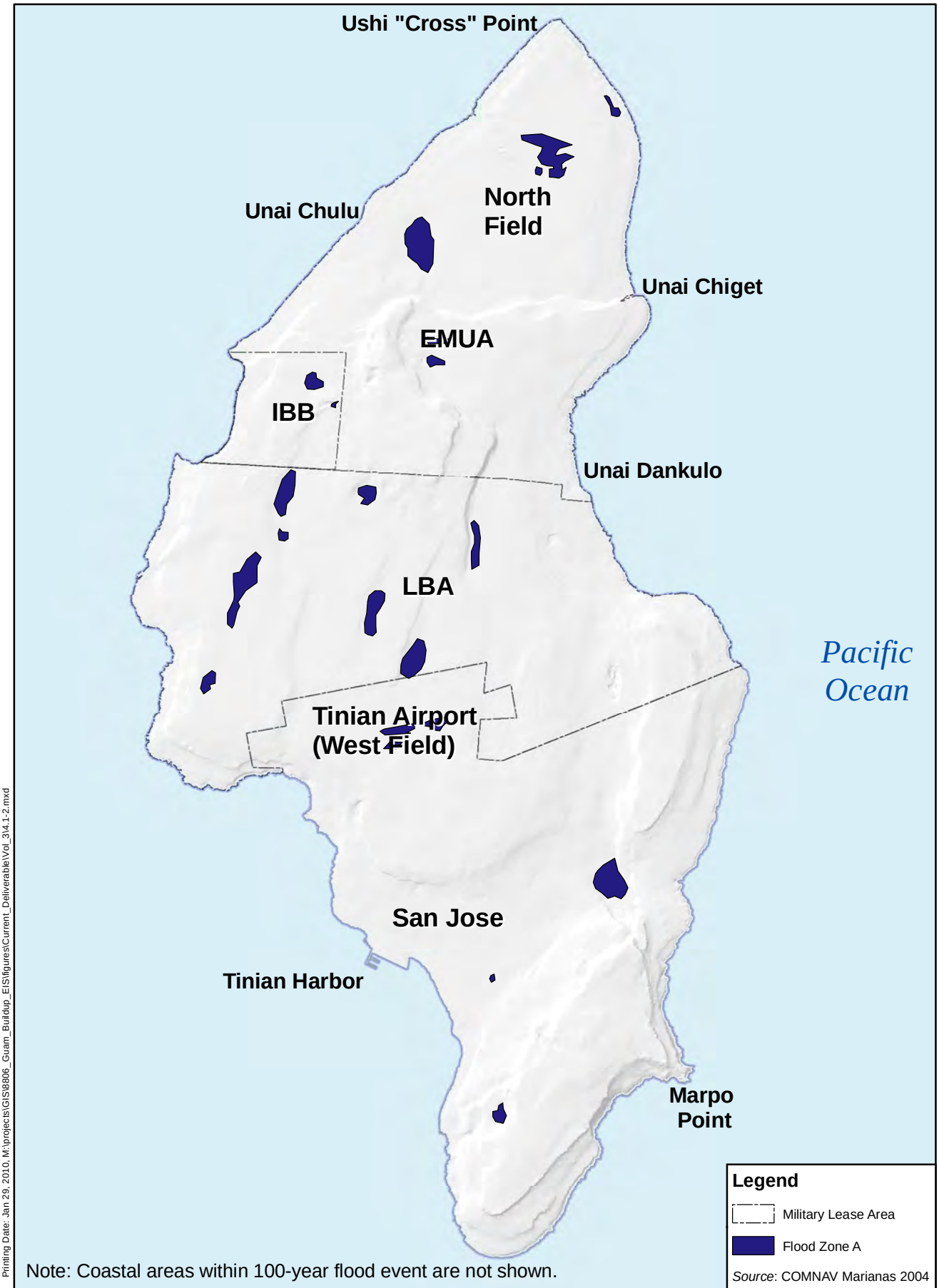
(a) Class 1 - It is the objective of this class that these waters remain in their natural state as nearly as possible with an absolute minimum of pollution from any human-caused source. To the extent possible, the wilderness character of such areas shall be protected. Wastewater discharges and zone of mixing into these waters are prohibited.

    The uses to be protected in this class of water are for domestic water supplies, food processing, the support and propagation of aquatic life, groundwater recharge, compatible recreation and aesthetic enjoyment including water contact recreation with risk of water ingestion by either children or adults.

(b) Class 2 - It is the objective of this class that use of these waters for recreational purposes, propagation of fish and other aquatic life, and agricultural and industrial water supply not be limited in any way. The uses protected in this class of waters are all compatible with the protection and propagation of fish and other aquatic life, groundwater recharge, and recreation. Compatible recreation shall include limited body contact activities. Such waters shall not act as receiving waters for any discharge that has not received the best degree of treatment or control practical under technological and economic conditions and compatible with the standards established for this class. A zone of mixing is permissible in these waters.

Flood Zones

Floodplains are low-lying areas subject to flooding. Nineteen isolated areas are designated as Flood Zone A that are areas likely to be inundated in a 100-year flood event. These zones are located in unpopulated areas including Hagoi, portions of North Field, Tinian International Airport, and Makpo (COMNAV Marianas 2004) (Figure 4.1-2).



Note: Coastal areas within 100-year flood event are not shown.

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Figure 4.1-2
Flood Zone Map of Tinian

4.1.2.2 Groundwater

Groundwater Availability

Tinian's groundwater supply is a lens of fresh water floating on saltwater that forms as a result of percolation of precipitation through the rock formations. On Tinian, the surface of the basal fresh water lens, which is not underlain by volcanic material, ranges from about 0.8 to 1.6 ft (0.24 to 0.39 m) above mean sea level. As measured in 1997, the vertical distance to the mid-point of the fresh-water/saltwater transition zone is approximately 60 ft (18 m) at well TH4X, located adjacent to production well TH04 (Figure 4.1-3). The water table elevation at the well was about 0.8 ft (0.24 m) (Gingerich 2002).

The primary aquifer on Tinian is in the coralliferous Mariana limestone. This rock formation is very permeable and covers over 80% of the land. In the central plateau of the island, this limestone extends down approximately 200 ft (61 m) below sea level, deeper than the bottom of the freshwater lens. The thickness of the Mariana Limestone increases toward the coast, but is thinnest or not present in small areas of the north-central and south-central parts of the island (Gingerich 2002).

The Natural Resources Conservation Service has mapped the known and probable extent of the freshwater lens from well development data (U.S. Department of Agriculture [USDA] Soil Conservation Service [SCS] 1994). The area of known freshwater lens includes most of the Central Plateau, inland portions of the Median Valley, and the Northern Lowland. The SCS also mapped "watersheds" for Tinian. However these designations were primarily for dividing the island into natural resource study areas and do have a sound hydrogeological basis for groundwater resource planning. Figure 4.1-3 shows these watersheds and the generalized groundwater flow direction based on modeling done by the USGS (Gingerich, 2002). Groundwater flow on Tinian is controlled primarily by:

- The position on the island relative to the coast (i.e. groundwater will flow from the center of the island to coastal discharge zones); and
- The intrusion of the low permeability volcanic into the freshwater lens causing the water to flow away from or around these areas.

The main source of drinking water on Tinian is the freshwater lens aquifer in the high-permeability limestone overlying low-permeability volcanic rock (Gingerich 2002). USEPA Region 9 has not identified a sole source aquifer on Tinian. Historically, approximately 40 wells were drilled at an average depth of 229.7 ft (70 m); however, most of these have been abandoned. Currently, there are nine production wells on Tinian. The municipal and agricultural wells are located in or near the Makpo wetland area, and the potable water is stored in tanks at Makpo Heights and Carolinas Heights (Navy 2009). Figure 4.1-3 shows the location of the production wells and the abandoned wells. It is not known at this time whether or not the abandoned wells have been properly destroyed in accordance with CNMI Well Drilling and Well Operation Regulations (CNMI DEQ 2005). The name and location of the abandoned wells was taken from a map provided by the CNMI Combined Utilities Commission (CUC) (CNMI CUC 2009). The source of the map could not be verified and further information requests have not been answered.

Per the CNMI *Wastewater Treatment and Disposal Rules and Regulations*, a Class I Aquifer Recharge Area is defined as an "area contributing surface infiltration to a geologic formation, or part of a formation, that is water bearing and which currently transmits, or is believed capable of transmitting water to supply pumping wells or springs." It is inferred from mapping of the freshwater lens that most of the proposed project area lies within a Class I Aquifer Recharge Area. Coastal areas are likely underlain by brackish channeled groundwater (U.S. Department of the Interior [USDOI] 2008).

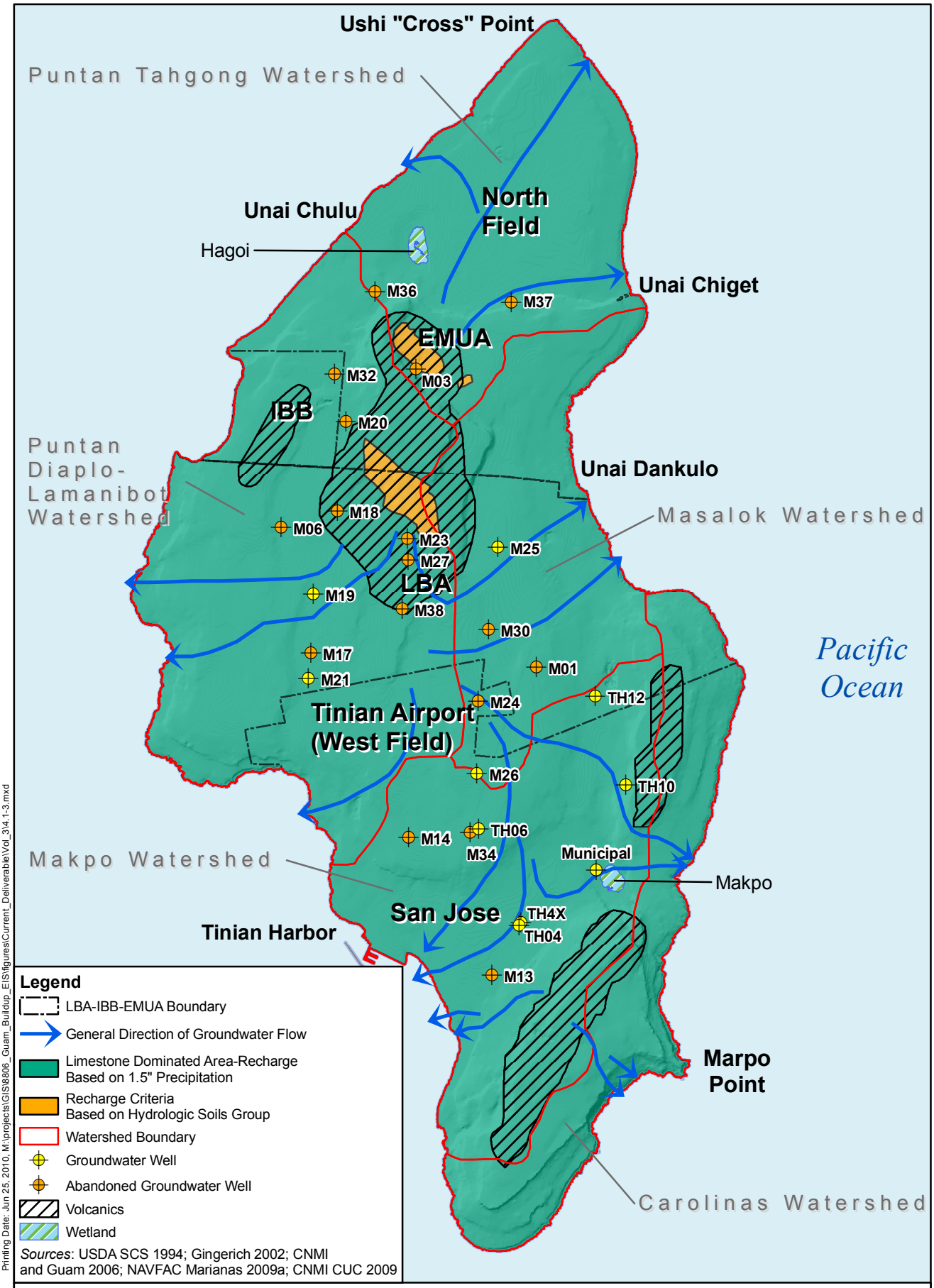

Figure 4.1-3
Groundwater Resources

Groundwater Quality

The potential for high chloride levels resulting from saltwater intrusion into the freshwater lens due to excessive pumping of the freshwater aquifer is of concern on Tinian. While it is not currently a problem, it may be in the future if groundwater pumping rates exceed the sustainable yield of the aquifer. The two "Maui Type" municipal wells draw water from an aquifer located beneath the Makpo Wetland. This groundwater is considered to be under the direct influence of surface water and thus it must meet the same drinking water treatment technologies standards as surface water (Bearden et al. 2004, 2008).

