

CHAPTER 13.

MARINE BIOLOGICAL RESOURCES

13.1 INTRODUCTION

This chapter contains a discussion of the potential environmental consequences associated with implementing the alternatives within the region of influence (ROI) for this resource. For a description of the affected environment for all resources, refer to the respective chapter of Volume 2. The locations described in Volume 2 include the ROI for the utilities and roadway projects and Volume 2, Chapter 11 includes Marine Biological Resources. See Volume 2, Chapter 16, Section 16.1.6 for a discussion of recreational and traditional fishing and coral reef ecosystem as it relates to the overall increased human population associated with the proposed project.

The analysis contained in this chapter focuses on marine biological resources in both ocean and near-shore waters around Guam. There is some overlap of information in this chapter with analysis and information in Volume 6, Chapter 6, Water Resources. This is because freshwater streams and surface water runoff which is addressed in the Water Resources chapter may eventually make its way to near-shore marine environments. Therefore, both Chapter 13 (Marine Resources) and Chapter 6 (Water Resources) discuss this connection between surface and marine waters.

13.2 ENVIRONMENTAL CONSEQUENCES

13.2.1 Approach to Analysis

13.2.1.1 Methodology

The methodology for identifying, evaluating, and mitigating impacts to marine biological resources was based on federal laws and regulations including the Endangered Species Act (ESA), the Marine Mammal Protection Act (MMPA), Magnuson-Stevens Fishery Conservation and Management Act (M-SA), Clean Water Act (CWA), and Executive Order (EO) 13089, Coral Reef Protection. Significant marine biological resources include all special-status species including species that are ESA-listed as threatened and endangered or candidates for listing under ESA, species protected under the MMPA, or species with designated Essential Fish Habitat (EFH) or Habitat Area of Particular Concern (HAPC) established under the M-SA. The M-SA defines EFH as “...those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.” ‘Waters’ include aquatic areas and their associated physical, chemical, and biological properties that are used by fish. ‘Substrate’ includes sediment, hard bottom, structures underlying the waters, and associated biological communities. ‘Necessary’ means the habitat required to support a sustainable fishery and the managed species’ contribution to a healthy ecosystem, and ‘spawning, breeding, feeding, or growth to maturity’ covers a species’ full life cycle (16 United States Code 1801 et seq.). Additionally, at least one or more of the following criteria established by the National Marine Fisheries Service (NMFS) must be met for HAPC designation: (1) the ecological function provided by the habitat is important; (2) the habitat is sensitive to human-induced environmental degradation; (3) development activities are, or will be, stressing the habitat type; or (4) the habitat type is rare. It is possible that an area can meet one HAPC criterion and not be designated an HAPC. The Western Pacific Regional Fishery Management Council (WPRFMC) used a fifth HAPC criterion, not established by the National Marine Fisheries Service (NMFS), that includes areas that are already protected, such as Overlay Refuges (WPRFMC 2009).

In general, the main intentions of the three federal acts and the EO listed above are as follows:

- The ESA establishes protection over and conservation of threatened and endangered species and the ecosystems upon which they depend, and requires any action that is authorized, funded, or carried out by a federal entity to ensure its implementation would not jeopardize the continued existence of listed species or adversely modify critical habitat.
- The MMPA was established to protect marine mammals by prohibiting take of marine mammals without authorization in U.S. waters and by U.S. citizens on the high seas, and the importation of marine mammals and marine mammal products into the U.S.
- The M-SA requires NMFS and regional fishery management councils to minimize, to the extent practicable, adverse effects to EFH caused by fishing activities. The M-SA also requires federal agencies to consult with NMFS about actions that could damage EFH.
- The CWA is the primary federal law in the U.S. governing water pollution. The act established the goals of eliminating releases to water of high amounts of toxic substances, eliminating additional water pollution, and ensuring that surface waters would meet standards necessary for human sports and recreation.
- EO 13089 mandates preservation and protection of U.S. coral reef ecosystems that are defined as "... those species, habitats and other natural resources associated with coral reefs in all maritime areas and zones subject to the jurisdiction and control of the U.S." This guidance is intended to clarify and reemphasize the protection afforded the Nation's valuable coral reef ecosystems under the CWA Section 404 regulatory program, the Marine Protection, Research, and Sanctuaries Act Sections 102 and 103 provisions, Rivers and Harbors Act Section 10 requirements, and Federal Projects conducted by the USACE.

The ESA, MMPA, and M-SA require that NMFS and/or U.S. Fish and Wildlife Service (USFWS) be consulted when a proposed federal action may adversely affect an ESA-listed species, a marine mammal, EFH or HAPC. In addition, while all habitats are important to consider, 'coral reef ecosystems' are perhaps the most important habitats and the analysis of this special aquatic site (SAS) is included under EFH (see also Volume 2 and 4, chapter 11). SAS are geographic areas, large or small, possessing special ecological characteristics of productivity, habitat, wildlife protection, or other important and easily disrupted ecological values. These areas are generally recognized as significantly influencing or positively contributing to the general overall environmental health or vitality of the entire ecosystem of a region.

Best Management Practices (BMPs) and Protective Measures

The implementation of construction and industrial permit BMPs, Navy Low Impact Development (LID) concept plans and Industrial Management Practices, and general maritime measures in place by DoD is assumed for each resource and anticipated to reduce any construction- and operation-related impacts to marine biological resources. With respect to possible construction impacts on the nearshore marine environment, the implementation and management of such plans would reduce/eliminate any construction-related stormwater runoff into the nearshore environment. The LID concept plan would support master planning activities, and through these joint efforts, a sustainable development strategy would be implemented where pre-construction site hydrology would be equal or nearly equal to post- construction hydrology. Stormwater would be treated for pollutants prior to discharge to the porous ground surface. Volume 6, Chapter 6 contains a more detailed discussion of BMPs and LIDs to be implemented as part of the utilities alternatives, along with a discussion of potential impacts to surface waters (inland waters) and near-shore waters. This chapter focuses on potential impacts to marine waters and the ocean.

A detailed listing of BMPs is provided in Volume 7 of this Environmental Impact Statement.

13.2.1.2 Determination of Significance

This section analyzes the potential for impacts to marine biological resources from implementation of the utilities and roadway alternatives and the no-action alternative. Factors considered in the analysis of potential impacts to marine biological resources include: (1) importance (i.e., legal, commercial, recreational, ecological, or scientific) of the resource; (2) proportion of the resource that would be affected relative to its occurrence in the region; (3) sensitivity of the resource to proposed activities; and (4) duration of ecological ramifications. The factors used to assess significance of the effects to marine biological resources include the extent or degree that implementation of a utility or roadway alternative would result in permanent loss or long-term degradation of the physical, chemical, and biotic components that make up a marine community. The following significance criteria were used to assess the impacts of implementing the alternatives:

- The extent, if any, that the alternative would diminish suitable habitat for a special-status species or permanently lessen designated EFH or HAPC for the sustainment of managed fisheries.
- The extent, if any, that the alternative would disrupt the normal behavior patterns or habitat of a federally listed species, and substantially impede the Navy's ability to either avoid jeopardy or conserve and recover the species.
- The extent, if any, that the alternative would diminish population sizes or distribution of special-status species or designated EFH or HAPC.
- The extent, if any, that the alternative would be likely to jeopardize the continued existence of any special-status species or result in the destruction or adverse modification of habitat of such species or designated EFH or HAPC.
- The extent, if any, that the alternative would permanently lessen physical and ecological habitat qualities that special-status species depend upon, and which partly determines the species' prospects for conservation and recovery.
- The extent, if any, that the alternative would result in a substantial loss or degradation of habitat or ecosystem functions (natural features and processes) essential to the persistence of native flora or fauna populations.

ESA specifically requires agencies not to "jeopardize" the continued existence of any ESA-listed species, or destroy or adversely modify habitat critical to any ESA-listed species. Under Section 7, "jeopardize" means to engage in any action that would be expected to reduce appreciably the likelihood of the survival and recovery of a listed species by reducing its reproduction, numbers, or distribution. Section 9 of the ESA defines "take" as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect.

Effects determinations for EFH assessments are either "no adverse effect on EFH" or "may adversely affect EFH" (WPRFMC 2009). Pursuant to 50 CFR 600.910(a), an "adverse effect" on EFH is defined as any impact that reduces the quality and/or quantity of EFH. Adverse effects to EFH require further consultation if they are determined to be permanent versus temporary (NMFS 1999).

An example of temporary (or short-term) and localized impacts would be the increased barge traffic that may be associated with transport of construction materials. These increases may disturb special-status species and EFH, however as these species are highly mobile and speeds low, disturbances would be short-term and localized in nature. If disturbed by vessel traffic, sea turtles, dolphins, and finfish would likely avoid or leave the area for the duration of the disturbance, and return once the disturbance ceases.

Navy and NMFS EFH consultation is included in Volume 9, Appendix C. To help identify DoD activities falling within the adverse affect definition, the DoD has determined that temporary or minimal impacts

are not considered to “adversely affect” EFH. 50 CFR 600.815(a)(2)(ii) and the EFH Final Rule (67 Federal Register [FR] 2354) were used as guidance for this determination, as they highlight activities with impacts that are more than minimal and not temporary in nature, opposed to those activities resulting in inconsequential changes to habitat. Temporary effects are those that are limited in duration and allow the particular environment to recover without measurable impact (67 FR 2354). Minimal effects are those that may result in relatively small changes in the affected environment and insignificant changes in ecological functions (67 FR 2354). Whether an impact is minimal would depend on a number of factors (NAVFAC Pacific 2009):

- The intensity of the impact at the specific site being affected
- The spatial extent of the impact relative to the availability of the habitat type affected
- The sensitivity/vulnerability of the habitat to the impact
- The habitat functions that may be altered by the impact (e.g., shelter from predators)
- The timing of the impact relative to when the species or life stage needs the habitat

The proposed military relocation would have direct and indirect impacts. The direct impacts generally relate to the demand for utility services and roadways by the military population and facilities. For utilities and roadways, indirect impacts generally relate to population growth outside of the base and the demand that this off base population would have on existing utilities and roads. This population would include workers for the construction of facilities, their dependants, and people who migrate to Guam in response to the economic growth, resulting from the military relocation (induced civilian population growth). The analysis of potential impacts to marine biological resources considers impacts related to utilities and roadways such as the “taking” of special-status species, increased noise, decreased water quality, and lighting impacts resulting from construction or operation activities and sedimentation/siltation of coral reef ecosystems resulting from construction or operational activities. Cumulative impacts are also described in detail in Volume 7 of this EIS.

If marine biological or aquatic resources could be significantly affected by proposed project activities, potential impacts may be reduced or offset through implementation of appropriate BMPs and/or mitigation measures. “Significantly” as used in National Environmental Policy Act (per 43 FR 56003, November 29, 1978; 44 FR 874, January 3, 1979) requires considerations of both context and intensity:

- **Context.** This term means that the significance of an action must be analyzed in several contexts, such as society as a whole (human, national), the affected region, the affected interests, and the locality. Significance varies with the setting of the proposed action. For instance, in the case of a site-specific action, significance would usually depend on the effects in the locale rather than in the world as a whole. Both short- and long-term effects are relevant.
- **Intensity.** This term refers to the severity of impact. Responsible officials must bear in mind that more than one agency may make decisions about partial aspects of a major action. The following should be considered in evaluating intensity:
 - Impacts that may be both beneficial and adverse. A significant effect may exist even if the federal agency believes that on balance the effect would be beneficial.
 - The degree to which the proposed action affects public health or safety.
 - Unique characteristics of the geographic area, such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas.

- The degree to which the effects on the quality of the human environment are likely to be highly controversial.
- The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.
- The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration.
- Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.
- The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.
- The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the ESA of 1973.
- Whether the action threatens a violation of federal, state, or local law or requirements imposed for the protection of the environment.

13.2.1.3 Issues Identified During Public Scoping Process

The following analysis focuses on possible effects to marine biological resources that could be affected by the proposed action. As part of the analysis, concerns relating to marine biological resources that were mentioned by the public, including regulatory stakeholders, during scoping meetings were addressed. A general account of these comments includes the following:

- Potential impacts to endangered species (including nesting habitats), species of concern, and federal trust species such as corals and marine mammals
- Potential impacts on the marine resources from military expansion at all project sites, including removal or disturbance of the marine habitat through decreased water quality
- Impacts to culturally significant marine-related areas for subsistence fishing and beliefs
- Increased land runoff impacting beaches and marine life (erosion and sediment stress)
- Increased anthropogenic factors impacting the coral reef ecosystem

13.2.2 Power

13.2.2.1 Basic Alternative 1 (Preferred Alternative)

The Basic Alternative 1 would recondition existing Guam Power Authority (GPA) Combustion Turbines (CTs) and upgrade Transmission and Distribution (T&D) systems. This work would be undertaken by GPA on its existing permitted facilities and would not require new construction or enlargement of the existing footprint of the facilities. Reconditioning would be made to existing permitted facilities at the Marbo, Yigo, Dededo (2 units), and Macheche CTs. These CTs are currently being used very little and after reconditioning would be available for peaking and reserve power. T&D system upgrades would be on existing above ground and underground transmission lines. This alternative supports Main Cantonment Alternatives 1 and 2 and Main Cantonment Alternatives 3 and 8 would require additional upgrades to the T&D system.

It is anticipated that these units would require general overhaul, capabilities testing, and controlled startup that could take up to 12 months. The amount of reconditioning would not be known until the units are inspected and tested as part of an ongoing study by DoD. Upgrades would also be required to the T&D

system. No direct impact to marine biological resources is expected by this alternative. Potential indirect impacts are described below for each marine resource category. Table 13.2-1 includes seasonally sensitive marine organisms and their known occurrence in the project area.

Table 13.2-1. Sensitive Months for Certain Species within Apra Harbor and Coastal Waters of Naval Computer and Telecommunications Station Finegayan

<i>Species</i>	<i>Status</i>	<i>Location</i>	<i>Months</i>
Green Sea Turtle	ESA-listed, Threatened	see Figure 13.2-1 and Figure 13.2-2	Nesting (Jan – Mar)
Hawksbill Sea Turtle	ESA-listed, Endangered	see Figure 13.2-1 and Figure 13.2-2	Nesting (Apr – Jul)
Green and Hawksbill Sea Turtles	ESA-listed	see Figure 13.2-1 and Figure 13.2-2	Foraging (Jan – Dec)
Adult Bigeye Scad	EFH-CHCRT	see Figure 13.2-1	Jun – Dec
Scalloped Hammerhead	EFH-PHCRT	aircraft carrier turning basin, see Figure 13.2-1	Pupping (Jan – Mar)
Juvenile Fish*	EFH	Sasa Bay and other nearshore environments	Nursery (Jan – Dec)
Hard Corals	EFH-PHCRT	Apra Harbor	Full Moon Spawning (July-Aug)

Note: *Includes barracudas, emperors, goatfishes, groupers, mullets, parrotfishes, puffers, snappers, surgeonfishes, wrasses, and small-toothed whiptails.

Legend: CHCRT = current harvested coral reef taxa; EFH = Essential Fish Habitat; ESA = Endangered Species Act; PHCRT = potentially harvested coral reef taxa.