Groundwater aquifers on Tinian are also vulnerable to contamination by substances introduced onto the soil surface because the thin soils and underlying permeable limestone does not significantly impede the passage of contaminants to the shallow aquifer.

Federal Regulations

Safe Drinking Water Act

The Safe Drinking Water Act regulates the nation's drinking water supplies by establishing standards for drinking water to protect against both naturally–occurring and man-made contaminants. This act also seeks to prevent contamination of drinking water resources by establishing requirements under programs such as the underground injection control program. This relates directly to groundwater resources on Tinian since this resource provides a majority of the drinking water.

Groundwater Rule

The Groundwater Rule (40 Code of Federal Regulations [CFR] Parts 9, 141 and 142) provides for increased protection against microbial contamination. This is a risk based rule that mandates groundwater in the public drinking water system be disinfected if indicator bacteria are detected in this water.

Technical Standards and Corrective Action Requirements for Owners and Operator of Underground Storage Tanks

This regulation (40 CFR Chapter 1, Part 280) protects groundwater by establishing regulations and procedures for underground storage tanks that contain regulated substances such as petroleum products. Owners and operators are required to take specific action when investigating releases from their tanks.

Local Regulations

CNMI Drinking Water Regulations

The Drinking Water Regulations establish standards for drinking water to protect against both naturally–occurring and man-made contaminants. These regulations sets forth testing requirements and standards required to ensure groundwater does not pose a risk to human health. This relates directly to groundwater resources on Tinian since this resource provides a majority of the drinking water.

CNMI Well Drilling and Well Operation Regulations

The CNMI Well Drilling and Well Operation Regulations establish well-related regulations to ensure the long-term availability of reliable and potable groundwater to the public.

CNMI Water Quality Standards

The CNMI Water Quality Standards establish standards for all of CNMI's waters, including groundwater. These standards promulgate procedures to follow when disposing of wastewater over groundwater recharges zones. Primary recharge zones are areas that contribute recharge to groundwater capable of

supplying water to public water supply; are areas with an active or future public water supply well field; discharge water to a stream or spring in sufficient quantity to support a public water supply, or are 400 ft (122 m) up gradient or 200 ft (61 m) down gradient from a public supply well. A secondary recharge zone overlies groundwater with a total dissolved solids concentration less than 500 parts per million that is currently capable of transmitting quantities of water sufficient to support a public water supply well.

Underground and Aboveground Storage Tank Regulations

This regulation (Northern Mariana Islands Administrative Code Chapter 65-100) protects groundwater by establishing a system of control and enforcement over the permitting installation, compliance use, and monitoring for underground and aboveground storage tanks that contain regulated substances such as petroleum products. Owners and operators are required to take specific action when investigating releases for their tanks.

Wastewater Treatment and Disposal Rules and Regulations

This regulation (Northern Mariana Islands Administrative Code Chapter 65-120) protects groundwater by establishing regulations and procedures for treatment and disposal of wastewater, in particular, wastewater that is discharged from individual wastewater systems.

4.1.2.3 Nearshore Waters

Definition

Nearshore waters of Tinian are defined as those areas under the jurisdiction of the CNMI Coastal Resources Management Program. This includes all areas extending seaward to the extent of the territorial waters (§ 1513 of the CNMI Coastal Resources Management Act).

Oceanography

Tinian is one of the 15 islands of the Mariana Archipelago. The Philippine Sea borders its western shores and the Pacific Ocean the east. The island is located on the frontal, southern arc and is capped or surrounded by limestone terraces. The majority of shoreline consists of low to high limestone cliffs with sea-level caverns, cuts, notches and or slumped boulders, commonly bordered by intertidal benches (Kolinski 2001).

The north, east, and south coasts of Tinian have very limited fringing or apron reef development that is most conspicuous at Unai Dankulo. Submarine topography appears mainly characterized by limestone pavement with interspersed coral colonies and occasional zones of submerged boulders. Coral reef development is more prevalent at various west coast locations, with fringing coral reef habitats present inside Lamanibot and Peipeinigul Bays, and a patch and small barrier reef system (altered as a breakwater for the harbor) located within the Tinian Harbor area (Kolinski 2001).

The water column of the Mariana Islands contains a well-mixed surface layer ranging from approximately 300 to 410 ft (90 to 125 m). Immediately below the mixed layer is a rapid decline in temperature to the cold deeper waters.

Nearshore Water Quality

The CNMI has two classifications (AA and A) for marine water use. The majority of the coastal marine waters are Class AA, meaning that these waters should remain in their natural pristine state as nearly as possible with an absolute minimum of pollution or alteration of water quality from any human-related source or actions. The uses protected in these waters are the support and propagation of marine life, conservation of coral reefs and wilderness areas, oceanographic research, and aesthetic enjoyment and

compatible recreation inclusive of whole body contact (e.g. swimming and snorkeling) and related activities. Class A waters are protected for their recreational use and aesthetic enjoyment; other uses are allowed as long as they are compatible with the protection and propagation of fish, shellfish, and wildlife, and recreation in and on these waters of a limited body contact nature (Bearden et. al. 2004).

All the nearshore waters surrounding Tinian are designated Class AA, except for the nearshore waters of San Jose Harbor that are designated Class A. Sewage outfalls, sewer collection overflows, sedimentation from unpaved roads and development, urban runoff, reverse osmosis discharges, and nutrients from golf courses and agriculture are the most significant stressors on the CNMI's marine water quality (Bearden et. al. 2004).

Only one nearshore area on Tinian, Unai Chulu, did not support its designated use classification due to exceedances in enterococci bacteria violations. This beach is classified as being only partially supportive of its designated uses (Bearden et. al. 2004). Orthophosphate levels exceeded the water quality standards at all tested water bodies on Tinian (Bearden et. al. 2004).

Federal Regulations

CWA or Federal Water Pollution Control Act

The purpose of the CWA is to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters." Under Section 404 of the CWA the U.S. Army Corps of Engineers (USACE) has regulatory jurisdictions over the discharge of dredged or fill material into waters of the U.S., including wetlands.

Coastal Zone Management Act and Amendments

The Coastal Zone Management Act establishes a federal-state partnership to provide for the comprehensive management of coastal resources. Coastal states and territories develop management programs based on enforceable policies and mechanisms to balance resource protection and coastal development needs.

Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act ensures that water resources development programs must consider wildlife conservation. Under this act, federal agencies proposing actions, including issuance of permits, that would affect any body of water, must consult with the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, and the affected state or territory's fish and wildlife management agency.

Merchant Marine Act

This law empowers the Maritime Administration to investigate causes of congestion at ports; to investigate the practicability and advantage of harbor, river, and port improvements in connection with foreign and coastwise trade; and to investigate any other matter that may tend to promote use by vessels of ports.

Rivers and Harbors Act

The original purpose of the Rivers and Harbor Act (RHA) was to establish the federal interest in interstate navigation. Section 10 of the RHA requires approval from the USACE prior to undertaking any work with the potential to affect the course, capacity, use, or quality of navigable waters.

Water Resources Development Act

Dredging projects are authorized by Congress through the Water Resources Development Act that is reauthorized biennially. Water Resources Development Act 86 introduced cost sharing for construction projects whereby the local sponsor pays between 20 and 60% of the construction cost based on the depth of the navigation channel. The Water Resources Development Act cost sharing provisions apply to federal dredging projects implemented by the USACE Civil Works Program, and are not applicable to dredging undertaken by other agencies.

Local Regulations

The CNMI DEQ is the administrative authority for CWA Section 401 Water Quality Certifications required for validation of CWA Section 404, Rivers and Harbors Act (RHA) Section 10. CNMI coastal waters are divided into Class A and Class AA waters by CNMI DEQ. Water quality criteria specific to Class AA and Class A waters are presented in Table 4.1-1 (USDOI 2008). Class A waters are designated for recreational purposes and aesthetic enjoyment and are to be protected. Any use shall be allowed as long as it is compatible with the protection and propagation of fish, shellfish, and wildlife. Class A waters shall be kept clean of solid waste, oil and grease, and shall not act as receiving waters for any effluent that has not received the best degree of treatment or control practicable under existing technology and economic conditions and compatible with standards established for this class. A mixing zone is approvable in Class A waters (Bearden et. al. 2004).

Table 4.1-1. Specific Water Quality Criteria for Class AA and Class A

Parameter	*Unit*	*Class AA*	*Class A*
Total Nitrogen	mg/L	0.4	0.75
Nitrate-Nitrogen	mg/L	0.20	0.50
Ammonia (un-ionized)	mg/L	0.02	0.02
Total Phosphorous	mg/L	0.025	0.05
Orthophosphate	mg/L	0.025	0.05
Fecal Coliform	CFU per 100 ml	200[a]	200[a]
Enterococci	Per 100 ml	35[b]	35[c]
Dissolved Oxygen	% saturation	≥ 75%	≥ 75%
TSS	mg/L	5[d]	40[d]
Turbidity[a]	NTU	0.5	1.0
Temperature[e]	°C	1.0	1.0
pH	-	7.6 – 8.6	7.6 – 8.6

Legend: °C= degrees Celsius; ml= million liters; CFU= Colony Forming Units; NTU =nephelometric turbidity units

Notes: [a] Fecal coliform concentration shall not exceed a geometric mean of 200 CFU per 100 ml based on samples taken over a 30-day period nor shall any single sample exceed 400 CFU per 100 ml at any time.

[b] Enterococci concentration shall not exceed a geometric mean of 35 per 100 ml based on samples taken over a 30-day period nor shall any single sample exceed 104 per 100 ml at any time.

[c] Enterococci concentration shall not exceed a geometric mean of 35 per 100 ml based on samples taken over a 30-day period nor shall any single sample exceed 276 per 100 ml at any time.

[d] Concentrations of suspended matter shall not be increased from ambient conditions at any time, and should not exceed the criteria when due to natural conditions.

[e] Shall not exceed ambient more than stated value.

Source: Bearden et. al. 2004.

Class AA waters should remain in their natural pristine state as nearly as possible with an absolute minimum of pollution or alteration of water quality from any human-related source or actions. To the extent practicable, the wilderness character of such areas must be protected as well as for the support and propagation of shellfish and other marine life, conservation of coral reefs and wilderness areas, oceanographic research, and aesthetic enjoyment and compatible recreation with risk of water ingestion

by people. Mixing zones for dredging and the discharge of dredged or fill material may be permitted in Class AA waters; mixing zones for any other discharge are not permitted.

4.1.2.4 Wetlands

Definition

Wetlands are habitats that are subject to permanent or periodic inundation or prolonged soil saturation including marshes, swamps, and similar areas. The recurrent excess of water in wetlands imposes controlling influences on all biota (plants, animals, and microbes). Areas described and mapped as wetland communities may also contain small streams or shallow ponds or pond or lake edges.

Marshes are generally located in low places along the coast, along streams, in depressions and sinkholes with argillaceous (of or resembling clay) limestone, or in poorly drained areas with volcanic soils. Marshes may be inundated with freshwater or brackish water if near the ocean. Swamps are generally located along rivers, especially near the coast or near sea level along river valleys if inland, and are usually designated as ravine communities rather than as wetland communities.

Wetlands are considered waters of the U.S. under the CWA. Impacts to jurisdictional wetlands as well as waters of the U.S. require permitting from the USACE; the USACE issues permits for the discharge of dredged or fill material to jurisdictional wetlands or waters of the U.S. under Section 404 of the CWA.

Wetland Areas and Quality

The limestone plateaus of Tinian are generally far too porous to support stream or wetland development. Thus, the few wetlands on Tinian constitute discrete areas where impermeable materials such as clay impounds rainwater and are entirely dependent on direct precipitation as a water source. No mangrove or coastal wetlands are found on Tinian as the entire shoreline is either limestone cliffs and blocks or sand beach. The two largest wetland areas, Hagoi and Makpo, are located in the Northern Lowland and Median Valley, respectively (NAVFAC Marianas 2009a). These are the only two wetland areas identified in a wetland assessment completed in 1977 (University of Guam 1977).

Hagoi (which means “lake” in Chamorro) is a 38.5 ac (15.5 ha) marsh wetland with areas of open water located within the Exclusive Military Use Area approximately 2.5 mi (4 km) north of the project area. It is classified as palustrine, emergent herbaceous wetland, water persistent but intermittently exposed and brackish or mixohaline. Hagoi is situated either on an impervious layer or over a perched water table. As the basin fills in with sediment, the open water of the lake is slowly transforming to a marsh with a more or less complete covering of emergent vegetation (NAVFAC Marianas 2009a). Hagoi is dependent entirely on direct precipitation as a water sources; in periods of drought the water level drops and the coverage of open water dramatically decreases (NAVFAC Pacific 2004). The Makpo wetland area is an approximately 28 ac (11.33 ha) wetland located east of the village of San Jose, approximately 3.0 mi (4.9 km) south southeast of the project area (NAVFAC Marianas 2007a). The Makpo wetland area once supported open water, but municipal groundwater pumping significantly altered the water levels (NAVFAC Marianas 2004). As shown on Figure 4.1-4, both of these wetland areas are located well north and south of the project area, respectively.

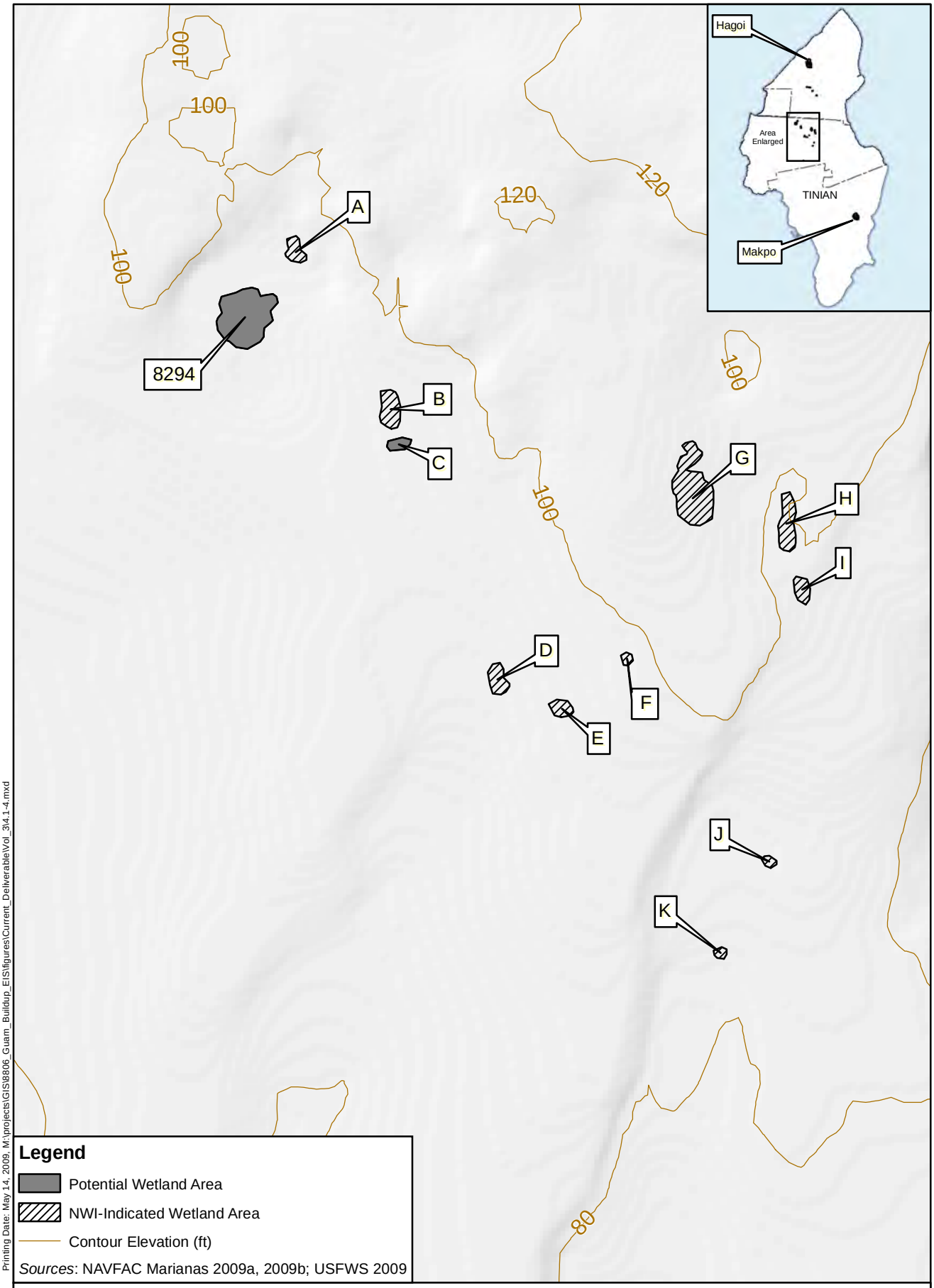

Figure 4.1-4
Potential Wetland and NWI-Indicated Wetland Areas

In 2007, a wetland survey evaluated several of the 12 National Wetland Inventory (NWI)-indicated wetland areas in and around the project area using satellite data verified by field inspections (refer to Figure 4.1-4). These 12 NWI-indicated wetland areas are traditionally and collectively referred to as the "Bateha Area" (NAVFAC Marianas 2009a). The "Bateha Wetlands" are been historically described as broad depressions or "moats" that have evolved as eroded clay and silt from the upland volcanic rock have filled depressions in limestone bedrock (NAVFAC Marianas 1997). These areas are considered ephemeral because they are not large enough to sustain periods of low rainfall (NAVFAC Marianas 2004); the 1997 INRMP classified these areas as palustrine system (temporarily flooded), emergent wetland class, and non-persistent (NAVFAC Marianas 1997).

The majority of the NWI-indicated wetland areas are located in an area formerly used for farming (and with some evidence of either continuing or recently abandoned occupation). There is no or minimal evidence of distinguishable hydrology; that is, while the areas may be distinguishable from surrounding area by vegetation, they appear not to represent depressions that would accumulate runoff, even temporarily.

To verify the NWI-indicated wetland areas and findings of the 2007 survey (NAVFAC Marianas 2009a), and previous studies, a biologist conducted a field investigation of several of these areas in September 2009 (NAVFAC Marianas 2009b). Table 4.1-2 summarizes the NWI-indicated wetland areas in and near the project area based on available data (NAVFAC 2009a, b; USFWS 2009). The following paragraphs described the areas and their potential wetland status.

Table 4.1-2. NWI-Indicated Wetland Areas in the Tinian Project Area

Area	*Size (ac/ha)*
8294	3.5/1.41[a]
A	0.5/0.20
B	0.9/0.36
C	0.3/0.12[a]
D	0.6/0.24
E	0.4/0.16
F	0.1/0.04
G	3.0/1.21
H	1.1/0.44
I	0.5/0.20
J	0.2/0.08
K	0.2/0.08

Legend: [a] = potential jurisdictional wetland.
Sources: NAVFAC Marianas 2009a, 2009b; USFWS 2009.

Water accumulates at Area 8294, although not for very long periods; outflow is via seepage into the ground. Wetland indicators (soil and vegetation) are weak, but perhaps sufficient to claim wetland status as the flooding appears to control the vegetation (NAVFAC Marianas 2009a). Area A was not investigated in September 2009 (NAVFAC Marianas 2009b).While Area 8294 has not been evaluated by the USACE for jurisdictional status, for the purposes of this analysis, it is considered to be a potential jurisdictional wetland, and is treated as such in the following impact analysis.

Areas B and D - G were field investigated by a biologist in September 2009 shortly after a major rain event (NAVFAC Marianas 2009b). Areas D, E and F were old farm fields and had no hydrology, plants, or hydric soils. Areas B, G, and H had identical conditions as D, E, and F and were also most likely farmed in the past. Areas A, I, J, and K were not investigated in September 2009; however, based on their

location and the findings of the field evaluation for adjacent areas, these NWI-indicated wetland areas are likely not wetlands. The underlying factor appears to be that none of these NWI-indicated areas (Areas A-B and D-K) are sufficiently permanent, primarily due to the underlying porous limestone geology of Tinian.

Area C was also investigated by the same biologist in September 2009 (NAVFAC Marianas 2009b). Area C is a large sink-hole type area. The land in the area slopes gently towards it from all directions and the last few meters are steep, descending into the pan. At the time of the investigation, it had a few inches of water in the pan. No hydric soils were observed; however, if one were to dig in the center of the area, where the water is deepest, it is likely one would find hydric soils at depth. There were no facultative obligate wetland plant species, possibly because the area is totally surrounded by bamboo, even into higher areas of the pan (NAVFAC Marianas 2009b). While Area C has not been evaluated by the USACE for jurisdictional status, for the purpose of this analysis, Area C is considered to be a potential jurisdictional wetland and is treated as such in the following impact analysis.

There are 12 NWI-indicated wetland areas in and adjacent to the project area (refer to Figure 4.1-4). Based on recent field investigations and a consideration for prior investigations, only the 3.5 ac (1.41 ha) Area 8294 and the 0.3 ac (0.12 ha) Area C are wetland areas. Areas 8294 and C are classified as palustrine, non-persistent emergent herbaceous vegetation, intermittently flooded.

Wetlands on Tinian are subject to siltation that can reduce their size and functionality. In addition, wetlands are threatened by groundwater wells located adjacent to wetlands and the use of the wetlands for aquaculture in some areas (Scott 1993). Of note, groundwater pumping wells located adjacent to the Makpo wetland area present a threat to the wetland area when pumping occurs during dry periods (NAVFAC Marianas 2009a).

Federal Regulations

Federal Water Pollution Control Act (CWA 33 U.S. Code [USC] §1251 et seq.)

Regulates dredging and filling of wetlands and establishes procedures for identifying and regulating nonpoint sources of polluted discharge into waterways. Actions require federal consistency with State Nonpoint Source Pollution Control Plans.

Statement of Procedures on Floodplain Management and Wetlands Protection; 40 CFR Part 6, Appendix A

These procedures set forth USEPA policy and guidance for carrying out Executive Order 11990 and 11988.

Endangered Species Act (ESA), 16 USC §1531 et seq.; 50 CFR Parts 17, Subpart I, and 50 CFR Part 402

The ESA of 1973 and subsequent amendments provide for the conservation of threatened and endangered species of animals and plants, and the habitats that they are found. The act requires federal agencies, in consultation with the Secretary of the Interior, to verify that any agency supported action is not likely to jeopardize the continued existence of any endangered or threatened species or its critical habitat, or result in the destruction or adverse modification of a critical habitat of such species. Exemptions may be granted by the Endangered Species Committee.