Construction

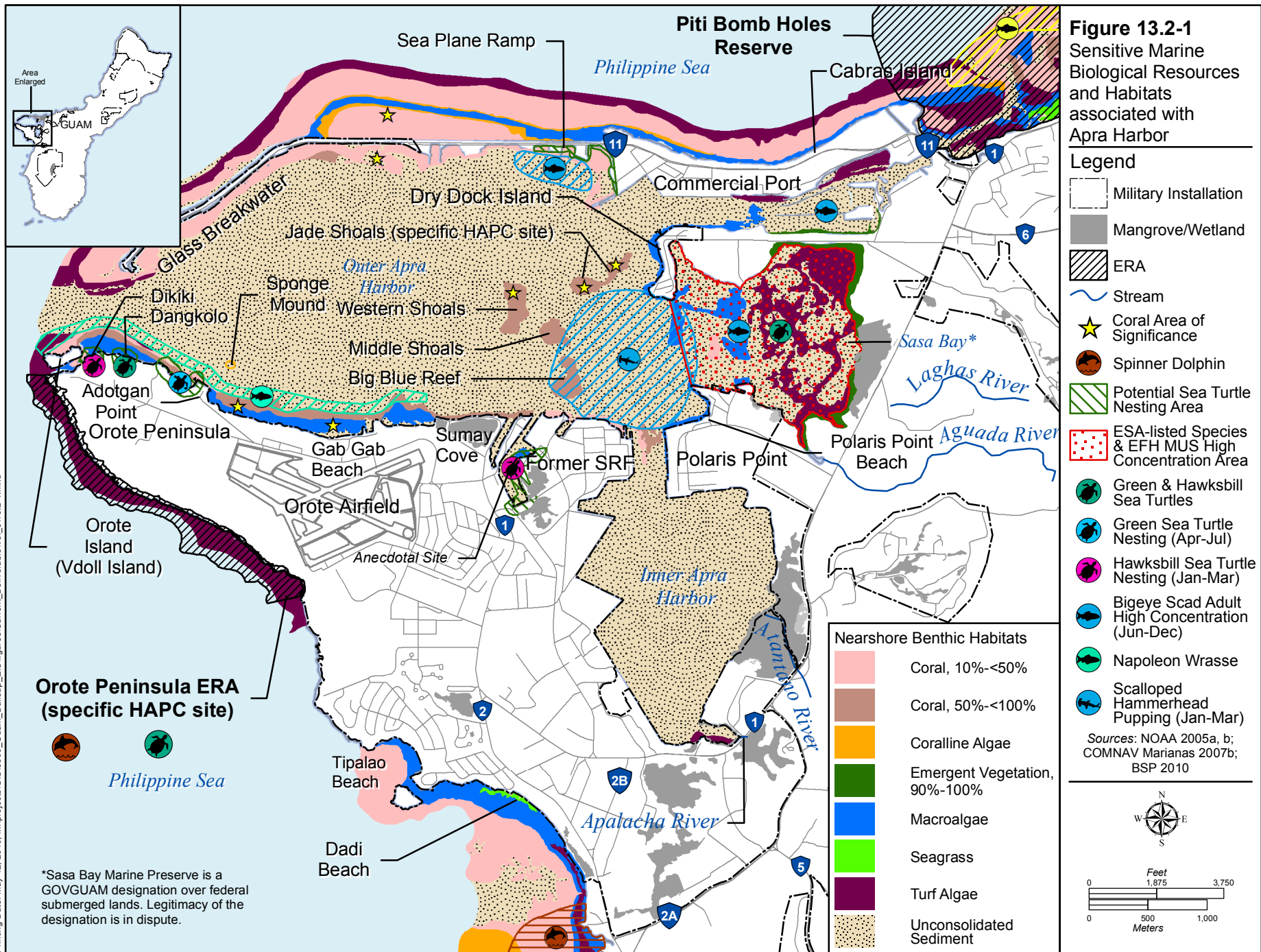
Marine Flora, Invertebrates and Associated EFH

Marine flora, invertebrates, and associated EFH in the project area would not be directly affected by construction activities associated with the Basic Alternative. Upgrades to the power systems, which include construction activities and increased road traffic may lead to temporary decreases in water quality from runoff, but these impacts would be minimized by the use of BMPs and restricted to the duration of the upgrades. Increased barge traffic is not likely to disturb flora or invertebrates. The Basic Alternative would result in temporary and minimal impacts to marine flora and invertebrates, and would have no adverse effect on associated EFH. Therefore, less than significant impacts are anticipated with the implementation of the Basic Alternative.

Essential Fish Habitat

EFH Management Unit Species (MUS) in the project area would not be directly affected by activities associated with the Basic Alternative, and indirect impacts would be minimal. Upgrades to the power systems, which include construction activities and increased road traffic may lead to temporary decreases in water quality from runoff, but these impacts would be minimized by the use of BMPs and restricted to the duration of the upgrades. Increased barge traffic is not likely to disturb EFH. If disturbed by vessel traffic, fish would likely avoid or leave the area for the duration of the disturbance, and return once the disturbance ceases. The sensitive months for seasonally sensitive species identified by NMFS would be taken into account for project activities. EFH would not be disturbed by vessel traffic. Activities associated with the Basic Alternative would result in temporary and minimal impacts to fish, and would have no adverse effect on EFH. Therefore, less than significant impacts are anticipated with the implementation of the Basic Alternative.

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Special-Status Species

Special-status species (sea turtles and dolphins) in the project area would not be directly affected by activities associated with the Basic Alternative, and indirect impacts would be minimal. Upgrades to the power systems, which include construction activities and increased road traffic may lead to temporary decreases in water quality from runoff, but these impacts would be minimized by the use of BMPs and restricted to the duration of the upgrades. Volume 6, Chapter 6 discusses stormwater runoff from construction activities and BMPs to control pollutant runoff in more detail. Increased barge traffic that may be associated with transport of construction materials is not likely to disturb special-status species, as these species are highly mobile. If disturbed by vessel traffic, sea turtles and dolphins would likely avoid or leave the area for the duration of the disturbance, and return once the disturbance ceases. Activities associated with the Basic Alternative may affect, but are not likely to adversely affect sea turtles. No serious injury or mortality of any marine mammal species, specifically spinner and bottlenose dolphins, is reasonably foreseeable and no adverse effects on the annual rates of recruitment or survival of any of the species and stocks is expected with the implementation of the Basic Alternative. Therefore, a less than significant impact is anticipated with the implementation of the Basic Alternative.

Non-native Species

Increased barge traffic associated with refurbishing of power utilities offers the potential for an increase in introductions of non-native invasive species into the project area. Existing U.S. Coast Guard (USCG) and Navy policies regarding hull and ballast water management would be required by vessels. The Navy is developing the Micronesia Biosecurity Plan (MBP) and would implement interim measures designed to reduce the potential of non-native invasive species introductions. Impacts from non-native invasive species would be minimal.

Operation

Marine Flora, Invertebrates, and Associated EFH

Marine flora, invertebrates and associated EFH in the project area would not be directly affected by activities (direct or indirect impacts of the military relocation) associated with the Basic Alternative, and indirect impacts would be minimal. Operation of the power systems may include increased road and or barge traffic involved in supporting maintenance operations, but these impacts are expected to be negligible. Increased entrainment of larvae by the saltwater intake systems at the Tanguisson and Cabra/Piti Power Plants is possible with the increased need for cooling water. However, these increases are anticipated to be minimal and impacts would likely be to a small number of organisms, so negligible. Likewise, increased thermal discharges would be minimal with little effect to the ambient conditions. The Basic Alternative would result in temporary and minimal impacts to marine flora and invertebrates, and would have no adverse effect on associated EFH.

Essential Fish Habitat

EFH MUS in the project area would not be directly affected by activities associated with the Basic Alternative (direct or indirect impacts of the military relocation), and indirect impacts would be minimal. Operation of the power systems may include increased road and or barge traffic involved in supporting maintenance operations, but these impacts are expected to be negligible. Increased barge traffic is not likely to disturb EFH. If disturbed by vessel traffic, fish would likely avoid or leave the area for the duration of the disturbance, and return once the disturbance ceases. The sensitive months for seasonally sensitive species identified by NMFS would be taken into account for project activities. EFH would not be disturbed by vessel traffic. Possible entrainment of larvae by the saltwater intake system is possible,

but impacts would likely be to a small number of organisms, so minimal. The Basic Alternative would result in temporary and minimal impacts to fish, and would have no adverse effect on EFH.

Special-Status Species

Special-status species (sea turtles and dolphins) in the project area would not be directly affected by activities (direct or indirect impacts of the military relocation) associated with the Basic Alternative, and indirect impacts would be minimal. Operation of the power systems may include increased road and or barge traffic involved in supporting maintenance operations, but these impacts are expected to be negligible. Increased barge traffic is not likely to disturb special-status species, as these species are highly mobile. If disturbed by vessel traffic, sea turtles and dolphins would likely avoid or leave the area for the duration of the disturbance, and return once the disturbance ceases. Activities associated with the Basic Alternative may affect, but are not likely to adversely affect sea turtles. No serious injury or mortality of any marine mammal species, specifically spinner and bottlenose dolphins, is reasonably foreseeable and no adverse effects on the annual rates of recruitment or survival of any of the species and stocks is expected with the implementation of the Basic Alternative. Therefore, a less than significant impact is anticipated with the implementation of the Basic Alternative.

Non-native Species

Increased barge traffic associated with operation of power utilities offers the potential for an increase in introductions of non-native invasive species into the project area. Existing USCG and Navy policies regarding hull and ballast water management would be required by vessels. The Navy is developing the MBP and would implement interim measures designed to reduce the potential of non-native invasive species introductions. Impacts from non-native invasive species would be minimal.

Proposed Mitigation Measures

As impacts to marine resources are indirect and temporary, no mitigation measures are identified at this time. The use of BMPs as described in Volume 7 would be implemented as appropriate to avoid and minimize negative impacts to marine resources.

13.2.2.2 Summary of Impacts

Table 13.2-2 summarizes the impacts for Basic Alternative. The induced civilian population growth would have no impacts to marine biological resources since there would be limited construction and no change in operations of the power facilities.

Table 13.2-2. Summary of Potential Power Impacts on Marine Biological Resources

<i>Basic Alternative 1*</i>	
Construction Impacts (direct and indirect impacts are the same)	
LSI	<ul style="list-style-type: none"> • General overall minor indirect impacts from increased road and barge traffic • No adverse effect on special-status species or EFH • Minimal potential for increased introduction of non-native invasive species
Operation Impacts (direct and indirect impacts are the same)	
LSI	<ul style="list-style-type: none"> • General overall minor indirect impacts from increased road and barge traffic and possible larval entrainment in saltwater intake • No adverse effect on special-status species or EFH • Minimal potential for increased introduction of non-native invasive species

*Legend: LSI = Less than significant impact. *Preferred Alternative.*

13.2.3 Potable Water

As discussed in Chapter 2, potable water alternatives are not distinguished as interim or long-term but are basic alternatives that address both interim and long-term potable water demand.

13.2.3.1 Basic Alternative 1 (Preferred Alternative)

Basic Alternative 1 would provide additional water capacity of 11.3 MGd (42.8 MLd), which is anticipated to be met by an estimated 22 new wells at Andersen Air Force Base (AFB), rehabilitate existing wells, interconnect with the Guam Waterworks Authority (GWA) water system, and associated treatment, storage and distribution systems. Two new 2.5 MG (9.5 ML) water storage tanks would be constructed at ground level at NCTS Finegayan. Up to two new elevated 1 MG (3.8 ML) water storage tanks would be constructed at Finegayan within the Main Cantonment footprint.

New Water Supply Facilities

Activities associated with Basic Alternative 1 include constructing up to 22 wells in the Andersen AFB area. Two wells located at the Naval Hospital would be rehabilitated to supplement the local supply and to the Navy island wide water system. Project activities include subgrade construction, cut/fill activities, and brush clearing. No structures would be modified or demolished for this action.

New Water Storage and Distribution Facilities

Many components are associated with the new water storage and distribution facilities for Basic Alternative 1. These include constructing pumps at each well station, installing two treated water transmission mains (including a connection to the GWA system), constructing a network of water distribution pipes on both DoD and non-DoD lands, and installation of one grade level water storage tank at Finegayan. Project activities include tree removal, cut/fill activities, and subgrade construction.

Construction

As described above, project activities planned for the area include subgrade construction, cut/fill activities, and brush clearing that are not directly associated with the marine environment, but may lead to indirect impacts. Potential indirect impacts are described below for each marine resource category. Volume 6, Chapter 6 has a more detailed discussion of control measures that would be used during construction to control pollutants in stormwater runoff.

Marine Flora, Invertebrates and Associated EFH

Marine flora, invertebrates and associated EFH in the project area would not be directly affected by activities (direct or indirect impacts of the military relocation) associated with Basic Alternative 1, and indirect impacts would be minimal. Upgrades to the potable water systems, which include construction activities and increased road traffic may lead to temporary decreases in water quality from runoff, but these impacts would be minimized by the use of BMPs and restricted to the duration of the upgrades. Volume 6, Chapter 6 has a more detailed discussion of BMPs that would be used during construction to control pollutants in stormwater runoff. Increased vessel traffic related to the delivery of construction materials is not likely to disturb marine flora or invertebrates. Basic Alternative 1 would result in temporary and minimal impacts to marine flora and invertebrates, and would have no adverse effect on associated EFH.

Essential Fish Habitat

EFH MUS in the project area would not be directly affected by activities (direct or indirect impacts of the military relocation) associated with Basic Alternative 1, and indirect impacts would be minimal.

Upgrades to the potable water systems, which include construction activities and increased road traffic may lead to temporary decreases in water quality from runoff, but these impacts would be minimized by the use of BMPs and restricted to the duration of the upgrades. Volume 6, Chapter 6 has a more detailed discussion of BMPs that would be used during construction to control pollutants in stormwater runoff. Increased vessel traffic related to the delivery of construction materials is not likely to disturb fish and associated EFH. If disturbed by vessel traffic, fish would likely avoid or leave the area for the duration of the disturbance, and return once the disturbance ceases. The sensitive months for seasonally sensitive species identified by NMFS would be taken into account for project activities. EFH would not be disturbed by vessel traffic. Basic Alternative 1 would result in temporary and minimal impacts to fish, and would have no adverse effect on EFH.

Special-Status Species

Special-status species (sea turtles and dolphins) in the project area would not be directly affected by activities (direct or indirect impacts of the military relocation) associated with Basic Alternative 1, and indirect impacts would be minimal. Upgrades to the potable water systems, which include construction activities and increased road traffic may lead to temporary decreases in water quality from runoff, but these impacts would be minimized by the use of BMPs and restricted to the duration of the upgrades. Volume 6, Chapter 6 has a more detailed discussion of BMPs that would be used during construction to control pollutants in stormwater runoff. Increased vessel traffic related to the delivery of construction materials is not likely to disturb special-status species, as these species are highly mobile. If disturbed by vessel traffic, sea turtles and dolphins would likely avoid or leave the area for the duration of the disturbance, and return once the disturbance ceases. Activities associated with Basic Alternative 1 may affect, but are not likely to adversely affect sea turtles. No serious injury or mortality of any marine mammal species, specifically spinner and bottlenose dolphins, is reasonably foreseeable and no adverse effects on the annual rates of recruitment or survival of any of the species and stocks is expected with the implementation of Basic Alternative 1. Therefore, a less than significant impact is anticipated with the implementation of Basic Alternative 1.

Non-native Species

Increased vessel traffic associated with construction of potable water infrastructure offers the potential for an increase in introductions of non-native invasive species into the project area. Existing USCG and Navy policies regarding hull and ballast water management would be required by vessels. The Navy is developing the MBP and would implement interim measures designed to reduce the potential of non-native invasive species introductions. Interim measures may include incorporating into contractual agreements with vessels chartered to support the criteria specific to the military relocation to ensure low levels of biofouling and ballast water management. Impacts from introductions of non-native marine species would be minimal and limited to the construction phase of the proposed action.