Fish and Wildlife Coordination Act (16 USC § 662)

The Fish and Wildlife Coordination Act requires consideration of the effects of a proposed action on wetlands and areas affecting streams (including floodplains), as well as other protected habitats. Federal

agencies must consult with the U.S. Fish and Wildlife Service and the appropriate state agency with jurisdiction over wildlife resources prior to issuing permits or undertaking actions involving the modification of any body of water (including impoundment, diversion, deepening, or otherwise controlled or modified for any purpose). The requirements of this act are applicable for alternatives involving remediation activities in wetlands or floodplains.

National Wildlife Refuge System Administration Act of 1966 (16 USC §§ 668dd-668ee)

The Act provides for the administration and management of the national wildlife refuge system, including wildlife refuges, areas for the protection and conservation of fish and wildlife threatened with extinction, wildlife ranges, game ranges, wildlife management areas and waterfowl production areas.

4.2 ENVIRONMENTAL CONSEQUENCES

This chapter contains the discussion of the potential environmental consequences associated with implementation of the alternatives within the region of influence (ROI) for water resources. For a description of the affected environment, refer to Section 4.1.

4.2.1 Approach to Analysis

4.2.1.1 Methodology

The environmental consequences of each alternative and the no-action alternative are presented in this section. Available data and literature were used to assess existing conditions and to establish a baseline for the assessment, as described in the Affected Environment section (Section 4.1). The methodology for identifying, evaluating, and mitigating impacts to water resources has been established based on federal and local laws and regulations as described in Section 4.1.

The environmental consequences evaluation for water resources includes a qualitative and quantitative analysis of surface water, groundwater, nearshore waters, and wetlands to the extent possible given available project data. Environmental impact assessments were made and compared to baseline conditions, items of public concern, and significance criteria to determine the magnitude of potential impacts to water resources.

The proposed action analysis is separated into two main activities: construction and operation (consisting of non-training and training operations). Each of these activities has potential impacts to water resources. The analysis of potential impacts considers both direct and indirect impacts. Direct impacts are those that may occur during the construction phase of the project and cease when the project is complete or those that may occur as a result of project operations following the completion of construction. Indirect impacts are those that may occur as a result of the completed project or those that may occur during operations but not as a direct result of the construction or operational action.

<u>Surface Water/Stormwater</u>

Surface water issues include:

- Water quality
- Flooding
- Flow path alterations

Surface water quality impacts are evaluated by examining the potential increase of contamination, including chemicals, heavy metals, nutrients, and/or sediments in the surface water as a result of the proposed action. The analysis is performed by comparing existing water quality data with possible

increases in water quality contaminants in the surface water. Potential impacts to surface water quantity and velocity are analyzed by examining changes in drainage volumes and patterns associated with the proposed action. For construction activities, some of the key effects include stormwater discharges that may contain elevated sediment concentrations, and spills and leaks of chemicals such as lubricants, fuels, or other construction materials that may increase pollutant loading into surface waters. In addition, direct construction or alteration of stream channels or reservoirs may cause increased contamination by sedimentation or chemical constituents.

For construction activities, some of the key effects include stormwater discharges that may contain elevated sediment concentrations and spills and leaks of chemicals such as lubricants, fuels, or other construction materials that may increase pollutant loading in the surface water. In addition, direct construction or alteration of stream channels or reservoirs may cause increased contamination by sedimentation or chemical constituents. If flow paths or patterns are altered, additional studies, such as instream flow analysis, would be conducted to ensure that human uses and/or biological services are preserved.

For non-training operation activities, effects include stormwater discharges that may increase the volume of sediment loading to the surface water and/or increase contaminants from vehicle maintenance, household discharge, privately-owned vehicles, and animal waste. Contamination of surface water from leaks or spills of hazardous, or otherwise regulated materials, is also a potential impact. Increased water use may reduce the water availability in the reservoirs and/or reduce instream flows. Increased impervious areas may increase the runoff and increase the potential for flooding. Development in the floodplain may result in potential damage from flooding. Diversion of water courses for municipal water consumption may impact the ecological services that the resource provides. Training operation activities include potential contaminants from range and course training activities. For example, vehicle traffic could result in an increase in runoff due to the removal of ground cover. The storage of hazardous materials and fuels poses a continued risk of contamination for surface water from leaks or spills.

Groundwater

Groundwater impact concerns include water quality and water quantity. Groundwater quality was assessed by examining the potential risk of a hazardous or regulated waste release, as well as approximating the amount of additional stormwater and associated non-point source pollution that enter the groundwater.

Groundwater quality was assessed by examining the potential risk of a hazardous or regulated waste release, as well as approximating the amount of additional stormwater and associated non-point source pollution that would enter the groundwater. Water availability is addressed in Volume 6, Chapter 3, Section 3.1.2.

Potential groundwater impacts associated with construction activities include spills, leaks, and sedimentation having direct impacts to stormwater runoff that can contribute to groundwater contamination, as well as to direct contamination of groundwater resources through percolation.

Potential impacts resulting from non-training operation activities include increases in impervious surfaces, waste generating activities, storage of potential contaminants, and landfill leaching. The direct impacts include an increase in polluted stormwater runoff and contamination from leaks or spills of hazardous or regulated materials. Indirect impacts include decreases in groundwater recharge from increased impervious areas and saltwater intrusion from increased aquifer pumping.

The effects related to training operations include contamination from expended training materials, discharges from latrines, and leaks or spills from hazardous materials. These training activities can pose both short-term and long-term effects.

Nearshore Water

The nearshore water impact analysis focuses on water quality. Recreational nearshore issues are addressed in Chapter 9, Recreational Resources. The potential increases of contamination of nearshore waters by chemicals, heavy metals, nutrients, and/or sediments as a result of the proposed action are assessed by comparing existing water quality data with the projected changes in water quality.

Potential impacts associated with construction activities include construction spills and leaks that may discharge to nearshore waters and an increase in stormwater discharge that may increase non-point source pollution.

Operations effects include potential non-point source from chemicals, nutrients, and/or sediments that may run off from bivouac sites. Training operation activity effects include direct contamination from training materials that are used and not recovered.

Wetlands

The wetland impacts of concern include:

- Pollutants
- Loss of area
- Loss of functionality

The potential for pollutants to impact a wetland is evaluated by examining the risk of hazardous materials leaking or spilling and their proximity to the wetlands. The loss of area is assessed by the total amount of delineated wetland area that would be directly removed either in loss of area or function as a result of the proposed action. The wetland functionality refers to the ability of the wetland to trap sediment and nutrients, receive and retain water, maintain wildlife habitat (both flora and fauna), and provide recreational uses. The impacts to wildlife habitat associated with wetlands are addressed in Chapter 10, Terrestrial Biological Resources.

For construction activities, the effects associated with activities in close proximity to any designated wetland or activities in the wetlands themselves are considered. Runoff from nearby construction sites may contain increased chemicals, heavy metals, nutrients, and/or sediment that could adversely affect those wetlands. Wetland impacts could result from changes in land uses and/or spills or leaks from construction operations and equipment. Loss of functionality can also occur if construction operations occur directly within the designated wetlands. Loss of wetland area would occur if the proposed action involves the direct removal of wetlands.

The effects associated with operations include an increase in potential spills and leaks from hazardous materials that may be stored in close proximity to designated wetlands. An indirect impact to existing wetlands may occur by altering (i.e., diverting or restricting) the surface water flowing into the wetlands. Indirect impacts to wetlands could also occur as a result of altered sedimentation of watercourses or drainage conveyances connected to wetland areas.

4.2.1.2 Determination of Significance

The following factors are considered in evaluating impacts to groundwater and surface waters:

- Long-term increased inundation, sedimentation, and/or damage to water resources in the ROI caused by project activities, including impervious surfacing that increases and/or diverts rainfall runoff and/or affects its collection and conveyance and implementation of mitigation measures.
- Depletion, recharge, or contamination of a usable groundwater aquifer for municipal, private, or agricultural purposes.
- Increases in soil settlement or ground swelling that damages structures, utilities, or other facilities caused by inundation and/or changes in groundwater levels.
- Noncompliance with applicable water quality standards, laws, and regulations.
- Increasing risk associated with environmental hazards or human health.
- Decreasing existing and/or future beneficial use.
- Reducing the amount of water or wetlands available for human use or ecological services.
- Reducing availability or accessibility of water resources.
- Long-term increased inundation, sedimentation, and/or damage to water resources.

If an activity is deemed to have an impact, the activity then can be evaluated to determine if the impact is significant or insignificant. For significant impacts, a determination is made as to whether they can be mitigated to less than significant impacts.

4.2.1.3 Issues Identified During Public Scoping Process

The following analysis focuses on the effects to water resources: surface water, groundwater, nearshore water, and wetlands that could be impacted by the proposed action. As part of the analysis, concerns relating to water resources that were identified by the public, including regulatory stakeholders, during the scoping meetings are addressed. These include:

- Describe water quality with respect to public health requirements, drinking water regulations, and applicable water quality standards.
- Estimate quality and quantity of storm water runoff to be generated by increased impervious surface, methods of contaminant removal, methods of runoff redirection to recharge the aquifer, and groundwater under the direct influence of surface water.
- Accidental or intentional contamination of groundwater.
- Capacity of water resources to meet agricultural needs.
- Stormwater management controls to prevent pollution during construction and subsequent operations.
- Construction and vegetation clearing that potentially cause runoff, pollute the beaches, and destroy marine life.
- Effects of training and dredging on sedimentation stress for the coral reefs and other marine life.
- Identify ways to monitor and mitigate indirect impacts from sediments on coral reefs.

4.2.2 Alternative 1 (Preferred Alternative)

The analysis of potential impacts to water quality under Alternative 1 focuses on proposed weapons firing training. This involves construction and operation of the proposed firing ranges as configured for the alternative.

4.2.2.1 Tinian

Construction

Surface Water/Stormwater

Under Alternative 1, proposed firing range and supporting areas (parking areas, roads, and bivouac areas) construction activities would result in the potential for a temporary increase in stormwater runoff, erosion, and sedimentation. To minimize these potential temporary increases in stormwater runoff, erosion, and sedimentation, an EPA Construction General Permit (CGP) would be obtained and a Storm Water Pollution Prevention Plan (SWPPP) would be prepared and implemented. The SWPPP would identify construction-specific Best Management Practices (BMPs) (Volume 2, Chapter 4, Table 4.2-1) would be implemented as part of Alternative 1 to reduce the potential for erosion, runoff, sedimentation, and subsequent water quality impacts. Furthermore, an Earthmoving and Erosion Control Permit would be obtained from CNMI DEQ for any type of mechanized earthmoving activities.

No buildings/structures would be constructed in the 100-year flood zone. Therefore, construction activities associated with Alternative 1 would result in less than significant impacts to surface water.

Groundwater

Under Alternative 1, range construction activities would include surface water protection measures (identified above) that would also serve to protect groundwater quality. By adhering to the provisions of the CGP and implementing BMPs associated with addressing site- and activity-specific water resource protection needs, there would be a reduction in stormwater pollutant loading potential and thus a reduction in pollution loading potential to the underlying groundwater subbasins. Therefore, construction activities associated with Alternative 1 would result in less than significant impacts to groundwater.

Nearshore Waters

Range construction activities associated with Alternative 1 would occur more than 1 mile (mi) (1.6 km) from the coastline. As a result, construction activities would not result in direct impacts to the nearshore water. However, by adhering to the provisions of the CGP and implementing BMPs associated with addressing site- and activity-specific water resource protection needs, pollutant loading to surface runoff would be reduced and potential indirect impacts to nearshore waters would be subsequently lessened. Therefore, construction activities associated with Alternative 1 would result in less than significant impacts to nearshore waters.