Operation

Marine Flora, Invertebrates and Associated EFH

Marine flora, invertebrates and associated EFH in the project area would not be directly affected by activities (direct or indirect impacts of the military relocation) associated with Basic Alternative 1, and indirect impacts would be minimal. Operation of the potable water systems may include discharge of water to the ground involved in supporting maintenance operations, but these discharges are unlikely to reach marine waters, and if they do impacts are expected to be negligible. Basic Alternative 1 would

result in no impacts to marine flora and invertebrates, and would have no adverse effect on associated EFH.

Essential Fish Habitat

EFH MUS in the project area would not be directly affected by activities (direct or indirect impacts of the military relocation) associated with Basic Alternative 1, and indirect impacts would be minimal. Operation of the potable water systems may include discharge of water to the ground involved in supporting maintenance operations, but these discharges are unlikely to reach marine waters, and if they do impacts are expected to be negligible. Basic Alternative 1 would result in no impacts to this resource, and therefore have no adverse effect on EFH.

Special-Status Species

Special-status species (sea turtles and dolphins) in the project area would not be directly affected by activities (direct or indirect impacts of the military relocation) associated with Basic Alternative 1, and indirect impacts would be minimal. Operation of the potable water systems may include discharge of water to the ground involved in supporting maintenance operations, but these discharges are unlikely to reach marine waters, and if they do impacts are expected to be negligible. Activities associated with Basic Alternative 1 would have no effect on ESA-listed sea turtles or any marine mammal species. Therefore, no impacts are anticipated to special-status species with the implementation of Basic Alternative 1.

Non-native Species

Since non-native marine species are associated with vessel hulls and discharges, and vessel traffic is not associated with the operation of the potable water system, then there would be no impacts related to the introduction of non-native marine species.

Proposed Mitigation Measures

As impacts to marine resources are indirect and temporary, no mitigation measures are identified at this time. The use of BMPs as described in Volume 6, Chapter 6 and summarized in Volume 7 would be implemented as appropriate to avoid and minimize negative impacts to marine resources. The Navy is developing the MBP and is implementing interim measures to reduce the likelihood of potentially invasive marine organisms.

13.2.3.2 Basic Alternative 2

Basic Alternative 2 would provide additional water capacity of 11.7 MGd (44.3 MLd), which is anticipated to be met by an estimated 20 new wells at Andersen Air Force Base (AFB) and 11 new wells at Air Force Base Barrigada, rehabilitate existing wells, interconnect with the Guam Waterworks Authority (GWA) water system, and associated treatment, storage and distribution systems. Two new 1.8 MG (6.8 ML) water storage tanks would be constructed at ground level at NCTS Finegayan and one 1 MG (3.8 ML) water storage tank would be construction at Air Force Base Barrigada. Up to two new elevated 1 MG (3.8 ML) water storage tanks would be constructed at Finegayan within the Main Cantonment footprint.

New Water Supply Facilities

Activities associated with Alternative 2 are the same as for Basic Alternative 1 for the new water supply facilities. Impacts to the areas include subgrade construction, cut/fill activities, and brush clearing.

New Water Storage and Distribution Facilities

Many components are associated with the new water storage and distribution facilities for Basic Alternative 2. These include constructing pumps at each well station, installing two treated water transmission mains (including a connection to the GWA system), constructing a network of water distribution pipes on both DoD and non-DoD lands, and two grade level water storage tanks (one at Finegayan and one at Air Force Barrigada). Impacts to the areas include tree removal, cut/fill activities, and subgrade construction.

Volume 6, Chapter 2 figures provide the proposed project locations in relation to the marine environment on Andersen AFB, Finegayan, Andersen South, and Barrigada. Due to the large distance from shore, this alternative and its actions are not directly associated with the marine environment.

As described above, project activities planned for the area include subgrade construction, cut/fill activities, and brush clearing that are not directly associated with the marine environment, but may lead to indirect impacts. Potential indirect impacts are described below for each marine resource category.

Construction

Marine Flora, Invertebrates and Associated EFH

Marine flora, invertebrates and associated EFH in the project area would not be directly affected by activities (direct or indirect impacts of the military relocation) associated with Basic Alternative 2, and indirect impacts would be minimal. Upgrades to the potable water systems, which include construction activities and increased road traffic may lead to temporary decreases in water quality from runoff, but these impacts would be minimized by the use of BMPs and restricted to the duration of the upgrades. Volume 6, Chapter 6 has a more detailed discussion of BMPs that would be used during construction to control pollutants in stormwater runoff. Increased vessel traffic related to the delivery of construction materials is not likely to disturb marine flora or invertebrates. Basic Alternative 2 may result in temporary and minimal impacts to marine flora and invertebrates, and would have no adverse effect on associated EFH. Therefore, less than significant impacts are anticipated with the implementation of Basic Alternative 2.

Essential Fish Habitat

EFH MUS in the project area would not be directly affected by activities (direct or indirect impacts of the military relocation) associated with Basic Alternative 2, and indirect impacts would be minimal. Upgrades to the potable water systems, which include construction activities and increased road traffic may lead to temporary decreases in water quality from runoff, but these impacts would be minimized by the use of BMPs and restricted to the duration of the upgrades. Volume 6, Chapter 6 has a more detailed discussion of BMPs that would be used during construction to control pollutants in stormwater runoff. Increased vessel traffic related to the delivery of construction materials is not likely to disturb EFH MUS. If disturbed by vessel traffic, fish would likely avoid or leave the area for the duration of the disturbance, and return once the disturbance ceases. The sensitive months for seasonally sensitive species identified by NMFS would be taken into account for project activities. EFH would not be disturbed by vessel traffic. Basic Alternative 2 would result in temporary and minimal impacts to fish, and would have no adverse effect on EFH.

Special-Status Species

Special-status species (sea turtles and dolphins) in the project area would not be directly affected by activities (direct or indirect impacts of the military relocation) associated with Basic Alternative 2, and

indirect impacts would be minimal. Upgrades to the potable water systems, which include construction activities and increased road traffic may lead to temporary decreases in water quality from runoff, but these impacts would be minimized by the use of BMPs and restricted to the duration of the upgrades. Volume 6, Chapter 6 has a more detailed discussion of BMPs that would be used during construction to control pollutants in stormwater runoff. Increased vessel traffic related to the delivery of construction materials is not likely to disturb special-status species, as these species are highly mobile. If disturbed by vessel traffic, sea turtles and dolphins would likely avoid or leave the area for the duration of the disturbance, and return once the disturbance ceases. Activities associated with Basic Alternative 2 may affect, but are not likely to adversely affect sea turtles. No serious injury or mortality of any marine mammal species, specifically spinner and bottlenose dolphins, is reasonably foreseeable and no adverse effects on the annual rates of recruitment or survival of any of the species and stocks is expected with the implementation of Basic Alternative 2. Therefore, a less than significant impact is anticipated with the implementation of Basic Alternative 2.

Non-native Species

Although temporary, increased vessel traffic under Basic Alternative 2 offers the potential for an increase in introductions of non-native species into the project area during the construction phase. Existing hull and ballast water management programs, along with the development of the MBP and implementation of interim biosecurity measures would minimize and avoid the potential introduction of non-native invasive species. Therefore, activities associated with Basic Alternative 2 are expected to have minimal impacts with respect to the introduction of non-native marine species.

Operation

Marine Flora, Invertebrates and Associated EFH

Marine flora, invertebrates and associated EFH in the project area would not be directly affected by activities (direct or indirect impacts of the military relocation) associated with Basic Alternative 2, and indirect impacts would be minimal. Operation of the potable water systems may include discharge of water to the ground involved in supporting maintenance operations, but these discharges are unlikely to reach marine waters, and if they do impacts are expected to be negligible. Basic Alternative 2 would result no impacts to marine flora and invertebrates, and would have no adverse effect on associated EFH.

Essential Fish Habitat

EFH MUS in the project area would not be directly affected by activities (direct or indirect impacts of the military relocation) associated with Basic Alternative 2, and indirect impacts would be minimal. Operation of the potable water systems may include discharge of water to the ground involved in supporting maintenance operations, but these discharges are unlikely to reach marine waters, and if they do impacts are expected to be negligible. Basic Alternative 2 would result in no impacts to fish, and would have no adverse effect on EFH.

Special-Status Species

Special-status species (sea turtles and dolphins) in the project area would not be directly affected by activities (direct or indirect impacts of the military relocation) associated with Basic Alternative 2, and indirect impacts would be minimal. Operation of the potable water systems may include discharge of water to the ground involved in supporting maintenance operations, but these discharges are unlikely to reach marine waters, and if they do impacts are expected to be negligible. Activities associated with the

Basic Alternative 2 would have no effect on ESA-listed sea turtles or any marine mammal species. Therefore, no impacts are anticipated with the implementation of Basic Alternative 2.

Non-native Species

Since potentially invasive non-native marine species are associated with vessel hulls and discharges, and vessel traffic is not associated with the operation of the potable water system, then there would be no impacts related to introduction of non-native marine species.

13.2.3.3 Summary of Impacts

Table 13.2-3 summarizes the impacts. A text summary is provided below.

Table 13.2-3. Summary of Potential Impacts to Marine Biological Resources- Potable Water

<i>Basic Alternative 1*</i>	<i>Basic Alternative 2</i>
Construction Impacts (direct and indirect impacts are the same)	
LSI <ul style="list-style-type: none"> • General overall minor indirect impacts from increased road and barge traffic • No adverse effect on special-status species or EFH • Minimal potential for increased introduction of non-native invasive species 	LSI <ul style="list-style-type: none"> • General overall minor indirect impacts from increased road and barge traffic • No adverse effect on special-status species or EFH • Minimal potential for increased introduction of non-native invasive species
Operation Impacts (direct and indirect impacts are the same)	
NI <ul style="list-style-type: none"> • Discharge to ground during maintenance activities • No adverse effect on special-status species or EFH • No potential for increased introduction of non-native invasive species 	NI <ul style="list-style-type: none"> • Discharge to ground during maintenance activities • No adverse effect on special-status species or EFH • No potential for increased introduction of non-native invasive species

Legend: EFH = Essential Fish Habitat; LSI = Less than significant impact.

*Preferred Alternative.

Basic Alternatives 1 and 2 do not have construction or operation-related actions that are associated with the marine environment; however, there would be an associated increase in barge traffic into Apra Harbor carrying construction- and operation-related materials. There is small potential for runoff to reach the marine environment. The induced civilian population growth would have no impacts to marine biological resources since there is limited construction or change in operations. Alternatives 1 and 2 would result in less than significant impacts to marine biological resources.

13.2.4 Wastewater

13.2.4.1 Basic Alternative 1a (Preferred Alternative) and 1b

As described in Section 3.2.4.1 Basic Alternative 1 (Alternative 1a supports Main Cantonment Alternatives 1 and 2; Alternative 1b supports Main Cantonment Alternatives 3 and 8), combining upgrades to the existing primary treatment facilities and expansion to secondary treatment at the Northern District Wastewater Treatment Plant (NDWWTP). The difference between Alternatives 1a and 1b is a requirement for a new sewer line from proposed DoD housing at Barrigada to NDWWTP for Alternative

1b. For both alternatives, industrial wastewater generated on DoD properties would be pretreated in accordance with a local DoD pretreatment program that uses standard industry practices, or with a GWA pretreatment program once one is established, before discharging wastewater to the sanitary sewer system.

Basic Alternative 1a

Construction

The land-based construction has the potential for temporary increases in sediment laden stormwater, which may impact near shore waters. However, as described and evaluated in Volume 6, Chapter 6 Section 6.2.4, National Pollutant Discharge Elimination System (NPDES) permits, requiring construction Stormwater Pollution Prevention Plans (SWPPPs) and associated BMPs would reduce or eliminate discharge from the site. Special-status species (sea turtles and dolphins) and the EFH would not be directly affected by construction activities. Increased vessel traffic associated with the delivery of construction materials is not likely to disturb special-status species and EFH, as these species are highly mobile and barges are slow moving. Although temporary, increased construction-related vessel traffic offers the potential for an increase in introductions of non-native invasive species into the project area. Existing Navy hull and ballast water policies and the implementation of a MBP would avoid introducing non-native invasive species.

The Navy is developing the MBP and would implement interim biosecurity measures to reduce the likelihood of introducing and spreading invasive marine organisms. Some example BMPs may include clarifying biosecurity requirements for all Navy vessels (including chartered MSC ships), improving hull husbandry documentation, and incorporating into contractual agreements with vessels chartered to support the military-relocation specific criteria to ensure low levels of biofouling and ballast water management.

Alternative 1 construction impacts would be less than significant to marine biological resources, and would have no adverse effects on EFH.

Operation

As stated in Chapter 2, the proposed military relocation on Guam would be potentially located at Andersen AFB, NCTS Finegayan, South Finegayan, Andersen South, Barrigada, and Naval Base Guam at Apra Harbor. These areas are currently serviced by wastewater treatment plants owned by the Guam Water Authority (GWA) and the Navy. Of these plants, two are considered as alternative locations for wastewater treatment for the discharges directly associated with the military buildup, which includes wastewater from the DoD population and new facilities on DoD property. These are GWA's Northern District Wastewater Treatment Plant (NDWWTP) and Navy's Apra Harbor WWTP. Figure 2.3-1 shows the locations of these wastewater treatment plants that could receive wastewater from the direct DoD populations that would result from the military relocation.

The construction workforce was assumed to make up two-thirds of the residents in North Guam and one-third in Central Guam, while induced civilian population growth was assumed to make up 38 percent (%) of the population on North Guam, 43% of Central Guam, and 19% of South Guam, as estimated by the socioeconomic analysis. The NDWWTP and the Hagatna WWTP are expected to treat the vast majority of the increased wastewater flows that would be generated by the temporary construction workforce and the induced civilian population, based on these predictions of where these populations would reside. Other GWA wastewater treatment facilities are on Guam that are not in the proposed military relocation area, but would be indirectly affected by the relocation-induced civilian population growth. These

facilities are located among scattered communities in South Guam and include Agat–Santa Rita WWTP, Baza Gardens WWTP, Umatac-Merizo WWTP, and Inarajan WWTP. Descriptions of all these wastewater systems are provided in Chapters 2 and 3 of this Volume. The United States Department of Justice (DOJ) filed a civil suit against GWA and the GovGuam in December 2002 for failure to comply with the Safe Drinking Water Act (SDWA) and the Clean Water Act (CWA) (*U.S. versus Guam Waterworks Authority*, Civil No. 02-00035 (D. Guam)). A Stipulated Order (SO) for Preliminary Relief was entered in June 2003. Subsequently, the parties agreed to two modifications of the SO. The second amended SO was entered by the court in October 2006. The parties viewed the SO as the most appropriate way to require GWA to immediately implement short-term projects to address GWA's compliance with the CWA and SDWA. The SO indicates that the parties contemplate entering into a further stipulation to address additional compliance issues after GWA's completion of the initial planning measures set out in the SO. The SO requires the following steps:

- Construction of a new ocean outfall at the Hagatna WWTP by January 1, 2008
- Construction of a new ocean outfall at the NDWWTP by January 1, 2009
- Implementation of corrective actions to restore primary treatment to the original design operational capacity at the Hagatna WWTP and the NDWWTP by March 2, 2007
- Implementation of corrective actions to restore operational capacity at the Hagatna Main Sewage Pump Station (SPS) by March 2, 2007
- Implementation of corrective actions to stop overflows of raw sewage from the Hagatna Main SPS, including development of an implementation schedule
- Assessment of the Chaot Wastewater Pump Station and sewer collection and conveyance system, including development of an implementation schedule
- Renovation and/or Expansions of Agat, Baza Gardens, and Umatac-Merizo WWTPs

As part of compliance with the SO, the GWA submitted the WRMP in 2007. The WRMP lists the following goals:

- Institute sound asset management and capital planning.
- Develop a foundation for sound management, operations, and maintenance and financial planning.
- Engage the customer and achieve the appropriate level of service.
- Achieve long-term resource sustainability.
- Establish a road map for full regulatory compliance.