Wetlands

The Hagoi and Makpo Wetlands are located 2.5 mi (4 km) north and 3.0 mi (4.9 km) south, respectively of the project area associated with Alternative 1; these wetlands would not be impacted. Area 8294 is located approximately 1,000 ft (305 m) west of the proposed Platoon Battle Course (Figure 4.2-1); no direct impacts would occur. As Area 8294 is located up-gradient from the proposed range footprints, no indirect impacts to this wetland area would occur during construction. As shown on Figure 4.2-1, there is one potential wetland area (Area C) located within the initial Platoon Battle Course footprint. Under Alternative 1, the Marine Corps would design the proposed Platoon Battle Course to avoid direct impacts to Area C. In addition, to minimize potential indirect impacts to Area C during construction, the Marine Corps would implement site-specific BMPs as necessary (depending on the final design location with respect to Area C). Therefore, Alternative 1 would result in less than significant impacts to wetlands.

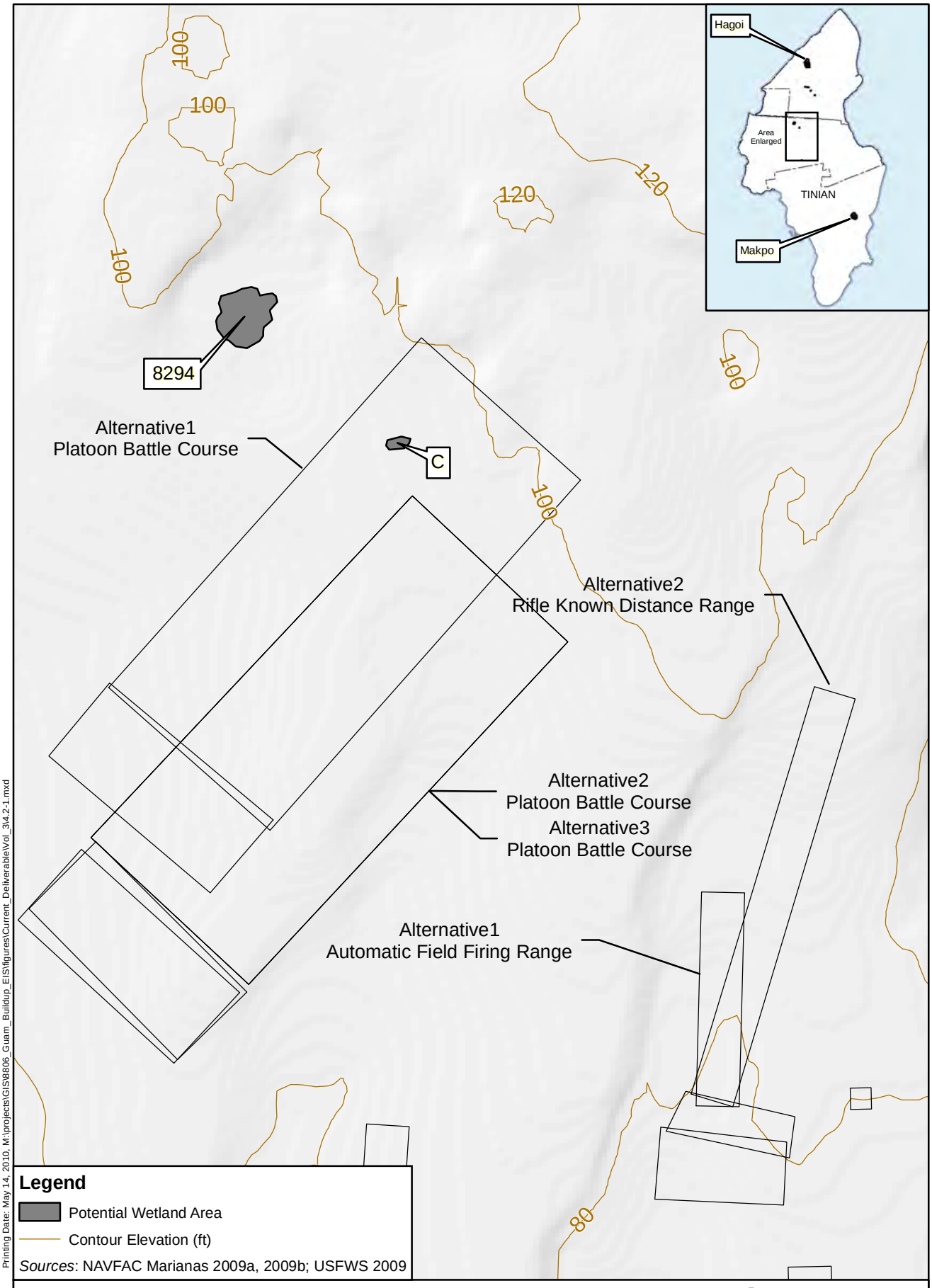

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Figure 4.2-1
Potential Wetland Areas and Range Footprints, All Alternatives

Operation

Surface Water/Stormwater

The operational phase would result in a minor increase in the area of impervious surface as a result of new range training buildings and courses that would result in an associated relatively minor increase in stormwater discharge intensities and volume. However, stormwater infrastructure included as part of the proposed action would incorporate Low Impact Development (LID) measures and BMPs to ensure that stormwater retention would be consistent with local and federal requirements, and thus minimizing potential impacts to surface water quality. Stormwater flow paths would continue to mimic area topography.

To address this potential increase in stormwater runoff, Alternative 1 would incorporate the concept of LID in the final planning, design, and permitting of the ranges and courses. The goals of LID are to closely match the post-development topography and stormwater runoff hydrology to the pre-development status. The intent of LID is to control non-point source runoff through the implementation of plant-soil-water and man-made (where appropriate) mechanisms that protect and sustain the ecological integrity of the receiving water bodies and wetlands. LID technologies are well suited to reduce stormwater runoff loadings for a variety of potential contaminants including sediment, nutrients, and heavy metals. LID practices at the planning level are in conformance with USEPA non-structural Pollution Prevention strategies. The range-specific LID measures for Tinian would reduce stormwater runoff using a combination of retention devices and vegetation. For example, grassy vegetation would be maintained on berms to help reduce erosion and minimize stormwater runoff, thereby reducing the potential for negative water quality impacts. With the implementation of LID measures such as these to reduce runoff volume and stormwater pollutants, no impacts are anticipated.

Proposed range training activities would have the potential to release contaminants into receiving waters. To minimize these potential impacts, Alternative 1 would be implemented in accordance with all applicable orders, laws, and regulations, including preparation of and compliance with an SWPPP, Stormwater Management Plan, and Spill Prevention, Control, and Countermeasure Plan that would minimize potential water quality impacts from runoff, leaks, spills, and range training activities. For example, munitions expended at the ranges would be entrapped in soil impact berms that would be maintained to remove expended rounds from the soil. The rounds would be removed and transported for recycling, and the soils would be returned to the range. A monitoring program would be implemented to identify any early indications of lead movement so that action could be taken to address any potential water quality impacts. Thus, implementation of these range-specific water quality protective measures would minimize potential impacts of runoff, spills, leaks, and training activities to water resources.

Implementation of Alternative 1 would be in compliance with all federal, local, and military orders, laws, and regulations, including COMNAV Marianas Instruction 3500.4 (refer to Volume 8, Chapter 3). In addition, BMPs, LID, and monitoring would be part of the implementation plan. Regulatory compliance and implementation of protective measures and plans would minimize potential impacts to surface water resources. Therefore, operations associated with Alternative 1 would result in less than significant impacts to surface water.

Groundwater

Implementation of Alternative 1 would not increase groundwater pumping rates. The proposed range locations generally lie over groundwater in the low permeability pyroclastic rocks and the Toagpochau Limestone. Figure 4.2.2 shows the proposed range locations, the production wells and abandoned wells in

the area, the low permeability zones, and the groundwater flow lines as modeled by Gingerich (2002). Generally, groundwater would flow radially out from the major low permeability zones, around any minor low permeability zones, then toward the coast. Groundwater can carry leachate from the low permeability zones to the Marianas Limestone. Based on the general groundwater flow pattern, production wells M19 and M25 would be the wells closest to the ranges. Abandoned well M23 is near a live fire range proposed under this alternative. If improperly abandoned the well could provide a preferential flow path for runoff from the range.

Proposed range training operations have the potential to leach ammunition to groundwater. The primary contaminant of concern is lead. A combination of natural geology and implementation of BMPs can minimize the risk. It is recognized that any leachate reaching the water table is undesirable. Military Handbook 1027/3B contains procedures for reducing potential impacts from ranges through the implementation of BMPs. These include adding soil amendments to maintain the soil pH between 6 and 8, maintaining vegetation on berms and drainage ways and turf on the range, contaminant monitoring, and reclamation and recycling of spent ammunition. To minimize the potential for groundwater leachate to affect the production wells, proposed range maintenance activities and training operations would be in compliance with water protection measures and Military Handbook 1027/3B (NAVFAC 1992). These would include the same measures that are described in the Surface Water/Stormwater section such as removal of expended rounds to the extent practicable, diverting any runoff to on-site vegetated detention basins, and other measures that include not using nitrate fertilizers, and removal of dead or dying vegetation.

Prior to establishment of the proposed training ranges, a range management plan would be created and updated every 5 years in accordance with DD 4715.11. The plan would address long-term sustainable use, hydrology and hydrogeology, management procedures, record keeping, standards, monitoring, public outreach and public participation programs, technology requirements for sustainable range management, and integration with other installation planning processes and resources.

In addition, a monitoring program would be implemented as part of Alternative 1 to identify any early indications of lead movement so that action could be taken to address any potential water quality impacts. This monitoring would be conducted in accordance with Military Handbook 1027/3B (NAVFAC 1992). Established procedures would be followed for identifying contaminant levels above action thresholds. Procedures would include testing pH of soils to ensure it stays within the acceptable range and sampling soil at a depth from below the root zone to detect the presence of lead leachate. A soil sample that has a lead concentration greater than the USEPA Region 9 Preliminary Remediation Goal of 800 mg/kg would indicate a problem severe enough to warrant a proactive approach. This could include adding lead stabilization soil amendments such as phosphate to immobilize the lead or a more aggressive lead removal action (e.g., direct removal of lead fragments). The use of phosphate soil amendments will necessitate increased frequency of soil pH testing.

Wastewater from personnel using the ranges would be collected in portable sanitary facilities provided and maintained by a contractor. This contract would require that collected wastewater be disposed of in compliance with both local and federal regulations and such compliance be monitored by DoD inspectors. The preferred method of disposal would be the use of an existing DoD septic tank and leach field system (Figure 4.2-2).

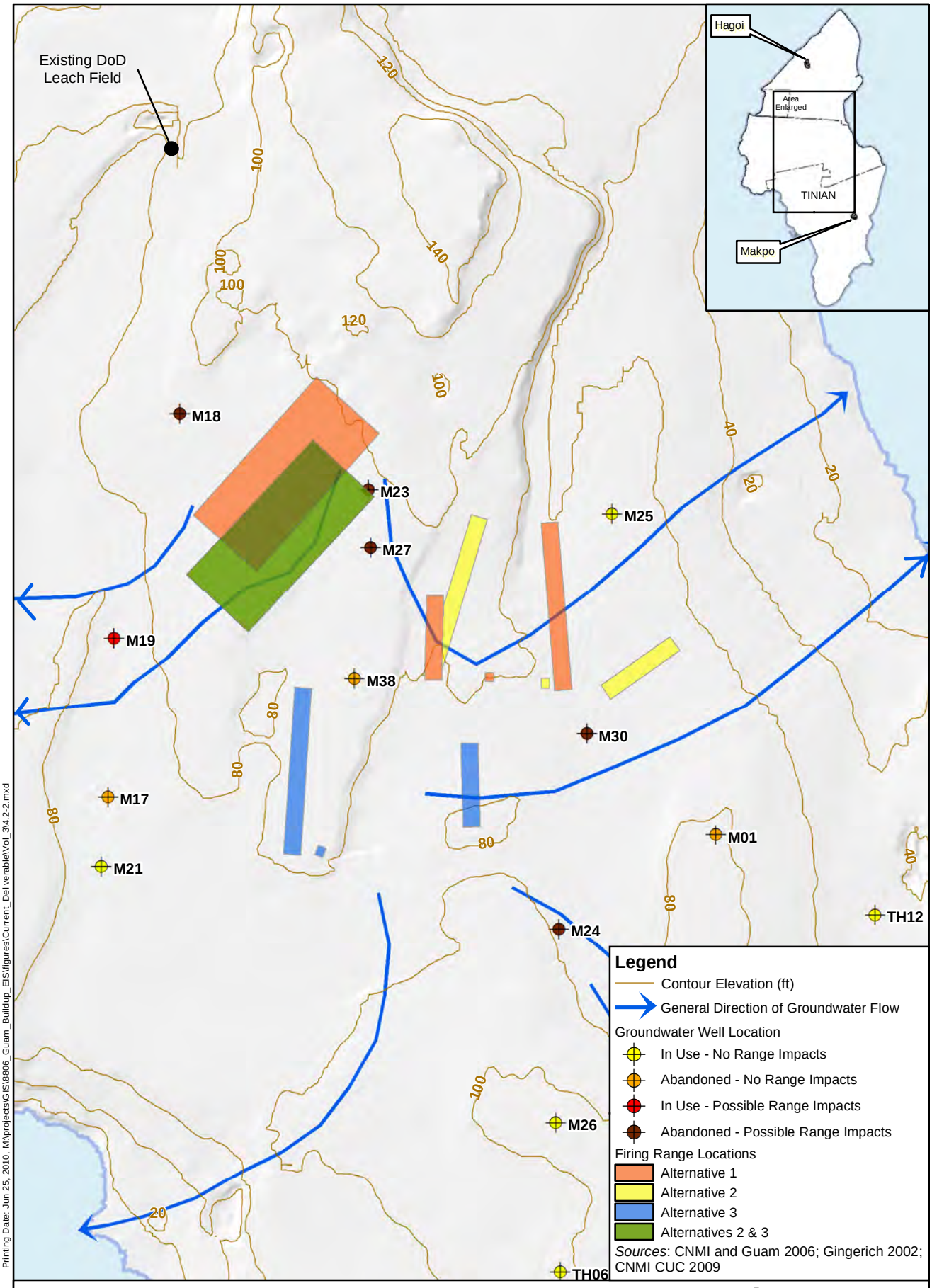

Figure 4.2-2
Groundwater Resources and Range Alternatives

To prevent deodorizing and disinfecting chemicals from interfering with the natural degradation processes, DoD would use leach field friendly odor chemicals (refer to Section 15.2.2.1 for more detail on wastewater disposal). DoD would do further research and contact other agencies to identify a nontoxic, non-hazardous, and biodegradable disinfectant that is more environmentally friendly and less taxing on waste water treatment systems. The location of the existing septic tank and leach field system is not near any production wells. The low through flow (2,000 gallons per day [7,529 liters per day] for 12 to 16 weeks per year), primary treatment by the septic system, and high dilution rate once the leach field effluent reaches the water table would result in less than significant impact to groundwater. Therefore, operations associated with Alternative 1 would result in less than significant impacts to groundwater.

Nearshore Waters

While alterations to the watershed have the potential to result in indirect impacts that could alter the nearshore water quality, these potential effects would be minimized by complying with all applicable orders, laws and regulations presented in Volume 8, Chapter 3, Section 3.1. In addition, the aforementioned training surface water resource protection measures would minimize potential indirect impacts to nearshore waters. Therefore, operations associated with Alternative 1 would result in less than significant impacts to nearshore water.

Wetlands

No direct impacts to the wetland areas are anticipated as no wetland areas would be located within the proposed ranges or courses. Range operations would not alter surface water flow to wetland areas as wetland areas are located at higher elevations than the proposed ranges (i.e., any changes to surface hydrology would occur down-gradient from wetland areas) (refer to Figure 4.2-1) and, direct precipitation is the water source for wetlands on Tinian. In addition, due to the underlying porous limestone and siting of ranges down-gradient from the potential wetland areas, any residual lead or other potential range contaminants would not reach wetland areas via stormwater runoff. There is a possibility of an expended round landing in Areas 8294 or C as they are located within the Surface Danger Zone (SDZ) associated with each of the ranges. Assuming that 0.01% of ammunition falls outside the range and in the SDZ, the estimated number of bullets is approximately 328 over the course of a year. Only a portion of these rounds would potentially enter the wetland, as Areas 8294 and C (4.0 ac [1.6 ha]) are only a small fraction of the 3,700-ac (1,500-ha) area of the proposed SDZ. Therefore, the number of rounds that would enter the wetland would be minimal, so it is unlikely that these rounds would negatively impact the wetland functionality. Therefore, operations associated with Alternative 1 would result in less than significant impacts to wetlands.

4.2.2.2 Summary of Alternative 1 Impacts

Table 4.2-1 summarizes the potential construction and operational impacts associated with implementation of Alternative 1.

Table 4.2-1. Summary of Alternative 1 Impacts

Area	*Project Activities*	*Project Specific Impacts*
Tinian	Construction	SW: Temporary increase in stormwater runoff, erosion, and sedimentation GW: Increased potential for local groundwater contamination NW: Minor increase in runoff volume and pollutant loading potential WL: Less than significant impacts
	Operation	SW: Increase in stormwater volume and intensity; increase in training-related residual contaminants GW: Increased potential for local groundwater contamination NW: Minor increase in runoff volume and pollutant loading potential WL: Minor increase in pollutant loading potential from expended rounds

Legend: SW = Surface water/stormwater, GW = Groundwater, NW = Nearshore waters, WL = Wetlands.

Under Alternative 1, there would be no reduction in the amount of wetlands on Tinian, and there would be no reduction in the availability or accessibility of water resources. There is one potential wetland area (Area C) located within the initial Platoon Battle Course footprint. Under Alternative 1, the Marine Corps would design the proposed Platoon Battle Course to avoid direct impacts to Area C. Increases in stormwater would be managed by site-specific BMPs in accordance with the SWPPP and LID measures, stormwater flow paths would continue to mimic area topography, range operations and maintenance activities would not alter surface water flow to wetland areas, and no buildings/structures would be constructed in the 100-year flood zone; therefore, there would be no increase in flooding risk. To minimize the potential for groundwater leachate to affect production wells, proposed range maintenance activities and training operations would be in compliance with water protection measures and Military Handbook 1027/3B (NAVFAC 1992). In addition, a monitoring program would be implemented as part of Alternative 1 to identify any early indications of lead movement so that action could be taken to address any potential water quality impacts.

Through the development and implementation of site specific BMPs and LID measures appropriate for site conditions, as well as range and course-specific plans and procedures, there would no increased risk from environmental hazards or to human health. Furthermore, all actions associated with Alternative 1 would be implemented in accordance with all applicable federal, local, and military orders, laws, and regulations (refer to Volume 8, Chapter 3, Table 3.1-1), including COMNAV Marianas Instruction 3500.4. Therefore, Alternative 1 would result in less than significant impacts to water resources.

4.2.2.3 Alternative 1 Proposed Mitigation Measures

No proposed mitigation measures have been identified for Alternative 1.

4.2.3 Alternative 2

The analysis of potential impacts to water quality under Alternative 2 focuses on proposed firing training. Alternative 2 is general similar to Alternative 1; the orientation of the ranges and courses would be slightly different under Alternative 2.

4.2.3.1 Tinian

Construction

Surface Water/Stormwater

The proposed range and course construction activities are similar for all action alternatives; therefore, potential construction impacts to surface water resources resulting from implementation of Alternative 2 would be similar to the potential impacts discussed under Alternative 1. Refer to Section 4.2.2.1.

Therefore, construction activities associated with Alternative 2 would result in less than significant impacts to surface water.

Groundwater

The proposed range and course construction activities are similar for all action alternatives; therefore, potential construction impacts to groundwater resources resulting from implementation of Alternative 2 would be similar to the potential impacts discussed under Alternative 1. Refer to Section 4.2.2.1. Therefore, construction activities associated with Alternative 2 would result in less than significant impacts to groundwater.

Nearshore Waters

The proposed range and course construction activities are similar for all action alternatives; therefore, potential construction impacts to nearshore water resources resulting from implementation of Alternative 2 would be similar to the potential impacts discussed under Alternative 1. Refer to Section 4.2.2.1. Therefore, construction activities associated with Alternative 2 would result in less than significant impacts to nearshore waters.

Wetlands

Based on a recent investigation (refer to Section 4.1.2.4), there are no wetlands located within the range footprints associated with Alternative 2. No direct impacts to wetlands would occur during construction activities. The nearest potential wetland area to proposed construction under Alternative 2 is Area C, located approximately 400 ft (122 m) north of the Platoon Battle Course. The next nearest area is Area 8294, located approximately 1,750 ft (305 m) west of the proposed Platoon Battle Course (refer to Figure 4.2-1). Both of these potential wetland areas are located up-gradient from the proposed range footprints; no indirect impacts to these wetland areas would occur during construction. The recognized Hagoi and Makpo Wetlands are located 2.5 mi (4 km) north and 3.0 mi (4.9 km) south, respectively of the project area associated with Alternative 2; these wetlands would not be impacted. Therefore, construction activities associated with Alternative 2 would result in no impacts to wetlands.

Operation

Surface Water/Stormwater

The proposed range training operations on Tinian are the same for all action alternatives; therefore, the potential operational impacts to surface water resources resulting from implementation of Alternative 2 would be the same as the potential impacts discussed under Alternative 1. Refer to Section 4.2.2.1. Therefore, operations associated with Alternative 2 would result in less than significant impacts to surface water.

Groundwater

The proposed range training operations on Tinian are the same for all action alternatives except that under this alternative, abandoned wells M23 and M27 could be impacted; therefore, the potential operational impacts to groundwater resources resulting from implementation of Alternative 1 would be the same as the potential impacts discussed under Alternative 2. Refer to Section 4.2.2.1. Therefore, operations associated with Alternative 2 would result in less than significant impacts to groundwater.

Nearshore Waters

The proposed range training operations on Tinian are the same for all action alternatives; however, as shown in Chapter 2, Figure 2.5-2, a portion of the notational SDZ associated with Alternative 2 would overlap nearshore waters. As discussed in Volume 3, Chapter 2, Section 2.3.1.1, there is a very small chance an expended projectile to fall outside of the range footprint, within the SDZ. There would be an even smaller chance for an expended projectile to fall within the nearshore water portion of the SDZ. Due to the small number of potential projectiles that could fall into the nearshore SDZ and the relatively small size of the projectile. However, the chances of having enough rounds to fall within the Areas C or 8294 to impact potential wetland functionality is negligible. The potential impacts to nearshore water quality from these projectiles would be negligible. In addition, the same range and course management measures as identified in Section 4.2.2.1 would be implemented to minimize potential operational impacts to nearshore waters. Therefore, operations associated with Alternative 2 would result in less than significant impacts to nearshore waters.

Wetlands

Post-construction, range operations would not alter surface water flow to wetland areas as wetland areas are located at higher elevations than the proposed ranges (i.e., any changes to surface hydrology would occur down-gradient from wetland areas) (refer to Figure 4.2-1) and, direct precipitation is the water source for wetlands on Tinian. In addition, due to the underlying porous limestone and siting of ranges down-gradient from the potential wetland areas, any residual lead or other potential range contaminants would not reach wetland areas via stormwater runoff. There is a possibility of an expended round landing in Areas 8294 or C as they are located within the Surface Danger Zone (SDZ) associated with each of the ranges. Assuming that 0.01% of ammunition falls outside the range and in the SDZ, the estimated number of bullets is approximately 328 over the course of a year. Only a portion of these rounds would potentially enter the wetland, as Areas 8294 and C (4.0 ac [1.6 ha]) are only a small fraction of the 3,700-ac (1,500-ha) area of the proposed SDZ. Therefore, the number of rounds that would enter the wetland would be minimal, so it is unlikely that these rounds would negatively impact the wetland functionality. Therefore, operations associated with Alternative 2 would result in less than significant impacts to wetlands.