Direct Impacts

NDWWTP

The NDWWTP is a primary treatment plant that is owned by the GWA and operated by Veolia under contract with the GWA. The treatment plant treats wastewater flows from civilian populations and DoD installations that are located in North Guam. Andersen AFB, NCTS Finegayan, and South Finegayan contribute wastewater flows to the NDWWTP.

The NDWWTP could potentially receive the majority of wastewater flows from the direct DoD population that would result from the military relocation. It could also potentially receive a portion of the wastewater flows from the indirect construction workforce population and the induced civilian population. The NDWWTP is a GWA plant that services the areas where much of the direct military relocation would occur. The GWA holds an NPDES permit for the NDWWTP, which was issued by USEPA Region 9 in June 1986. The NDWWTP discharges to the Philippine Sea through an offshore

ocean outfall. The ocean outfall is designed with a diffuser that has discharge ports to disperse the effluent into the ocean; however, the diffuser is currently out of service, having not been installed at the time of recent outfall upgrades due to a design deficiency.

The NPDES permit for the NDWWTP expired in 1991. Since that time USEPA Region 9 administratively extended the permit. The permit contained a variance that allows plant to utilize only primary treatment processes instead of more advanced treatment processes that are typically required for sewage treatment plants. Primary treatment refers to sewage treatment that uses physical separation of solid material from the waste stream prior to discharge to a water body. More advanced treatment, called secondary treatment, provides for removal of organic matter and pollutants in sewage beyond what can be removed in primary treatment plants, typically by using bacteria as a means to digest and remove wastes. Secondary treatment variances are allowed under Section 301(h) of the Clean Water Act. Sewage treatment facilities that are granted a 301(h) secondary treatment variance must demonstrate that their discharge does not have an adverse impact on the environment or on water quality. They must also demonstrate that they adequately control industrial wastes that could enter the plant, and they must meet minimum standards for pollutants removal efficiencies in their treatment processes.

On September 30, 2009, USEPA Region 9 made a decision to deny the secondary treatment variance for the NDWWTP, which effectively requires the GWA to install full secondary treatment at the plant. The GWA has formally challenged USEPA's decision to deny the secondary variance, so it is unclear at this time if secondary treatment would be required at the NDWWTP. However, the alternatives presented in this EIS were adjusted to recognize this secondary variance denial and reflect the potential future need for secondary treatment plant upgrades for all alternatives evaluated by providing a phased approach to upgrading the plant. This is discussed in detail in Chapter 2 and 3 of this Volume.

The Navy conducted a study to evaluate potential impacts on water quality and the marine environment from the GWA NDWWTP, a primary treatment plant. The study, *Northern District Wastewater Treatment Outfall Assessment* (NAVFAC Pacific 2009), is located in Volume 9, Appendix K, and was used to assess the magnitude and duration of potential impacts to marine resources. Pertinent data and information from the draft study was used in this Environmental Impact Statement, along with other available information, to evaluate the water quality and marine environment impacts in this chapter. The study assesses impacts to the receiving marine environment resulting from the primary and secondary treatment and disposal of wastewater, including additional wastewater loadings associated with the military relocation on Guam.

Based on current conditions of the existing primary treatment processes, the NDWWTP would need to be refurbished and upgraded to restore its original design capacity and treatment capability of 12 MGd (45 MLd) average flow to meet the projected flows shown in Chapter 2. Also, an enforcement order is being developed between the GWA and USEPA Region 9 that would include provisions to allow increased average daily flows of 12 MGd (45 MLd) and maximum daily flows of 27 MGd (102 MLd) to accommodate the projected ultimate flow from the planned Marine Corps relocation at the completion of relocation for Main Cantonment Alternatives 1 and 2. Currently the NPDES permit allows only a 6 MGd (23 MLd) flow at the plant discharge, even though the plant design flow is 12 MGd (45 MLd). The DoD, as part of the military relocation to Guam, proposes to refurbish and upgrade the NDWWTP through a Special Purpose Entity (for more detail see Volume 6, Chapter 2). The proposed refurbishment and upgrades would improve the quality of the plant effluent and assist in meeting coastal water quality standards.

According to the USEPA Clean Water Act Section 301(h) waiver denial (USEPA 2009), the existing NDWWTP primary treatment plant is removing Biochemical Oxygen Demand (BOD) and Total

Suspended Solids (TSS) at only approximately 30% efficiency, while the plant was designed for 50–75% and 40–60% removal efficiencies for TSS and BOD respectively.

Table 13.2-4 shows the existing actual end-of-pipe pollutant concentrations of the effluent from the NDWWTP primary treatment plant based on results of the Navy's outfall assessment study (NAVFAC Pacific 2009), which shows that the plant is operating at approximately 50% of its intended removal capacity as originally designed (USEPA 2009). Table 13.2-4 also shows the estimated primary treatment plant effluent pollutant concentrations after the proposed DoD refurbishment based on the original design removal efficiency and shows the predicted effluent pollutant concentrations after secondary treatment upgrades (NAVFAC Pacific 2009). Using the data and estimates of pollutant removal concentrations from the USEPA Clean Water Act Section 301(h) waiver denial (USEPA 2009), effluent pollutant concentrations for Basic Alternative 1a after plant refurbishment and upgrades would result in pollutant concentrations reduced by approximately half of the current concentrations. A more conservative 40% increase in removal efficiency versus 50% per original design was assumed when calculating these predicted pollutant concentrations. The NDWWTP plant is designed to discharge plant effluent to the marine environment through an offshore ocean diffuser; however, this diffuser is not currently in service. Were the outfall diffuser in service, concentrations in the marine environment would be even lower than shown in the table. Because the diffuser is not currently in service the pollutant concentrations in the effluent were compared directly against Guam instream marine Water Quality Standards (GWQS) in Table 13.2-4.

Table 13.2-4. Comparison of Baseline, Estimate Primary and Modeled Secondary Treatment Effluents at NDWWTP Based on Projected Flows

Constituents Regulated by the GWQS	Units	Primary Treatment		Secondary Treatment Basic Alternative 1a (Year 2015)
		Baseline (No-Action Alternative) Effluent	Basic Alternative 1a (Year 2011-2012) Effluent*	Effluent
Enterococcus	MPN/100 ML	240,000	144,000	15
Turbidity	NTU	59	35	16
TSS	µg/L	80,000	48,000	9,000
Ortho-P	µgP/L	2,620	1,570	1,640
Ammonia	µgN/L	18,400	11,040	3,500
Total Nitrogen	µgN/L	47,600	28,560	23,950
Total Phosphorus	µgP/L	3,850	2,310	3,760

Legend: GWQS = Guam Water Quality Standards; ML = million liters; MPN = most probable number; NTU = Nephelometric Turbidity Unit; TSS = total suspended solids; µg/L = microgram per liter; N = Nitrogen; P = phosphorus; * estimated concentration values based on a conservative 40% increase in primary treatment plant removal efficiency (i.e. NDWWTP operating at designed removal rates after DoD refurbishing).

Environmental and biological impact assessments were also performed as part of the Navy's outfall assessment study (NAVFAC Pacific 2009). Parameters used to assess the environmental impacts on the receiving marine waters, aside from those in Section 13.2.1, include:

- Comparison with the GWQS
- Effects to 303(d) impaired waters
- Potential effects to the ecological life and environment of the receiving marine waters

Navy Apra Harbor WWTP

The Apra Harbor WWTP is a secondary treatment facility designed to treat an average daily flow of 4.3 MGd (16 MLd) and a peak flow of 9 MGd (34 MLd). The treatment plant currently receives an average daily flow of approximately 2.9 MGd (11 MLd). Treated effluent is discharged through an ocean outfall into Tupalao Bay under NPDES Permit No. GU0110019. This permit authorizes the Apra Harbor WWTP to discharge an average monthly flow of 4.3 MGd (16.3 MLd). The Navy-owned outfall also discharges effluent from the GWA Agat–Santa Rita WWTP (NPDES Permit No. GU0020222).

Proposed increases in the DoD population in the Apra Harbor area would increase the wastewater flow to the Apra Harbor WWTP by about 0.79 MGd (2.99 MLd), for a total projected flow of 3.69 MGd (13.96 MLd). This increase would occur when proposed transient ships would be in port, thus would not be a full time demand. This is within the design capacity and permit limits; therefore, no additional wastewater treatment capacity would be needed at the Apra Harbor WWTP, and no changes to the NPDES permit would be necessary. See Chapter 3 for additional information.

Indirect Impacts

Hagatna WWTP

The Hagatna WWTP is a primary treatment plant that is owned and operated by the GWA. The treatment plant treats wastewater flows from civilian populations and DoD lands that are located in Central Guam. Navy and Air Force Barrigada, the Naval Hospital, and DoD lands located in the Nimitz Hill area contribute wastewater flows to the Hagatna WWTP.

The Central Guam sewer collection system that conveys sewage to the Hagatna WWTP has several capacity limitations, which create periodic overflows during high flow conditions. To alleviate the problem, in 2008 the GWA issued a moratorium that limits development and new sewer connection, which was lifted in early 2009 based on planned improvements to the collection system to address sewer-line capacity issues. The Hagatna WWTP is designed to treat an average daily flow of 12.0 MGd (45.4 MLd) and a peak flow of 21 MGd (79 MLd). Communication with GWA has indicated that the current average daily flow to the Hagatna WWTP from civilian and military sources is approximately 4.4 MGd (16.6 MLd) (GWA 2008). Treated effluent is discharged from the WWTP through a newly constructed 42-inch (in) (107-centimeter [cm]) outfall into Agana Bay approximately 2,178 feet (ft) (664 meters [m]) offshore at a depth of approximately 275 ft (84 m) under a USEPA-administrated permit (NPDES Permit No. GU0020087) that expired on June 30, 1991. The permit contained a 301(h) variance allowing for less than secondary treatment and authorized the Hagatna WWTP to discharge a maximum daily flow of 12 MGd (45.4 MLd). The GWA failed to provide sufficient information for the USEPA to conclude that the GWA permit renewal application met the 301(h) criteria. As a result, USEPA issued a tentative decision on April 4, 1997, denying the reissuance of a 301(h) variance to the GWA. The GWA revised the permit renewal applications by installing a new extended outfall. The new outfall for the Hagatna WWTP was put into service in December 2008 and the Hagatna WWTP was refurbished in 2007 to restore its original designed capacity. Based on plant operation performance and data provided by the GWA on the actual effluent quality, the USEPA denied the GWA's application for a renewed variance from full secondary treatment on September 30, 2009, and concluded that the CWA 301(h) criteria have not been met at the Hagatna WWTP.

Plant effluent quality has improved since the plant was refurbished, but problems with elevated TSS in the discharge remain due to the processing of septage wastes at the plant and the need for improved

operator training. Needed upgrades to the plant to alleviate the problems are not part of the DoD proposed action.

GWA Southern Wastewater Treatment Plants

Four small GWA WWTPs (i.e., Agat-Santa Rita WWTP, Baza Gardens WWTP, Umatac-Merizo WWTP, and Inarajan WWTPs) and their sewer collection systems in Southern Guam would be affected by the proposed military relocation from the indirect population growth from induced civilian growth in their service regions. Figure 13.2-3 shows the locations of these plants. Based on a socioeconomic analysis, 19% of the induced civilian population growth could locate to Southern Guam, increasing wastewater flows to these GWA southern WWTPs (see Table 13.2-5). According to the GWA, these treatment facilities do not comply with their effluent NPDES permits and/or other operational requirements due to inadequate treatment capacity, deterioration of equipments, and lack of maintenance. Also, the sewer collection systems for all of these facilities currently experience overloading, resulting in sewage overflows. See Chapter 3 in this Volume for additional information on these WWTPs.

As shown in Table 13.2-5, the induced population would result in only a slight increase to wastewater flows to the southern treatment plants. Two of the treatment plants, Umatac-Merizo WWTP and Inarajan WWTP, do not discharge to surface waters but percolate into the ground. Therefore, these plants are not expected to affect the marine environment and are not evaluated further in this Chapter.

One of the treatment plants, Agat-Santa Rita WWTP, discharges to the Philippines Sea through a combined ocean outfall shared with the Navy's Apra Harbor WWTP. The other plant, Baza Gardens WWTP, discharges to surface waters. Although these treatment facilities in South Guam generally have inadequate treatment capacity, deterioration of equipment, bypassing of treatment processes, and lack of maintenance, the small increase of wastewater flow to these plants from the induced population is inconsequential and would not be expected to affect current plant removal efficiencies. See Volume 6, Chapter 3 for more information.

Table 13.2-5. Wastewater Treatment Plants in Southern Guam and the Associated Induced Population Growths and Waste Water Flows

WWTPs	Discharge Method	*Current WW Flow	Year 2014			Year 2019		
			Induced Population Growth	*WW Flow generated by Induced growth	Increased WW Flows	Induced Population Growth)	*WW Flow generated by Induced growth	Increased WW Flows
			8,797			2,375		
Agat-Santa Rita	Ocean Outfall	1.81/6.85	1602			432		
Baza Garden	Surface River	0.5/1.89	440	0.053/0.201	11%	119	0.014/0.053	3%
Umatac-Merizo	Percolation to groundwater	0.41/1.55	362	0.043/0.162	11%	98	0.012/0.045	3%
Inarajan	Percolation to groundwater	0.07/0.26	60	0.007/0.026	10%	16	0.002/0.0075	3%

Notes:

- 1) Islandwide induced population = 46,300 at Year 2014 and 12,500 at year 2019.
- 2) Induced population in south is 19% of islandwide = 8,797 at Year 2014 (19% x 46,300) and 2,375 at Y2019 (19% x 12,500).
- 3) A total of 28% of induced population is sewered: 2,464 at Y2014 (28% x 8,797), and 665 at Y2019 (28% x 2,375).
- 4) Induced population serviced by each treatment plant is determined by its proportion of the current WW flow.
- 5) Wastewater generated by induced population is assumed at 120 gallons per capita per day.

Legend: WW = wastewater; WWTP = wastewater treatment plant; * Wastewater flows in million gallons per day/million liters per day.