4.2.3.2 Summary of Alternative 2 Impacts

Table 4.2-2 summarizes the potential construction and operational impacts associated with implementation of Alternative 2.

Table 4.2-2. Summary of Alternative 2 Impacts

Area	*Project Activities*	*Project Specific Impacts*
Tinian	Construction	SW: Temporary increase in stormwater runoff, erosion, and sedimentation GW: Increased potential for local groundwater contamination NW: Minor increase in runoff volume and pollutant loading potential WL: No impacts
	Operation	SW: Increase in stormwater volume and intensity; increase in training-related residual contaminants GW: Increased potential for local groundwater contamination NW: Minor increase in runoff volume and pollutant loading potential; increase in training-related residual contaminants WL: Minor increase in pollutant loading potential from expended rounds

Legend: SW = Surface water/stormwater, GW = Groundwater, NW = Nearshore waters, WL = Wetlands.

Under Alternative 2, there would be no reduction in the area of wetlands on Tinian and there would be no reduction in the availability or accessibility of water resources. Increases in stormwater would be managed by BMPs and LID measures, stormwater flow paths would continue to mimic area topography, range operations and maintenance activities would not alter surface water flow to wetland areas, and no buildings/structures would be constructed in the 100-year flood zone; therefore, there would be no increase in flooding risk. To minimize the potential for groundwater leachate to affect production wells, proposed range maintenance activities and training operations would be in compliance with water protection measures and Military Handbook 1027/3B (NAVFAC 1992). In addition, a monitoring program would be implemented as part of Alternative 2 to identify any early indications of lead movement so that action could be taken to address any potential water quality impacts. Through the development and implementation of BMPs appropriate for site-specific conditions (refer to Volume 2, Chapter 4, Table 4.2-1) and LID measures, and range and course-specific plans and procedures, there would no increased risk from environmental hazards or to human health. Any potential projectiles landing in the nearshore water portion of the SDZ would have a negligible impact on nearshore water quality. Furthermore, all actions associated with Alternative 2 would be implemented in accordance with all applicable federal, local, and military orders, laws, and regulations (refer to Volume 8, Chapter 3, Table 3.1-1), including COMNAV Marianas Instruction 3500.4. Therefore, Alternative 2 would result in less than significant impacts to water resources.

4.2.3.3 Alternative 2 Proposed Mitigation Measures

No proposed mitigation measures have been identified for Alternative 2.

4.2.4 Alternative 3

The analysis of potential impacts to water quality under Alternative 3 focuses on proposed firing training. Alternative 3 is general similar to Alternative 1; the orientation of the ranges and courses would be slightly different under Alternative 3.

4.2.4.1 Tinian

Construction

Surface Water/Stormwater

The proposed range and course construction activities are similar for all action alternatives; therefore, potential construction impacts to surface water resources resulting from implementation of Alternative 3 would be similar to the potential impacts discussed under Alternative 1. Refer to Section 4.2.2.1. Therefore, construction activities associated with Alternative 3 would result in less than significant impacts to surface water.

Groundwater

The proposed range and course construction activities are similar for all action alternatives; therefore, potential construction impacts to groundwater resources resulting from implementation of Alternative 3 would be similar to the potential impacts discussed under Alternative 1. Refer to Section 4.2.2.1. Therefore, construction activities associated with Alternative 3 would result in less than significant impacts to groundwater.

Nearshore Waters

The proposed range and course construction activities are similar for all action alternatives; therefore, potential construction impacts to nearshore water resources resulting from implementation of Alternative 3 would be similar to the potential impacts discussed under Alternative 1. Refer to Section 4.2.2.1. Therefore, construction activities associated with Alternative 3 would result in less than significant impacts to nearshore waters.

Wetlands

Based on a recent investigation (refer to Section 4.1.2.4), there are no wetlands located within the range footprints associated with Alternative 3. No direct impacts to wetlands would occur during construction activities. The nearest potential wetland area to proposed construction under Alternative 3 is Area C, located approximately 400 ft (122 m) north of the Platoon Battle Course. The next nearest potential wetland area is Area 8294, located approximately 1,750 ft (305 m) west of the proposed Platoon Battle Course (refer to Figure 4.2-1). Both of these potential wetland areas are located up-gradient from the proposed range footprints; no indirect impacts to these wetland areas would occur during construction. The recognized Hagoi and Makpo Wetlands are located 2.5 mi (4 km) north and 3.0 mi (4.9 km) south, respectively of the project area associated with Alternative 3; these wetlands would not be impacted. Therefore, construction activities associated with Alternative 3 would result in no impacts to wetlands.

Operation

Surface Water/Stormwater

The proposed range training operations on Tinian are the same for all action alternatives; therefore, the potential operational impacts to surface water resources resulting from implementation of Alternative 3 would be the same as the potential impacts discussed under Alternative 1. Refer to Section 4.2.2.1. Therefore, operations associated with Alternative 3 would result in less than significant impacts to surface water.

Groundwater

The proposed range training operations on Tinian are similar for all action alternatives; however, the proposed locations place two ranges over the Mariana Limestone (refer to Figure 4.2-2). The potential operational impacts to groundwater resources resulting from implementation of Alternative 3 would be slightly different from the potential impacts discussed under Alternative 1 in that production well M21 could be affected by any leachate from the southwest range. Also, like Alternative 2, abandoned wells M23 and M27 could be potentially impacted by runoff from the ranges. Actions taken to prevent any adverse impact to groundwater are identical to those identified under Alternative 1. Therefore, operations associated with Alternative 3 would result in less than significant impacts to groundwater.

Nearshore Waters

The proposed range training operations on Tinian are the same for action alternatives; therefore, the potential operational impacts to nearshore water resources resulting from implementation of Alternative 3 would be the same as the potential impacts discussed under Alternative 1. Refer to Section 4.2.2.1. Therefore, operations associated with Alternative 3 would result in less than significant impacts to nearshore waters.

Wetlands

Post-construction, range operations would not alter surface water flow to wetland areas as wetland areas are located at higher elevations than the proposed ranges (i.e., any changes to surface hydrology would occur down-gradient from wetland areas) (refer to Figure 4.2-1) and, direct precipitation is the water source for wetlands on Tinian. In addition, due to the underlying porous limestone and siting of ranges down-gradient from the potential wetland areas, any residual lead or other potential range contaminants would not reach wetland areas via stormwater runoff. There is a possibility of an expended round landing in Areas 8294 or C as they are located within the Surface Danger Zone (SDZ) associated with each of the ranges. Assuming that 0.01% of ammunition falls outside the range and in the SDZ, the estimated number of bullets is approximately 328 over the course of a year. Only a portion of these rounds would potentially enter the wetland, as Areas 8294 and C (4.0 ac [1.6 ha]) are only a small fraction of the 3,700-ac (1,500-ha) area of the proposed SDZ. Therefore, the number of rounds that would enter the wetland would be minimal, so it is unlikely that these rounds would negatively impact the wetland functionality. Therefore, operations associated with Alternative 3 would result in less than significant impacts to wetlands.

4.2.4.2 Summary of Alternative 3 Impacts

Table 4.2-3 summarizes the potential construction and operational impacts associated with implementation of Alternative 3.

Table 4.2-3. Summary of Alternative 3 Impacts

Area	*Project Activities*	*Project Specific Impacts*
Tinian	Construction	SW: Temporary increase in stormwater runoff, erosion, and sedimentation GW: Increased potential for local groundwater contamination NW: Minor increase in runoff volume and pollutant loading potential WL: No impacts
	Operation	SW: Increase in stormwater volume and intensity; increase in training-related residual contaminants GW: Increased potential for local groundwater contamination NW: Minor increase in runoff volume and pollutant loading potential WL: Minor increase in pollutant loading potential from expended rounds

Legend: SW = Surface water/stormwater, GW = Groundwater, NW = Nearshore waters, WL = Wetlands.

Under Alternative 3, there would be no reduction in the area of wetlands on Tinian and there would be no reduction in the availability or accessibility of water resources. Increases in stormwater would be managed by BMPs and LID measures, stormwater flow paths would continue to mimic area topography, range operations and maintenance activities would not alter surface water flow to wetland areas, and no buildings/structures would be constructed in the 100-year flood zone; therefore, there would be no increase in flooding risk. To minimize the potential for groundwater leachate to affect production wells, proposed range maintenance activities and training operations would be in compliance with water protection measures and Military Handbook 1027/3B (NAVFAC 1992). In addition, a monitoring program would be implemented as part of Alternative 3 to identify any early indications of lead movement so that action could be taken to address any potential water quality impacts. Through the development and implementation of BMPs appropriate for site-specific conditions (refer to Volume 2, Chapter 4, Table 4.2-1) and LID measures, and range and course-specific plans and procedures, there would no increased risk from environmental hazards or to human health. Furthermore, all actions associated with Alternative 3 would be implemented in accordance with all applicable federal, local, and military orders, laws, and regulations (refer to Volume 8, Chapter 3, Table 3.1-1), including COMNAV

Marianas Instruction 3500.4. Therefore, Alternative 3 would result in less than significant impacts to water resources.

4.2.4.3 Alternative 3 Proposed Mitigation Measures

No proposed mitigation measures have been identified for Alternative 3.

4.2.5 No-Action Alternative

4.2.5.1 Surface Water/Stormwater

Under the no-action alternative, no new construction or new training activities associated with the Marine Corps relocation to Guam would occur on Tinian, and the Marine Corps would not meet training needs and requirements in support of the proposed action. The purpose and need for training on Tinian as described in Chapter 1 would not be met. No construction or operations would occur; therefore, existing surface water conditions as presented in Section 4.1 would remain.

The identified surface water availability and quality concerns for Tinian (e.g., construction-related discharges, sewage overflows, animal waste, and sediment erosion) would continue to exist. These threats to surface water would continue to be monitored by federal and Tinian agencies, and appropriate regulatory action would continue to occur in order to maximize surface water quality and availability. In time, surface water quality is expected to slowly improve as point and non-point sources of pollution are identified and pollution loading to surface waters is reduced. Not increasing the amount of training on Tinian would not change the ongoing water quality concerns or protection actions for surface waters; these conditions and actions would continue to persist. Therefore, implementation of the no-action alternative would result in no impacts to surface water.

4.2.5.2 Groundwater

Under the no-action alternative, no new construction or new training activities associated with the Marine Corps relocation to Guam would occur on Tinian, and the Marine Corps would not meet training needs and requirements in support of the proposed action. The purpose and need for training on Tinian as described in Chapter 1 would not be met. No construction or operations would occur; therefore, existing groundwater conditions as presented in Section 4.1 would remain.

The identified groundwater availability and quality concerns for Tinian (e.g., saltwater intrusion, leaky septic systems) would continue to exist. These threats to groundwater availability and quality would continue to be monitored by federal and Tinian agencies to minimize potential impacts, and appropriate regulatory action would continue to occur in order to protect groundwater resources. Monitoring for saltwater intrusion and coordination amongst water users, as well as potential designations for groundwater resources is expected to ensure there is a dependable, safe supply of groundwater for Tinian users. Not increasing the amount of training on Tinian would not change the on-going groundwater availability and quality concerns or the protection actions for Tinian nearshore waters; these conditions and actions would continue to persist. Therefore, implementation of the no-action alternative would result in no impacts to groundwater.

4.2.5.3 Nearshore Waters

Under the no-action alternative, no new construction or new training activities associated with the Marine Corps relocation to Guam would occur on Tinian, and the Marine Corps would not meet training needs and requirements in support of the proposed action. The purpose and need for training on Tinian as described in Chapter 1 would not be met. No construction or operations would occur; therefore, existing nearshore conditions as presented in Section 4.1 would remain.