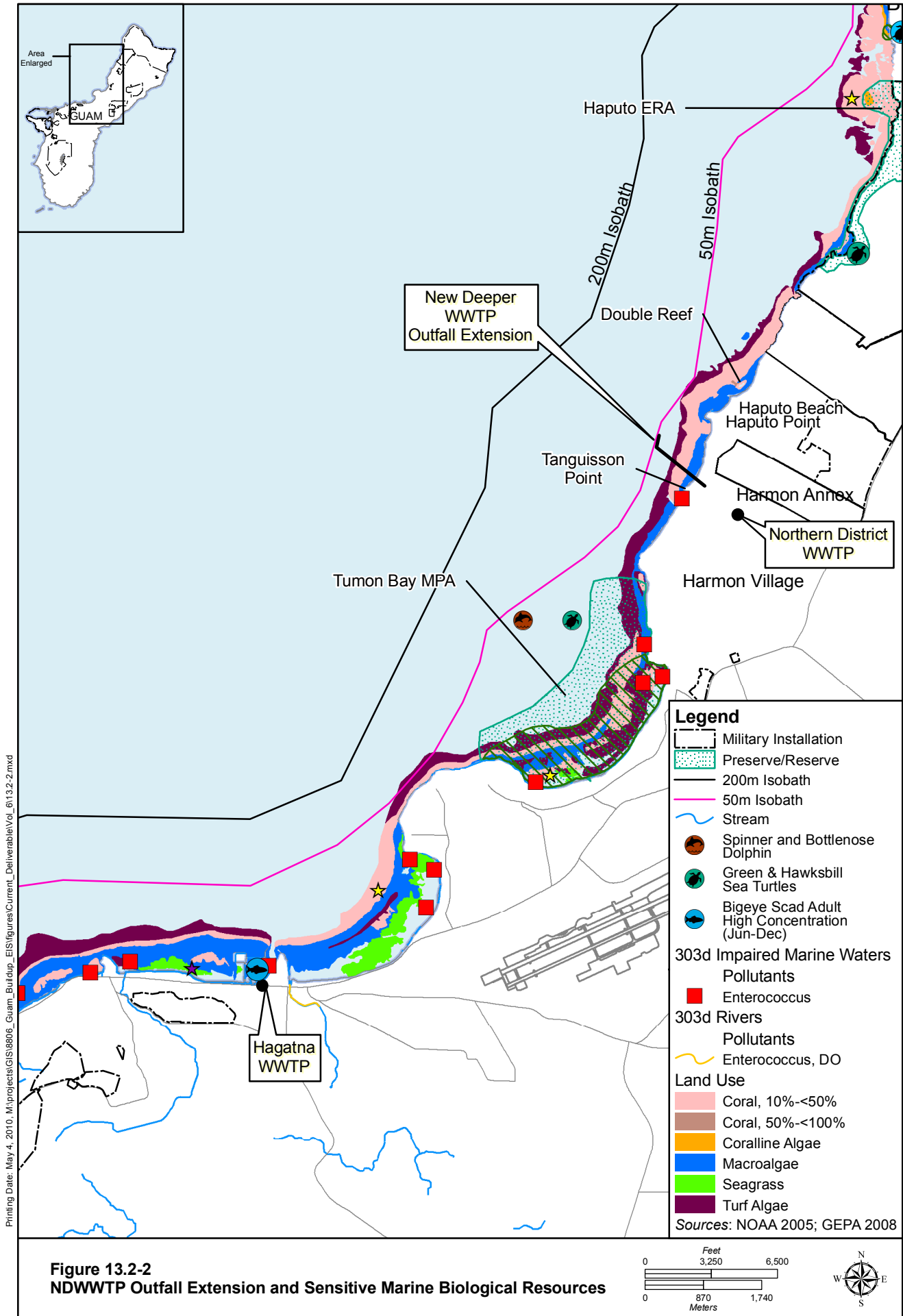
*Marine Flora, Invertebrates, and Associated EFH**Direct Impacts*

Figure 13.2-2 shows the location of the existing NDWWTP offshore ocean outfall in relation to sensitive marine biological resources in the area. Figure 13.2-2 and Figure 13.2-4 shows the southern GWA WWTP locations and receiving waters and associated sensitive marine biological resources. Potential marine biological receptors of ocean outfall effluent constituents include a wide variety of marine flora and fauna living in or near coastal or marine waters, including humans (human exposures are addressed in Volume 6, Chapter 11, Recreational Resources, and Volume 6, Chapter 19, Public Health and Safety).

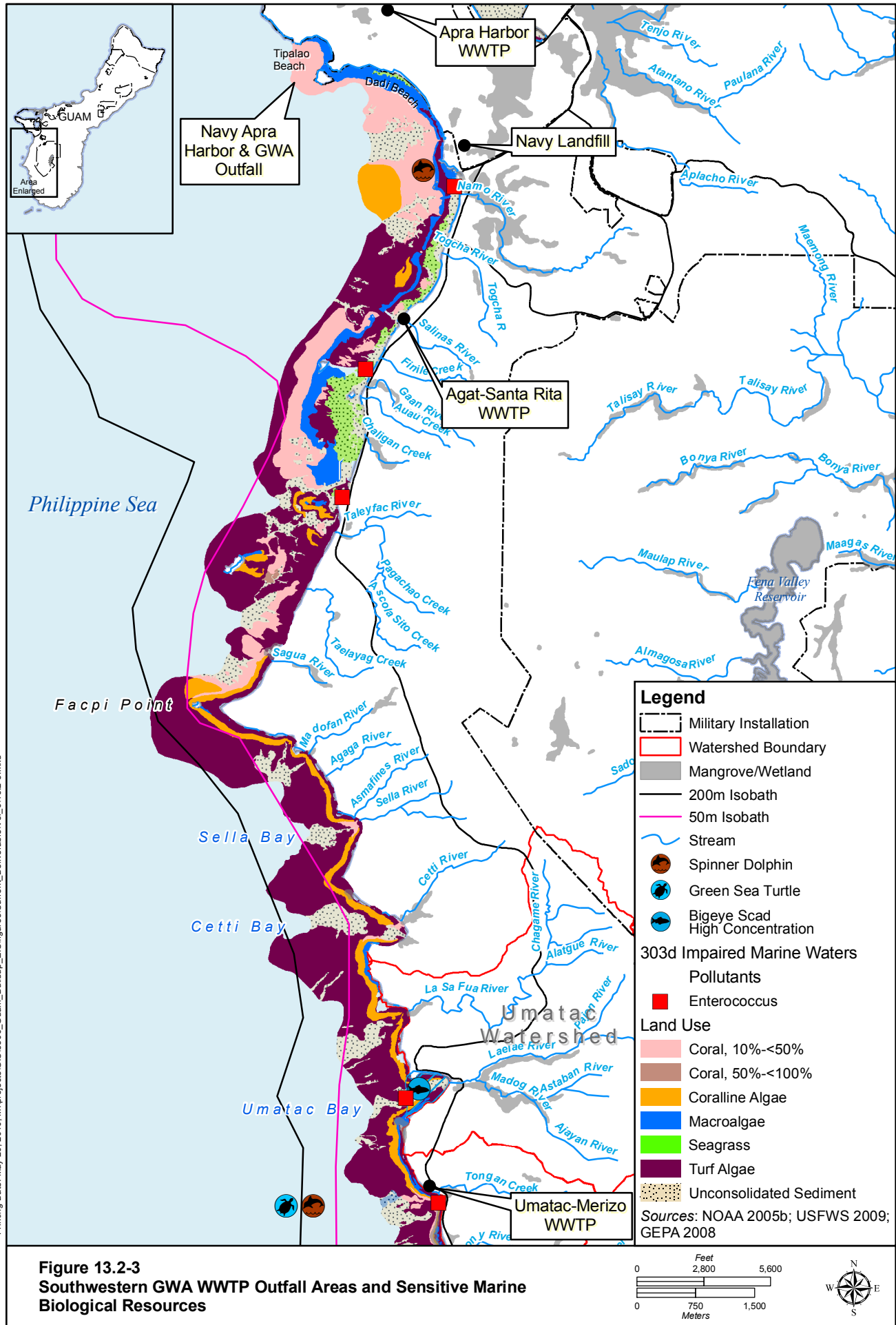
Marine flora, invertebrates, and associated EFH in the wastewater treatment plant outfall areas would be affected by activities associated with Basic Alternative 1a. As stated in Volume 2, Chapter 11, the three components of sewage effluent found to be most detrimental to marine life and coral reefs are nutrients, sediments, and toxic substances. Ammonia nitrogen, a nutrient and substance that is toxic to some marine life, probably has the most prominent sewage associated effect, especially with finfish. However, tropical ocean waters are typically characterized as low in nutrients and particulates. Therefore, the discharge of high levels of nutrients and particulates may have detrimental impacts to the receiving marine waters.

As stated in Volume 6, Chapters 2 and 3, the current NDWWTP and Hagatna WWTP are not operating as designed due to bypassing of treatment trains and poor maintenance. The proposed near-term refurbishment of the primary treatment system for the NDWWTP would result in a reduction of pollutant concentrations being discharged, contributing to improved receiving water quality in the long-term even with an increase in wastewater flows. Table 13.2-4 compares pollutant concentrations between current conditions at the NDWWTP (poor treatment of 6 MGd wastewater) to the proposed action at the plant, which includes repairing and upgrading the plant to provide primary treatment and increasing flows to 12 MGd, followed by upgrading the plant to provide secondary treatment and increasing flows up to 18 MGd. Table 13.2-4 shows that even with the substantial increase in flows that would result from the proposed action, effluent quality from the repaired and upgraded plant would be improved above what is discharged today. For example, TSS loading in the marine environment over the next 5 years under the no-action alternative (no repairs or upgrades to the plant and no increased flows) as compared to just the first phase of the proposed upgrades to the plant (repair and upgrade primary treatment) would result in the discharge of approximately 50,000 µg/L per day (or 91,250,000 µg/L) in 5 years more TSS into the marine environment in 5 years than the proposed action. After the proposed secondary upgrades are completed, these values would be lower. A similar analogy could be applied to the other pollutants found in wastewater discharge, including ammonia nitrogen.

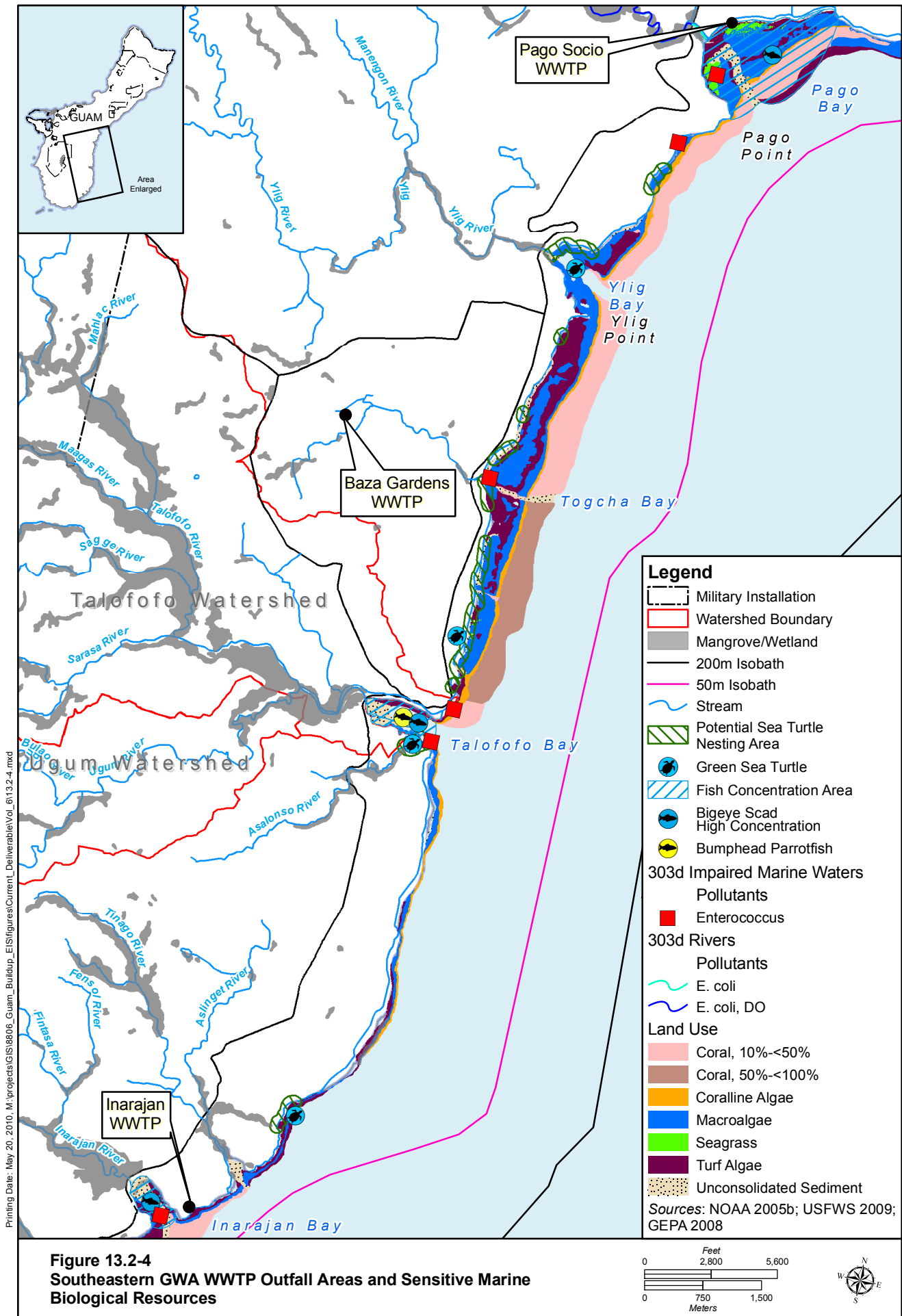
Significant short-term and localized impacts may be seen while DoD performs plant refurbishment, however as discussed in Volume 6, Chapter 3, the use of chemical flocculants in the interim while the primary treatment systems are upgraded would increase solids removal prior to discharge, resulting in improved effluent quality and less than significant impacts. A net beneficial impact is anticipated when the planned DoD primary refurbishment of the NDWWTP has been completed, even with the increased flows as described above. The repair and upgrade of the NDWWTP would produce an effluent with lower concentration of pollutants than discharged today from the plant, resulting in improved water quality at the plant discharge. The secondary upgrades to NDWWTP system, if required, would be designed to meet GEPA ambient coastal water quality standards, and result in significantly decrease pollutants in the plant discharge. This would result in positive significant beneficial impact to coastal water quality.



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If the DoD should fail to secure necessary financing to repair and upgrade the primary treatment capability of the NDWWTP from the Government of Japan (GoJ), significant environmental impacts would occur. These include increased flows from an already noncompliant treatment plant, resulting in further impacts on receiving waters caused by poorly treated wastewater. Consistent with the Navy's commitment to keep from significantly degrading utilities on Guam, the DoD would apply force flow reductions and/or adaptive program management of construction as explained in Volume 7, Chapter 2. Failure to secure funding for secondary treatment capability would result in failure to meet an impending enforcement order regarding secondary treatment requirements. Failure to secure necessary funding for secondary treatment may require that DoD delay or not issue construction contracts or task orders until such time as the financing is received from the GoJ and the necessary improvements to the NDWWTP primary treatment capability are implemented. Such action would severely affect the construction pace and the ability of Navy to complete required construction to support the Marine Corps relocation.

As reported in Volume 2, Chapter 11, Section 11.1.4, the nearfield plume at the deep NDWWTP outfall rises quickly with minimal horizontal dispersion before reaching the surface; therefore, minimal interaction occurs with the extant assemblages of organisms in the water column. Phytoplankton may assimilate some of the nutrients present in the near and farfield plume; however, phytoplankton requires several days to replicate, and the plume would likely disperse over a wide area in a matter of hours. The increase in biomass is not likely to be a concern, considering the low phytoplankton biomass around Guam and the vicinity (based on the low levels of chlorophyll), any increase resulting from phytoplankton productivity would be rapidly grazed by herbivorous zooplankton and fish. Detectable changes in phytoplankton or herbivorous zooplankton biomass are not anticipated, but should be monitored (Navy 2005, 2009). As a result, valuable EFH, including planktonic organisms in the water column, coral reef, and macro/turf algae habitats (700 feet [ft] [200 meters (m)]) toward the shore, are not likely to be negatively affected by the increased loading to the environment.

Considering that flora and invertebrates are generally more resistant to ammonia toxicity than fish (Ankley et al. 1996), and there are no heavy metals issues with NDWWTP, and the planned refurbishment and upgrades would considerably improve water quality, the impacts would be negligible.

Therefore, Basic Alternative 1a would result in less than significant impacts to marine flora and invertebrates, mitigated to temporary and minimal, in the NDWWTP outfall ROI. A beneficial short-term (in 2 years) and long-term impact to these resources would be expected when primary treatment system refurbishing and secondary upgrades are online, respectively. Therefore, the proposed action would have no adverse effect on associated EFH.

As described above, the Navy Apra Harbor WWTP is out of compliance for BOD, TSS, aluminum, copper, nickel, and total residual chlorine. There is a compliance strategy for all these constituents, but metals (copper in particular) would still be a problem because of the low ambient water quality standard. It is anticipated that all compliance issues would be addressed except copper. For copper, the Navy is working with the GEPA and USEPA Region 9 to obtain approval for a modified mixing zone at the ocean outfall to bring the discharge into compliance. The Navy Apra Harbor WWTP shares a deepwater outfall with the Agat-Santa Rita WWTP, discharging into the Philippine Sea outside Tupalao Bay. This water body is currently not impaired water; however the larger body (Agat Bay and associated coastal areas) are impaired waters with low priority ranking for polychlorinated biphenyls, chlordane, and dioxin in fish tissue. Therefore, with anticipated implementation of the Navy Apra Harbor WWTP compliance strategy and the GWA's implementation of upgrades to the plant as identified in the GWA Water Resources Management Plan (WRMP), a less than significant impact on this resource is expected. Basic Alternative

1a would result in less than significant impacts on marine flora, invertebrates, and no adverse effects on associated EFH from the combined effluent at the ocean outfall for the Apra Harbor WWTP and Santa-Rita WWTP ROI.

Indirect Impacts

The increased construction workforce and induced population in Central Guam would result in increased flows to the Hagatna WWTP. Increased discharges would have the potential to decrease water quality and affect marine resources if final improvements to the plant are not made and operations are not improved. The GWA has indicated that plant operational improvements will continue as directed by the USEPA Region 9, particularly in how septage is handled at the plant. Additionally, improved plant operator training will be implemented by the GWA to maximize plant operations. This is expected to result in continued improvements to plant effluent quality. Increased effluent from this plant under Basic Alternative 1a would be expected to result in short-term and localized impacts with potential long-term beneficial impacts even with increased flows. Thus, less than significant impacts on marine flora and invertebrates and no adverse effects on associated EFH would occur in the Hagatna WWTP ROI.

Although DoD is not proposing to repair the Hagatna WWTP or upgrade it to secondary treatment as part of the proposed action, DoD is seeking funding from the GoJ to finance these upgrades. If the DoD should fail to secure necessary financing from the GoJ to repair and upgrade the NDWWTP, significant environmental impacts would occur. These impacts include increased flows from already non-compliant treatment plant, resulting in further impacts on receiving waters caused by poorly treated wastewater. Consistent with the Navy's commitment to keep from significantly affecting utilities on Guam, the DoD would apply force flow reductions and/or adaptive program management of construction as explained in Volume 7, Chapter 2. Failure to secure necessary funding may require that DoD delay or not issue construction contracts or task orders until such time as the financing is received from the GoJ and the necessary improvements to the Hagatna WWTP treatment capability are implemented. Such action would severely affect the construction pace and the ability of the Navy to complete required construction to support the Marine Corps relocation.

The two GWA southern wastewater treatment plants that directly or indirectly discharge to the marine environment, Agat-Santa Rita and Baza Gardens, would likely receive wastewater from the indirect induced population resulting from the military relocation, but are not expected to receive wastewater from the indirect construction workforce.

The Agat-Santa Rita WWTP discharges to Tupalao Bay in the Philippines Sea through a combined ocean outfall shared with the Navy's Apra Harbor WWTP. The majority of the treatment processes and equipment are either not functioning at all or are bypassed, or are not operating within their design parameters because of deterioration or a lack of maintenance, resulting in 100% non-compliance. Another major factor in the plant's non-compliance is that the average wastewater flow to the plant is well in excess of the plant design. Unless the plant capacity is upgraded significantly or flow to this plant is diverted, permit violations will continue. However, the small increase of wastewater flows to the Agat-Santa Rita WWTP from the induced population would not contribute significant impacts to the plant in terms of plant performance and capacity. See Chapter 3 for more information. A less than significant impact on this resource is therefore expected. Basic Alternative 1a would result in less than significant impacts on marine flora and invertebrates, and no adverse effects on associated EFH in the Agat-Santa Rita WWTP ROI.

The Baza Gardens WWTP discharges effluent through a rock infiltrator to the Togcha River, which in turn flows into the Togcha Bay and Pacific Ocean. Because the treated effluent flows indirectly to a water body (river), the NPDES permit requirements are extremely strict.

The Togcha River flows to the ocean at Togcha Beach. Togcha Beach and adjacent beaches are impaired waters with high priority ranking on the Impaired Waters 303(d) list for the bacteria *Enterococcus*, exceeding GWQS >10% of the samples. The anticipated 11% increase in wastewater flows to Baza Gardens WWTP (see Table 13.2-5) represents only a small percentage increase in flow to the plant, is within the designed treatment capacity of the plant, and is not expected to affect current plant removal efficiencies.

Therefore, Basic Alternative 1a would result in less than significant indirect impacts on Marine Flora and Invertebrates and no adverse effects on associated EFH associated with the Baza Gardens WWTP outfall ROI.

Essential Fish Habitat

The biological impacts associated with the increase in effluent discharge, especially ammonia nitrogen and sedimentation, may be significant to finfish species and corals. Combined effects of ammonia and other stressors, such as low dissolved oxygen and high temperature, are highly complex, and can be difficult to separate from the toxic effects caused by ammonia alone, especially in sensitive finfish species (Ankley et al. 1996).

Detrimental impacts to the coral reef ecosystems associated with excessive nutrient-loading, bacteria, and sediment abrasion have been documented in various studies (Johannes 1975, Smith et al. 1981, Pastorok and Bilyard 1985). Long-term potential impacts to finfish from elevated ammonia levels may be detrimental. Coral impacts may include increased turbidity, decreased water quality, and sedimentation in an undefined area adjacent to the diffuser. However, these impacts are dependent on the flushing properties of the receiving waters and characteristics of the sediments (NAVFAC Pacific 2009). Pastorok and Bilyard (1985) studied the impacts of sewage effluent on the coral reef ecosystem. The findings of this study indicated that the discharge of sewage had little or no impact on the coral reef ecosystems in well-flushed waters along open coasts (NAVFAC Pacific 2009). Most of the literature describing negative impacts of sewage discharge on coral reefs is limited to studies of lagoons or embayment environments with relatively long residence times that can result in buildup of nutrients and sediments to detrimental levels (Johannes 1975, Smith et al. 1981, Pastorok and Bilyard

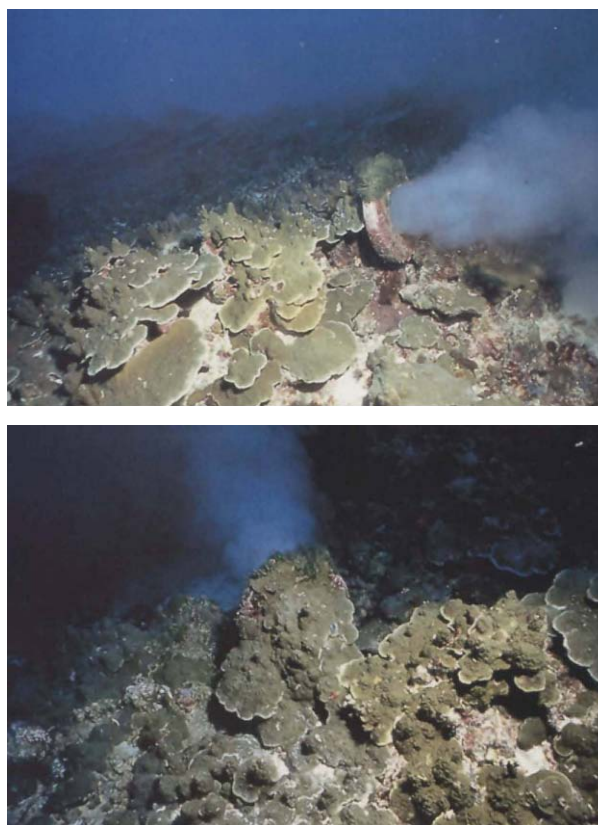


Photo credit: Dollar, S. SOAEST, UH 1994.

Figure 13.2-5. Former Tanguisson Point Primary WWTP Outfall and Coral Growth

1985). In coastal areas, discharge of treated sewage effluent may have no negative effect on coral community structure and may in fact enhance coral growth and benefit coral reef community by providing nutrient subsidies and additional surface area that is suitable for settlement and growth.

Figure 13.2-5 shows two photographs taken off Tanguisson Point in 1994 that are associated with the two diffuser ports of the Tanguisson sewage outfall (NDWWTP outfall). The outfall diffuser that was made up of 17 elevated diffuser ports (with 33-ft [10-m] separation) was aligned parallel to shore at a depth of about 66 ft (20 m). At this time period, the NDWWTP was reportedly discharging 3 to 4 MGd (11 to 15 MLd) of primary treated domestic effluent. Coral colonies, predominantly *Porities (Synaraea) rus*, have covered the discharge ports and adjacent reef areas that were excavated for placement of the diffuser pipe in the 10 years since the outfall was constructed. Effective engineering design of diffusers that maximizes dispersion, mixing, and dilution of treated plumes, and placement of outfalls in open coastal areas with high rates of water exchange appear to be important factors in preventing negative impacts to coral reef communities (Dollar 1994).

Considering the information provided above, EFH MUS (including NMFS species of concern Napoleon wrasse and Candidate Species bumphead parrotfish) found in the NDWWTP outfall ROI would experience short-term and localized negative impacts. Beneficial impacts are anticipated in the near-term (in 2 years) with the proposed primary treatment system refurbishment to the NDWWTP and with long-term loading (2010-2014) having a net beneficial impact over no-action alternative in this time period. Therefore, Basic Alternative 1a would result in more than minimal negative impacts to finfish, however temporary and localized. Thus, no adverse effect on EFH in the NDWWTP outfall ROI would occur. The implementation of Basic Alternative 1a is anticipated to result in a less than significant impact in the short-term and a beneficial impact in the long-term.

Increased wastewater treatment flows from the Hagatna WWTP outfall, the joint Navy Apra Harbor and Agat-Santa Rita WWTP outfall, and the South Guam WWTPs would be long-term impacts. However associated-effects to marine resources would be short-term impacts and localized within the ROI of the outfall. The Navy anticipates a long-term beneficial impact to the receiving water quality as the GWA brings their WWTPs into compliance in accordance with the GWA WRMP. Therefore, Basic Alternative 1a would result in no adverse effects on EFH associated with the WWTP outfalls. A less than significant impact to EFH is anticipated from the implementation of Basic Alternative 1a.

If the DoD should fail to secure necessary financing from the GoJ to repair and upgrade the primary treatment capability of the NDWWTP, significant environmental impacts would occur. These include increased flows from already non-compliant treatment plants, resulting in further impacts to receiving waters due to poorly treated wastewater. Consistent with the Navy's commitment to keep from significantly affecting utilities on Guam, the DoD would apply force flow reductions and/or adaptive program management of construction as explained in Volume 7, Chapter 2. Failure to secure funding for secondary treatment capability would result in failure to meet an impending enforcement order regarding secondary treatment requirements. Failure to secure necessary funding for secondary treatment may require that DoD delay or not issue construction contracts or task orders until such time as the financing is received from the GoJ and the necessary improvements to the NDWWTP primary treatment capability are implemented. Such action would severely affect the construction pace and the ability of Navy to complete required construction to support the Marine Corps relocation.

Although DoD is not proposing to repair the Hagatna WWTP or upgrade it to secondary treatment as part of the proposed action, DoD is seeking funding from the GoJ to finance these upgrades. If the DoD should fail to secure necessary financing from the GoJ to repair and upgrade the NDWWTP, significant

environmental impacts would occur. These impacts include increased flows from an already non-compliant treatment plants, resulting in further impacts on receiving waters caused by poorly treated wastewater. Consistent with the Navy's commitment to keep from significantly affecting utilities on Guam, the DoD would apply force flow reductions and/or adaptive program management of construction as explained in Volume 7, Chapter 2. Failure to secure necessary funding may require that DoD delay or not issue construction contracts or task orders until such time as the financing is received from the GoJ and the necessary improvements to the NDWWTP primary treatment capability are implemented. Such action would have a severe impact on the construction pace and the ability of Navy to complete required construction to support the Marine Corps relocation.

Special-Status Species

The four special-status species identified in Volume 2 (green and hawksbill sea turtles, and spinner and bottlenose dolphins) are anticipated to occur in the area and may be affected by decreased water quality in the ROI of the WWTP. Since these species are air breathing, increased turbidity should not adversely impact their respiration or biological functions (NOAA 2007). Sea turtles may forage in shallower waters in or near the project area, but are not likely to forage near the new deeper NDWWTP and Hagatna outfalls. Marine mammals (spinner dolphins) are highly mobile, and are not known to use the project areas regularly. No evidence has been shown that special-status species would be significantly affected from actions under Basic Alternative 1a. Water quality may be decreased in the nearshore habitat where these animals typical reside; however, foraging and resting habitat would not be affected nor is it limited, no adverse effects on the annual rates of recruitment or survival of any of the species and stocks is expected with the implementation of Basic Alternative 1a.

Based on the information provided previously, any impacts would be mitigated to minimal in the short-term and beneficial in the interim-term with the planned DoD primary refurbishment and subsequent upgrade to secondary treatment at the NDWWTP. Therefore, any negative impacts to sea turtles would be short-term, localized, and minimal impacts as the sea turtles pass through the WWTP ROI. The potentially significant impacts associated with Basic Alternative 1a actions are likely to affect, but are not likely to adversely affect ESA-listed sea turtles. No serious injury or mortality of any marine mammal species (spinner dolphins) is reasonably foreseeable and no adverse effects on the annual rates of recruitment or survival of any of the species and stocks is expected with the implementation of Basic Alternative 1a.

As stated, a long-term beneficial impact would be expected after completion of the NDWWTP primary refurbishment. Long-term beneficial impacts would also be expected concerning the Navy Apra Harbor, Hagatna, and associated ROIs of the southern WWTP outfalls when the GWA successfully brings these plants into compliance.

Therefore, activities associated with Basic Alternative 1a would result in short-term, localized, and minimal indirect impacts to special-status species.