The identified nearshore water quality concerns for the marine waters of Tinian (sewage outfalls, sewer collection overflows, sedimentation from unpaved roads and development, urban runoff, reverse osmosis discharges, and enterococci bacteria,) would continue to persist. These threats to nearshore water quality would continue to be monitored by federal and Tinian agencies to minimize potential impacts, and appropriate regulatory action would continue to occur to protect nearshore waters. In time, nearshore water quality is expected to slowly improve as point and non-point sources of pollution are identified and pollution loading to nearshore waters is reduced. Not increasing the amount of training on Tinian would not change the on-going nearshore water quality concerns or the protection actions for Tinian nearshore waters; these conditions and actions would continue to persist. Therefore, implementation of the no-action alternative would result in no impacts to nearshore waters.

4.2.5.4 Wetlands

Under the no-action alternative, no new construction or new training activities associated with the Marine Corps relocation to Guam would occur on Tinian, and the Marine Corps would not meet training needs and requirements in support of the proposed action. The purpose and need for training on Tinian as described in Chapter 1 would not be met. No construction or operations would occur; therefore, existing wetland conditions as presented in Section 4.1 would remain.

The identified primary threats to wetlands on Tinian (feral ungulates, human disturbance, non-native plants species, sedimentation, and erosion) would continue to occur. These threats to wetland areas and function are of concern and are therefore monitored by federal and Tinian agencies to protect wetland areas. Not increasing the amount of training on Tinian would not change the on-going threats or protection actions for wetlands on Tinian; these conditions and actions would continue to persist. Therefore, implementation of the no-action alternative would result in no impacts to wetlands.

4.2.6 Summary of Impacts

Table 4.2-4 summarizes the potential impacts. A text summary is provided below.

Table 4.2-4. Summary of Impacts

Alternative 1	*Alternative 2*	*Alternative 3*	*No-Action Alternative*
Construction Impacts			
SW: LSI • Temporary increase in stormwater runoff, erosion, and sedimentation GW: LSI • Increased potential for local groundwater contamination NW: LSI • Minor increase in runoff volume and pollutant loading potential WL: LSI	SW: LSI • Temporary increase in stormwater runoff, erosion, and sedimentation GW: LSI • Increased potential for local groundwater contamination NW: LSI • Minor increase in runoff volume and pollutant loading potential WL: NI	SW: LSI • Temporary increase in stormwater runoff, erosion, and sedimentation GW: LSI • Increased potential for local groundwater contamination NW: LSI • Minor increase in runoff volume and pollutant loading potential WL: NI	Water Resources: NI
Operation Impacts			
SW: LSI • Increase in stormwater volume and intensity; increase in training-related residual contaminants GW: LSI • Increased potential for local groundwater contamination NW: LSI • Minor increase in runoff volume and pollutant loading potential WL: LSI • Minor increase in pollutant loading potential from expended rounds	SW: LSI • Increase in stormwater volume and intensity; increase in training-related residual contaminants GW: LSI • Increased potential for local groundwater contamination NW: LSI • Minor increase in runoff volume and pollutant loading potential; • increase in training-related residual contaminants WL: LSI • Minor increase in pollutant loading potential from expended rounds	SW: LSI • Increase in stormwater volume and intensity; increase in training-related residual contaminants GW: LSI • Increased potential for local groundwater contamination NW: LSI • Minor increase in runoff volume and pollutant loading potential WL: LSI • Minor increase in pollutant loading potential from expended rounds	Water Resources: NI

Legend: SI-M = Significant impact mitigable to less than significant, LSI = Less than significant impact, NI = No impact, SW = Surface water/stormwater; GW = Groundwater.

Implementation of the alternatives would have the potential to impact the quality and quantity of stormwater runoff, during both the construction and operational phases of the project. Construction and operation would have the potential to cause erosion and sedimentation that could degrade surface water

quality. In addition, the action alternatives would increase the potential for leaks and spills from contaminants. However, a combination of BMPs (refer to Volume 2, Chapter 4, Table 4.2-1), LID measures, and monitoring programs would be implemented as a part of the proposed action to reduce the potential for erosion, runoff, sedimentation, and subsequent water quality impacts. Furthermore, the action alternatives would be implemented in compliance with all federal, local, and military orders, laws, and regulations (refer to Volume 8, Chapter 3, Table 3.1-1) including COMNAV Marianas Instruction 3500.4 and would include the implementation of BMPs, LID, and pollutant monitoring. No buildings/structures would be constructed in the 100-year flood zone.

Under Alternative 1, the Marine Corps would design the proposed Platoon Battle Course to avoid direct impacts to Area C. No direct wetland impacts would occur under Action Alternatives 2 or 3. Alternative 2 has the potential to result in a negligible impact to nearshore water quality due to expended projectiles falling in the nearshore water portion of the SDZ. Under Alternatives 1 and 3, the SDZs would not overlap nearshore waters.

4.2.7 Summary of Proposed Mitigation Measures

No proposed mitigation measures have been identified for Alternatives 1, 2, or 3.

Table 4.2-5. Summary of Proposed Mitigation Measures

Alternative 1	*Alternative 2*	*Alternative 3*
Construction		
• None	• None	• None
Operation		
• None	• None	• None

4.3 LEAST ENVIRONMENTALLY DAMAGING PRACTICABLE ALTERNATIVE (LEDPA)

This section focuses on compliance with the Section 404(b)(1) guidelines of the CWA. Specifically, Section 404(b)(1) of the CWA stipulates that no discharge of dredged or fill material into waters of the U.S., which include wetlands, shall be permitted if there is a practicable alternative which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant environmental consequences. Furthermore, an alternative is considered practicable if it is available and capable of being implemented after taking into consideration cost, existing technology, and logistics in light of overall project purposes. Section 404 permitting is applicable to the proposed training actions on Tinian. Permitting decisions are based on guidelines ("404(b)(1) Guidelines") developed jointly with the USEPA that are now part of the Code of Federal Regulations (40 CFR 230). This analysis is to show that the screening and selection process used in the development of this EIS has identified the *least environmentally damaging practicable alternative* (LEDPA) consistent with the Section 404(b)(1) guidelines.

The discussion below provides a brief comparative summary of the three alternatives carried forward for analysis in this EIS and highlights the reasons why Alternative 1 is considered the LEDPA. The Marine Corps has determined that Alternative 1 is the preferred alternative for the proposed action. Alternative 1 is preferred because it consolidates the ranges in a central location, is located on the terrain that requires the least amount of earthmoving for construction, makes best use of the existing road network to get to and to service the ranges, provides the most flexibility for future expansion, has the least impact on airspace due to centralized/overlapping SDZs, and only closes Broadway access when Platoon Battle Course is being used.

Options for a Range Training Area (RTA) that could accommodate the four proposed ranges (Rifle Known Distance (KD) Range, Automated Combat Pistol Range, Platoon Battle Course, and Field Firing Range) were evaluated on Tinian. Based on planning limitations and constraints at Tinian and the purpose and need for the proposed action at Tinian, this process identified that the RTA would:

- Be located within the MLA
- Compliment, but not conflict with or infringe on, other training activities within the MLA (to the extent practicable)
- Compliment, but not conflict with, other non training activities within MLA including the International Broadcasting Bureau (IBB) property
- Provide controlled access to and through the range areas for safety prior to and during firing
- Be suitable for company level training of approximately 200, but possibly up to 400, personnel that would periodically bivouac (i.e., a temporary camp under little or no shelter) at the RTA

Sections 2.1-2.5 of this Volume provide an overview of the background, planning criteria, proposed action elements, and alternatives. The overall purpose of the proposed actions is to relocate and site military forces within the Western Pacific Region based on U.S. policy, international agreements, and treaties. The rationale for siting the ranges on Tinian is that this is within the MIRC, provides close proximity to Marine Corps units based on Guam, and provides reliable access to training resources.

4.3.1 Alternatives Comparison Summary

4.3.1.1 Alternative 1 (Preferred)

Wetlands Differences

Under Alternative 1, the Marine Corps would design the proposed Platoon Battle Course to avoid direct impacts to wetlands. To minimize potential indirect impacts to Area C during construction, the Marine Corps would implement site-specific BMPs. Therefore, construction activities associated with Alternative 1 would result in less than significant impacts to wetlands.

Terrestrial Biological Resources Differences

Project construction would impact 1.0% of the current Tinian monarch population. The Tinian monarch is a CNMI-listed endangered species. Based on territory densities estimated by USFWS (2009), the number of Tinian monarch territories that would be lost through construction would be 204. Approximately 70 ac (28 ha) of the 936 ac (379 ha) Airport Mitigation Conservation Area would be removed. Direct impacts to the Tinian monarch would be significant. Vegetation that would be removed includes 173 ac (70 ha) of mixed introduced forest and smaller amounts of tangantangan (*Leucaena leucocephala*) and shrub/grassland. About 193 ac (78 ha) of forested habitat would be indirectly impacted.

Cultural Resources Differences

Alternative 1 would have significant adverse direct impacts to 10 NRHP-eligible archaeological resources, indirect impacts to 55 NRHP-eligible archaeological sites in the SDZ and the National Historic Landmark (NHL), and indirect impacts to two NRHP-eligible traditional cultural properties.

Operational Differences

There are no operational differences between the three alternatives.

4.3.1.2 Alternative 2 (LEDPA)

Wetlands Differences

Alternative 2 would not impact any wetland areas.

Terrestrial Biological Resources Differences

Project construction would impact 0.7% of the current Tinian monarch population. Based on territory densities estimated by USFWS (2009), the number of Tinian monarch territories that would be lost through construction would be 149. Approximately 108 ac (44 ha) of the 936 ac (379 ha) Airport Mitigation Conservation Area would be removed. Direct impacts to the Tinian monarch would be significant. Vegetation that would be removed includes 121 ac (49 ha) of mixed introduced forest and smaller amounts of tangantangan (*Leucaena leucocephala*) and shrub/grassland. About 178 ac (72 ha) of forested habitat would be indirectly impacted.

Cultural Resources Differences

Alternative 2 would have significant adverse direct impacts to 10 NRHP-eligible archaeological resources, indirect impacts to 52 NRHP-eligible archaeological sites in the SDZ and the NHL, and indirect impacts to one NRHP-eligible traditional cultural property.

Operational Differences

There are no operational differences between the three alternatives.

4.3.1.3 Alternative 3

Wetlands Differences

Alternative 3 would not impact any wetland areas.

Terrestrial Biological Resources Differences

Project construction would impact 0.9% of the current Tinian monarch population. Based on territory densities estimated by USFWS (2009), the number of Tinian monarch territories that would be lost through construction would be 190. Approximately 82 ac (33 ha) of the 936 ac (379 ha) Airport Mitigation Conservation Area would be removed. Direct impacts to the Tinian monarch would be significant. Vegetation that would be removed includes 155 ac (63 ha) of mixed introduced forest and smaller amounts of tangantangan (*Leucaena leucocephala*) and shrub/grassland. About 213 ac (86 ha) of forested habitat would be indirectly impacted.

Cultural Resources Differences

Alternative 3 would have significant adverse direct impacts to 7 NRHP-eligible archaeological resources, indirect impacts to 55 NRHP-eligible archaeological sites in the SDZ and the NHL, and indirect impacts to two NRHP-eligible traditional cultural properties.

Operational Differences

There are no operational differences between the three alternatives.

4.3.2 Conclusion

Based on the above discussion, Alternative 1 is considered the LEDPA and as previously noted, Alternative 1 is the Marine Corps' preferred alternative. The environmental differences between all three alternatives are small, with the greatest difference being due to potential wetland impacts and impacts to

the CNMI-listed endangered Tinian monarch. Under Alternative 1, the Marine Corps would design the proposed Platoon Battle Course to avoid direct impacts to wetlands. Alternatives 2 and 3 would result in no impacts to the aquatic ecosystem including wetlands. Alternative 2 has fewer impacts to cultural resources, but the differences are small. Alternative 2 has fewer impacts to terrestrial biological resources; however, these differences also are small. Alternative 1 would have less impact to the Airport Mitigation Conservation Area than either Alternatives 2 or 3. Consequently, by adjustment of the Platoon Battle Course, if necessary, to avoid jurisdictional wetlands, Alternative 1 is the LEDPA.

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