If the DoD should fail to secure necessary financing from the GoJ to repair and upgrade the primary treatment capability of the NDWWTP, significant environmental impacts would occur. These include increased flows from an already non-compliant treatment plants, resulting in further impacts on receiving waters due to poorly treated wastewater. Consistent with the Navy's commitment to keep from significantly affecting utilities on Guam, the DoD would apply force flow reductions and/or adaptive program management of construction as explained in Volume 7, Chapter 2. Failure to secure funding for secondary treatment capability would result in failure to meet an impending enforcement order regarding secondary treatment requirements. Failure to secure necessary funding for secondary treatment may

require that the DoD delay or not issue construction contracts or task orders until such time as the financing is received from the GoJ and the necessary improvements to the NDWWTP primary treatment capability are implemented. Such action would severely affect the construction pace and the ability of Navy to complete required construction to support the Marine Corps relocation.

Although the DoD is not proposing to repair the Hagatna WWTP or upgrade it to secondary treatment as part of the proposed action, the DoD is seeking funding from the GoJ to finance these upgrades. If the DoD should fail to secure necessary financing from the GoJ to repair and upgrade the NDWWTP, significant environmental impacts would occur. These include increased flows from an already non-compliant treatment plants, resulting in further impacts on receiving waters caused by poorly treated wastewater. Consistent with the Navy's commitment to keep from significantly affecting utilities on Guam, the DoD would apply force flow reductions and/or adaptive program management of construction as explained in Volume 7, Chapter 2. Failure to secure necessary funding may require that the DoD delay or not issue construction contracts or task orders until such time as the financing is received from the GoJ and the necessary improvements to the NDWWTP primary treatment capability are implemented. Such action would have a severe impact on the construction pace and the ability of Navy to complete required construction to support the Marine Corps relocation.

Non-native Species

WWTP outfalls are not a known pathway for the introduction of potentially invasive non-native species. Therefore, activities associated with Basic Alternative 1a are expected to have minimal impacts with respect to the introduction of non-native marine species.

Proposed Mitigation Measures

- To minimize adverse impacts associated with the proposed military relocation program on these wastewater treatment facilities, the DoD would assist GWA in identifying where the impacts are in South Guam and work with GWA to prioritize the improvement projects, and DoD is also leading a federal inter-agency effort to identify other federal programs and funding sources that could benefit the people of Guam.
- To offset negative impacts to marine biological resources from the increased volume of effluent released and coral impacts from dredging (Volume 4 compensatory mitigation), the DoD has developed short-term and long-term upgrades to the wastewater treatment system. For the short-term, upgrades to the current primary wastewater treatment system would take place in the 2011-2012 timeframe. For the long-term, upgrades to the system would be made resulting in secondary wastewater treatment by 2015. These upgrades would significantly improve the effluent water quality, resulting in conditions that are more favorable than the no-action alternative in the short- and long-term.
- Additional mitigation measures would include use of chemical flocculants at the NDWWTP as an interim measure while the primary upgrades are being done to increase solids removal prior to discharge.

See Volume 7 for a comprehensive list of BMPs and mitigation measures for in-water construction activities and for vessels underway, and Volume 2, Chapter 11 for a detailed description of general maritime measures in place by the military.

The implementation of appropriate resource agency (USFWS/NOAA/NMFS) BMPs, construction and industrial permit BMPs, Navy LID concept plans and Industrial Management Practices, USACE permit conditions, and general maritime measures in place by the military and USCG is assumed for each

resource and anticipated to reduce any construction- and operation-related impacts to marine biological resources. With respect to possible construction impacts on the nearshore marine environment, the implementation and management of such plans would reduce/eliminate any construction-related stormwater runoff into the nearshore environment. The LID concept plan would support master planning activities, and through these joint efforts, a sustainable development strategy would be implemented where pre-construction site hydrology would be equal or nearly equal to post-construction hydrology. Stormwater would be treated for pollutants prior to discharge to the porous ground surface.

Basic Alternative 1b

The difference between Alternatives 1a and 1b is a requirement for a new sewer line from Barrigada housing to NDWWTP for Alternative 1b. For both alternatives, industrial wastewater generated on the DoD land would be pretreated in accordance with GWA pretreatment program before discharging wastewater to the sanitary sewer system.

Construction

Impacts from activities associated Basic Alternative 1b would be the similar to those described under Basic Alternative 1a. Alternative 1b impacts would be less than significant to marine biological resources, and would have no adverse effects on EFH.

Operation

Impacts from activities associated with Basic Alternative 1b would be the same to those described under Basic Alternative 1a.

13.2.4.2 Summary of Impacts

Table 13.2-6 summarizes the impacts from wastewater. A text summary is provided below.

The proposed action, even with increased flow, would improve water quality in the marine environment within the NDWWTP ROI, providing beneficial impacts to marine biological resources associated with outfall waters. Any WWTP-related long-term, chronic, or cumulative adverse effect on marine organisms would be significantly reduced over the no-action alternative at the site.

Basic Alternative 1a and 1b would result in no adverse effects on EFH. Finfish may experience short-term and localized elevated concentration levels of nutrients (e.g., ammonia nitrogen), sediments, and toxic substances found within sewage discharges within the near and farfield plume exceeding GWQS. This issue is of particular concern at the southern GWA WWTPs, which already are not meeting discharge criteria in their associated impaired water bodies. The receiving waters (and WWTP) and EFH affected areas include: Philippine Sea off Tanguisson Point (NDWWTP); Philippine Sea/Agana Bay (Hagatna WWTP); Philippine Sea/Tipalao Bay/Agat Bay, Philippine Sea/Umatac Bay, Pacific Ocean/Inarajan Bay, and Pacific Ocean/Togcha Bay. However, these impacts are expected to be short-term, localized, and minimal. Long-term beneficial impacts are anticipated when the GWA brings their WWTPs into compliance as directed by the USEPA stipulated order and subsequently prepared Guam WRMP.

Basic Alternative 1a actions are likely to affect, but are not likely to adversely affect ESA-listed sea turtles. No serious injury or mortality of any marine mammal species (spinner dolphins) is reasonably foreseeable and no adverse effects on the annual rates of recruitment or survival of any of the species and stocks is expected with the implementation of Basic Alternative 1a.

Table 13.2-6. Summary of Potential Impacts to Marine Biological Resources-Wastewater

<i>Basic Alternative 1a*</i>	<i>Basic Alternative 1b</i>
Construction Impacts (no direct or indirect impacts)	
Marine Biological Resources	
LSI <ul style="list-style-type: none"> • Potential for temporary, minimal increases in sediment laden stormwater impacting marine flora, invertebrates, and special-status species. No adverse effect on EFH. • Minimal opportunity for non-native invasive species introduction. 	LSI <ul style="list-style-type: none"> • Similar to Alternative 1a.
Operation Impacts (direct and indirect are the same)	
Marine Flora, Invertebrates and Associated EFH	
LSI/BI <ul style="list-style-type: none"> • NDWWTP: Short-term and localized impacts in the interim until primary refurbishment and upgrades are completed, then less than significant impacts once primary upgrades are completed. Long term beneficial impacts once secondary upgrades are completed. No adverse effects on EFH. • Hagatna WWTP: Short-term and localized impacts with current operations at the plant, then long term beneficial impacts once anticipated secondary upgrades are completed. No adverse effect on EFH. • Apra Harbor WWTP: Short-term and localized impacts with current operations at the plant, then less than significant once changes to plant operations are implemented. No adverse effects on EFH. • Agat-Santa Rita WWTP and Baza Gardens WWTP: Less than significant impact with current operations at the plants. No adverse effect on EFH. 	LSI/BI <ul style="list-style-type: none"> • Same as Alternative 1a.
Essential Fish Habitat	
LSI /BI <ul style="list-style-type: none"> • NDWWTP: Significant short term and localized impacts in the interim until primary refurbishment and upgrades are completed especially increased ammonia level effects on finfish. Less than significant impacts once primary upgrades are completed. Long term beneficial impacts once secondary upgrades are completed. No adverse effect on EFH. • Hagatna WWTP: Significant short-term and localized with current plant operation. Long term beneficial impact once anticipated secondary are completed. No adverse effect on EFH. • Apra Harbor WWTP: Short-term and localized impacts with current plant operations, and less than significant impact once changes to operations are implemented. No adverse effect on EFH. • Agat-Santa Rita WWTP and Baza Gardens WWTP: Less than significant impact with current plant operations. 	LSI /BI <ul style="list-style-type: none"> • Same as 1a.

<i>Basic Alternative 1a*</i>	<i>Basic Alternative 1b</i>
Special-Status Species	
LSI/BI <ul style="list-style-type: none"> • Temporary minimal impacts from increased flows and subsequent decreased water quality and increased siltation at NDWWTP and Hagatna WWTP. Short-term and long-term beneficial impact to water quality over no-action alternative from staggered primary refurbishment and secondary upgrades to NDWWTP in 2011-2012 and 2015 timeframe, respectively. • Short-term localized impacts from increased flows and subsequent water quality degradation from the Navy Apra Harbor WWTP, Agat-Santa Rita WWTP and the Baza Gardens WWTP discharges. May affect, but are not likely to adversely affect, sea turtle habitat. Basic Alternative 1a actions are likely to affect, but are not likely to adversely affect ESA-listed sea turtles. No serious injury or mortality of any marine mammal species (spinner dolphins) is reasonably foreseeable and no adverse effects on the annual rates of recruitment or survival of any of the species and stocks is expected with the implementation of Basic Alternative 1a. • A beneficial impact is anticipated after the GWA upgrades to this plant to secondary treatment. 	LSI/BI <ul style="list-style-type: none"> • Same as 1a.
Non-native Species	
LSI <ul style="list-style-type: none"> • Minimal chance of non-native invasive introduction from proposed action. 	LSI <ul style="list-style-type: none"> • Same as 1a.

Legend: BI = Beneficial impact; EFH = Essential Fish Habitat; GWA = Guam Waterworks Authority; LSI = Less than significant impact; NDWWTP = Northern District Wastewater Treatment Plant; SI = Significant impact; WWTP = Wastewater Treatment Plant. *Preferred Alternative.

13.2.5 Solid Waste

13.2.5.1 Basic Alternative 1 (Preferred Alternative)

The Preferred Alternative would be to continue to use the Navy Landfill at Apra Harbor for municipal solid waste (MSW) until the new GovGuam Layon Landfill at Dandan is available for use. Disposal of other waste streams excluded from Layon Landfill would continue at the Navy Landfill. Construction and demolition (C&D) debris would continue to be disposed at the Navy hardfill.

Construction

No construction or changes in current operations would occur besides an increase in the volume of construction and disposal hardfill solid waste in the short-term.

Operation

The Navy Landfill has groundwater monitoring wells that monitor potential leachate infiltration. If future samples show contamination, further action may take place to avoid such infiltration to protect the nearby marine environment. Considering that the Navy Landfill would be receiving mainly Construction Debris, an increase in leachate is not anticipated. Potential indirect impacts to marine resources are described below for each marine resource category.

Marine Flora, Invertebrates and Associated EFH

Marine flora, invertebrates and associated EFH in the project area would not be directly affected by activities (direct or indirect impacts of the military relocation) associated with Basic Alternative 1, and indirect impacts would be minimal. Increased use of landfills would lead to more trips to the landfills by vehicles, which may lead to runoff that could decrease marine water quality. These impacts are expected to be minimal, and prevented by the use of BMPs. Other potential indirect impacts may occur from

increased barge traffic during construction of the new landfill. These activities would be temporary, and any negative impacts to marine resources in the area would be short-term and limited to the duration of project activities. Increased barge traffic is not likely to disturb flora or invertebrates. Activities associated with Basic Alternative 1 would result in temporary and minimal impacts to marine flora and invertebrates, and would have no adverse effect on associated EFH. Therefore, a less than significant impact would result with the implementation of Basic Alternative 1.

Fish and Associated EFH

Fish and associated EFH in the project area would not be directly affected by activities (direct or indirect impacts of the military relocation) associated with Basic Alternative 1, and indirect impacts would be minimal. Increased use of landfills would lead to more trips to the landfills by vehicles, which may lead to runoff that could decrease marine water quality. These impacts are expected to be minimal, and prevented by the use of BMPs. Other potential indirect impacts may occur from increased barge traffic during construction of the new landfill. These activities would be temporary, and any negative impacts to marine resources in the area would be short-term and limited to the duration of project activities. Increased barge traffic is not likely to disturb fish and associated EFH. If disturbed by vessel traffic, fish would likely avoid or leave the area for the duration of the disturbance, and return once the disturbance ceases. The sensitive months for seasonally sensitive species identified by NMFS to occur in nearby Agat Bay would be taken into account for project activities as permit conditions require. EFH would not be disturbed by vessel traffic. Activities associated with Basic Alternative 1 would result in temporary and minimal impacts to fish, and would have no adverse effect on associated EFH. Therefore, a less than significant impact would result with the implementation of Basic Alternative 1.

Special-Status Species

Special-Status species (sea turtles and dolphins) in the project area would not be directly affected by activities (direct or indirect impacts of the military relocation) associated with Basic Alternative 1, and indirect impacts would be minimal. Increased use of landfills would lead to more trips to the landfills by vehicles, which may lead to runoff that could decrease marine water quality. These impacts are expected to be minimal, and prevented by the use of BMPs. Other potential indirect impacts may occur from increased barge traffic during construction of the new landfill. These activities would be temporary, and any negative impacts to marine resources in the area would be short-term and limited to the duration of project activities. Increased barge traffic is not likely to disturb special-status species, as these species are highly mobile. If disturbed by vessel traffic, sea turtles and dolphins would likely avoid or leave the area for the duration of the disturbance, and return once the disturbance ceases. Activities associated with Basic Alternative 1 may affect, but are not likely to adversely affect sea turtles. No serious injury or mortality of any marine mammal species, specifically spinner and bottlenose dolphins, is reasonably foreseeable and no adverse effects on the annual rates of recruitment or survival of any of the species and stocks is expected with the implementation of Basic Alternative 1. Therefore, a less than significant impact would result with the implementation of Basic Alternative 1.

Non-native Species

Solid waste transported and stored in upland landfills is not a known pathway for the introduction of potentially invasive non-native marine species. Therefore, activities associated with Basic Alternative 1a are expected to have minimal impacts with respect to the introduction of non-native marine species.

Proposed Mitigation Measures

BMPs, as described in Volume 7, would be implemented to minimize risks of potential indirect impacts from increased barge traffic, surface runoff, and infiltration of groundwater from landfills.

13.2.5.2 Summary of Impacts

Table 13.2-7 summarizes the potential impacts of Basic Alternative 1. A text summary is provided below.

Table 13.2-7. Summary of Potential Impacts to Marine Biological Resources-Solid Waste

<i>Basic Alternative 1</i>
Construction Impacts (direct and indirect are the same)
NI <ul style="list-style-type: none"> • No construction actives
Operation Impacts (no direct)
LSI <ul style="list-style-type: none"> • General overall minor indirect impacts from increased road and barge traffic • Minor indirect impacts from runoff and/or infiltration potentially decreasing nearshore water quality • No adverse effect on special-status species or EFH • Minimal potential for increased introduction of non-native species

Legend: EFH = Essential Fish Habitat; LSI = Less than significant impact; NI = no impact. *Preferred Alternative.

Basic Alternative 1 would have less than significant impacts to marine biological resources.

13.2.6 Off Base Roadways

As discussed in Volume 6, Chapter 2.5, some Guam Road Network (GRN) projects involve road widening, bridge/culvert replacements, new road construction or roadway realignment, and pavement strengthening projects (including some pavement strengthening projects that can include widening). This section addresses the potential indirect impacts of the proposed GRN projects to marine biological resources. As discussed in Volume 6, Chapter 6, all proposed roadway improvements would occur above an elevation of 3.5 ft (1.1 m) mean lower low water (GUVD04 vertical datum). The high tide line has been estimated at 2.7 ft (0.8 m) above mean lower low water; therefore, no direct impacts to marine environments are anticipated for any proposed improvement project in any of the four regions. Based on the criteria described in the Methodology Section, no projects within the North Region would have the potential to affect marine biological resources; therefore, no analysis is required. Table 13.2-8 describes the direct and indirect impacts for each type of roadway project (non-widening pavement strengthening, intersection improvements, projects that require vegetation removal [e.g. roadway widening, new road construction, and roadway realignment projects], military access point modification or construction, and bridge and culvert replacements). Figure 13.2-6, Table 13.2-8, Table 13.2-9, Table 13.2-10, and Table 13.2-11 list the roadway projects and potential indirect and/or direct impacts on marine biological resources for the Central, Apra Harbor, and South regions, respectively.

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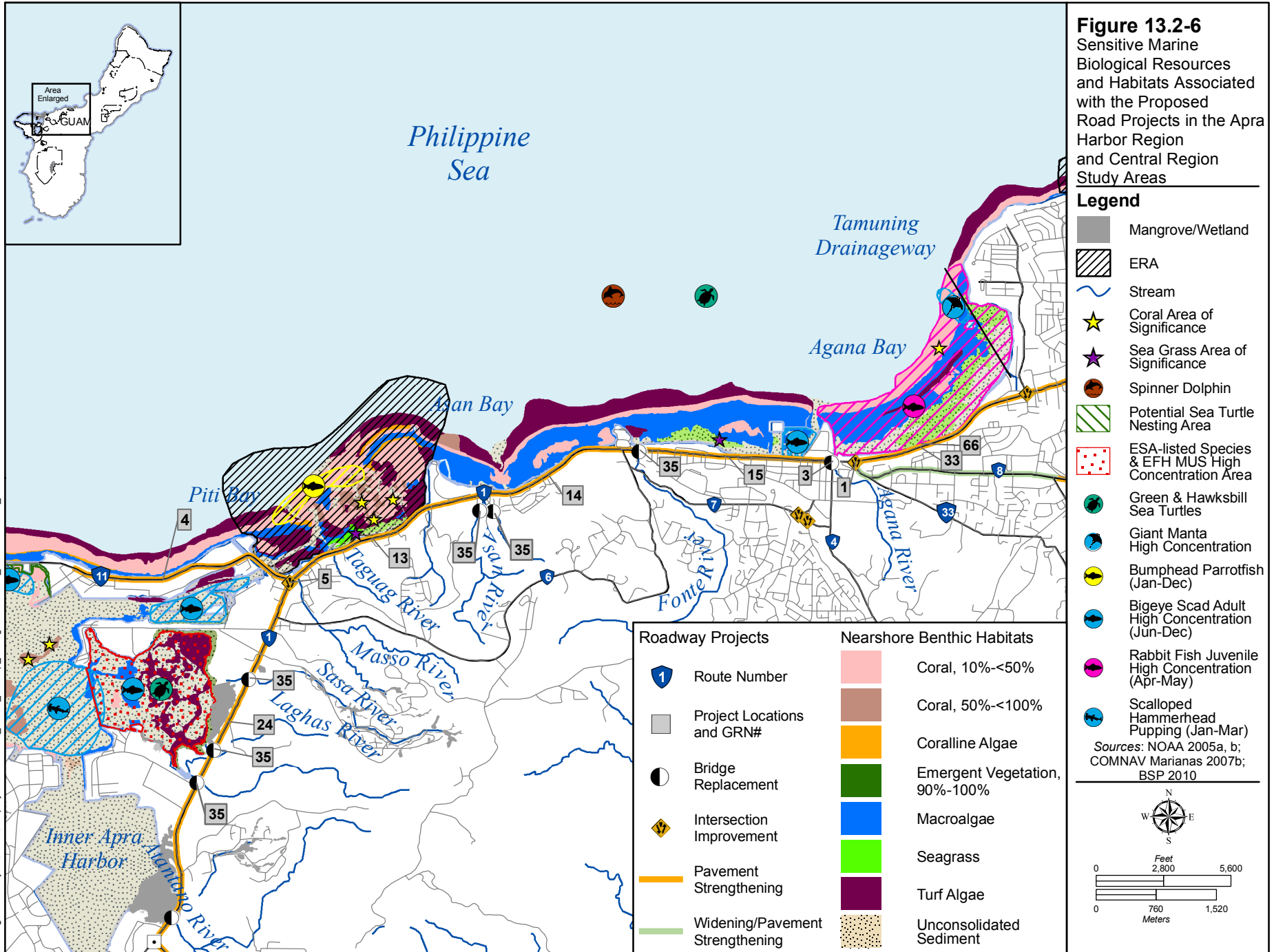


Figure 13.2-6
Sensitive Marine Biological Resources and Habitats Associated with the Proposed Road Projects in the Apra Harbor Region and Central Region Study Areas

Legend

- Mangrove/Wetland
- ERA
- Stream
- Coral Area of Significance
- Sea Grass Area of Significance
- Spinner Dolphin
- Potential Sea Turtle Nesting Area
- ESA-listed Species & EFH MUS High Concentration Area
- Green & Hawksbill Sea Turtles
- Giant Manta High Concentration
- Bumphead Parrotfish (Jan-Dec)
- Bigeye Scad Adult High Concentration (Jun-Dec)
- Rabbit Fish Juvenile High Concentration (Apr-May)
- Scalloped Hammerhead Popping (Jan-Mar)

Sources: NOAA 2005a, b; COMNAV Marianas 2007b; BSP 2010

Roadway Projects

- Route Number
- Project Locations and GRN#
- Bridge Replacement
- Intersection Improvement
- Pavement Strengthening
- Widening/Pavement Strengthening

Nearshore Benthic Habitats

- Coral, 10%-<50%
- Coral, 50%-<100%
- Coralline Algae
- Emergent Vegetation, 90%-100%
- Macroalgae
- Seagrass
- Turf Algae
- Unconsolidated Sediment

Scale: 0 to 5,600 Feet / 0 to 1,520 Meters

Table 13.2-8. GRN Project Type and Potential Impacts to Marine Biological Resources

<i>Project Type¹</i>	<i>Type of Impact Evaluated</i>	<i>Potential Impact Description²</i>
Pavement Strengthening	Indirect impacts – construction phase	No impact in areas without an impervious surface and/or drainage connection with marine environments (e.g. North Guam). Uncontrolled runoff in other areas (Central, Apra Harbor, and South regions) may impact marine communities downstream or downgradient during the construction phase. Sedimentation and non-point pollution inputs into marine waters, particularly near termini of rivers and stormwater outflows have the potential to stress marine resources (e.g. corals).
Intersection Improvements		
	Indirect impacts – operational phase	Additional traffic would increase loading of various potential non-point source pollutants (e.g. sediments, hydrocarbons) above current levels and have the potential for runoff and stress to marine resources (e.g. corals).
Roadway Widening, New Road Construction (Finegayan Connection), Military Access Point Modifications / Construction, & Road Realignment (Route 15)	Direct impacts	None: New road construction (Finegayan Connection) and Route 15 realignment would occur in upland areas with no direct removal or disturbance of marine communities.
	Indirect impacts – construction phase	None: New road construction (Finegayan Connection) and Route 15 realignment would occur in upland areas of North Guam with no impervious surface and/or drainage connection with marine environments.
	Indirect impacts – operational phase	
Bridge and Culvert Replacements (Aguada, Agana, Asan # 1, Asan # 2 Atantano, Fonte, Laguas, and Sasa Bridges)	Direct impacts	None: Bridge proposed for replacement span riverine habitats with no direct removal or disturbance of marine communities.
	Indirect impacts – construction phase	Uncontrolled runoff may impact marine communities downstream during the construction phase. Sedimentation and non-point pollution inputs into marine waters, particularly near termini of rivers and stormwater outflows have the potential to stress marine resources (e.g. corals).
	Indirect impacts – operational phase	Alteration of the hydraulic conveyance due to the new bridge design may impact downstream marine communities.

Notes:

¹ The GRN project descriptions are included in Volume 6, Chapter 2.

² Mitigation measures are included later in this chapter that minimize or avoid potential direct or indirect impacts.

Table 13.2-9. Central Region GRN Projects, Alternatives, and Potential Impacts

GRN #	Alternatives ¹				Potential Impact Type and Description ²	
	1	2	3	8	Indirect	Direct
1	x	x	x	x	Potential for uncontrolled runoff during the construction phase, non point-source pollutants and/or sedimentation inputs into marine communities of East Hagatna Bay.	None: The proposed road and intersection improvements in the Central region are all proposed to occur in upland non-marine environments. Therefore, no direct effects to marine environments are anticipated.
2	x	x	x	x		
3	x	x	x	x		
6	x	x	x	x	Potential for uncontrolled runoff during the construction phase, non point-source pollutants and/or sedimentation inputs into marine communities of Tumon Bay via stormwater drainages.	
7	x	x	x	x	The proposed roadway improvement along Chalan Lujuna would occur over pervious limestone substrates and limited potential for non-point source pollutant inputs into marine communities.	
11	x	x	x	x	The proposed roadway improvement along Route 15 would occur over pervious limestone substrates and limited potential for non-point source pollutant inputs into marine communities.	
12	x	x	x	x	Potential for uncontrolled runoff during the construction phase, non point-source pollutants and/or sedimentation inputs into marine communities of Asan Bay and Piti Bay, including Piti Bomb Holes Marine Preserve.	
13	x	x	x	x	Potential for uncontrolled runoff during the construction phase, non point-source pollutants and/or sedimentation inputs into marine communities of Hagatna Bay via stormwater drainages.	
14	x	x	x	x	Potential for uncontrolled runoff during the construction phase, non point-source pollutants and/or sedimentation inputs into marine communities of Tumon Bay via stormwater drainages.	
15	x	x	x	x		
16	x	x	x	x		
17	x	x	x	x		
18	x	x	x	x		
19	x	x	x	x		
20	x	x		x		
21	x	x	x	x		
28	x	x	x	x		
29	x	x	x	x	The proposed roadway improvement along Route 10 would occur over pervious limestone substrates and limited potential for non-point source pollutant inputs into marine communities.	
30	x	x	x	x		
31	x	x		x		
32	x	x	x	x	The proposed roadway improvement along Route 15 would occur over pervious limestone substrates and limited potential for non-point source pollutant inputs into marine communities.	

GRN #	Alternatives ¹				Potential Impact Type and Description ²	
	1	2	3	8	Indirect	Direct
33	x	x	x	x	Potential for uncontrolled runoff during the construction phase, non point-source pollutants and/or sedimentation inputs into marine communities of Tumon Bay via impervious surfaces, stormwater drainages, and/or Agana River drainages that terminate at Tumon Bay and Tumon Bay Marine Preserve.	None: The proposed road and intersection improvements in the Central region are all proposed to occur in upland non-marine environments. Therefore, no direct effects to marine environments are anticipated.
35	x	x	x	x	Potential for uncontrolled runoff during the construction phase, non point-source pollutants and/or sedimentation inputs into marine communities of Sasa Bay Marine Preserve (via Aguada, Laguas, Sasa Rivers), Inner Apra Harbor (via Fonte and Atantano Rivers), and Asan Bay (via the two crossings along the Asan River and adjacent drainage).	None: The proposed bridge replacements occur over riverine (non-marine) environments; therefore, no direct effects to marine environments are anticipated.
36	x	x	x	x	Potential for uncontrolled runoff from the Route 15 realignment; however, runoff would attenuate due to thick vegetation and highly pervious limestone. No surface stormwater drainage connection to marine communities around Pagat Point.	None: The proposed road and intersection improvements in the Central region are all proposed to occur in upland non-marine environments. Therefore, no direct effects to marine environments are anticipated.
44	x	x	x	x	Potential for uncontrolled runoff; however, runoff from the access gate construction area would attenuate due to thick vegetation and highly pervious limestone. No surface stormwater drainage connection to marine communities around Pagat Point.	
46	x	x	x	x		
47			x		The access gate at Barrigada (Navy) would occur over pervious limestone substrates and limited potential for non-point source pollutant inputs into marine communities.	
48			x			
49			x			
49A			x		The access gate at Barrigada (Air Force) would occur over pervious limestone substrates and limited potential for non-point source pollutant inputs into marine communities.	
63			x			
74			x			
113	x	x	x	x		

Note:

¹ The GRN project descriptions and alternatives are described in detail in Volume 6, Chapter 2.

² Mitigation measures are included later in this chapter that minimize or avoid potential direct or indirect impacts.

Legend: GRN = Guam Road Network.

Table 13.2-10. Apra Harbor GRN Projects, Alternatives, and Potential Impacts

GRN #	Alternatives ¹				Potential Impact Type and Description ²	
	1	2	3	8	Indirect	Direct
4	x	x	x	x	Potential for uncontrolled runoff during the construction phase, non point-source pollutants and/or sedimentation inputs into marine communities of Outer Apra Harbor (to the south) and outside the breakwater.	None: The proposed road and intersection improvements in the Apra Harbor region are all proposed to occur in upland non-marine environments. The addition of the weigh station associated with GRN #4) would also occur in upland non-marine environments. Therefore, no direct effects to marine environments are anticipated.
5	x	x	x	x		
24	x	x	x	x	Portions of the proposed roadway improvements along Route 1 are adjacent to Sasa Bay Marine Preserve (on the west side of Route 1) and freshwater wetlands (on the east side of Route 1) Potential for runoff during the construction phase into Sasa Bay and Sasa River, Laguas River, Aguada River, and Atantano River, which terminate at Sasa Bay or Inner Apra Harbor. Potential for uncontrolled runoff during the construction phase, non point-source pollutants and/or sedimentation.	
26	x	x	x	x	Portions of the proposed roadway improvements along Route 2A are adjacent freshwater wetlands formed by the Atantano River. Potential for runoff during the construction phase into the wetlands and other stormwater drainages that terminate at Inner Apra Harbor. Potential for uncontrolled runoff during the construction phase, non point-source pollutants and/or sedimentation.	
50	x	x	x	x	Potential for uncontrolled runoff during the construction phase, non point-source pollutants and/or sedimentation into marine communities of Inner Apra Harbor.	

Note:

¹ The GRN project descriptions and alternatives are described in detail in Volume 6, Chapter 2.

² Mitigation measures are included later in this chapter that minimize or avoid potential direct or indirect impacts.

Legend: GRN = Guam Road Network.

Table 13.2-11. South Region GRN Projects, Alternatives, and Potential Impacts

GRN #	Alternatives ¹				Potential Impact Type and Description ²	
	1	2	3	8	Indirect	Direct
25	x	x	x	x	Although most of the portions of the proposed roadway improvements along Route 5 are adjacent residential areas (e.g., Apra Heights), some portions have potential for construction runoff into freshwater wetlands formed by the Namo River near the Agat Commercial Center. The Namo River terminates at Agat Bay. Potential for runoff during the construction phase into upper reaches of the Namo River. The proposed intersection improvement for Route 2 and 12 would occur near commercial and light industrial areas (e.g., Agat Commercial Center). Runoff or noise during the construction phase would not impact terrestrial biological resources.	None: The proposed road and intersection improvements in the South region are all proposed to occur in upland non-marine environments. Therefore, no direct effects to marine environments are anticipated.
27	x	x	x	x		
52	x	x	x	x		
110	x	x	x	x		

Note:

¹ The GRN project descriptions and alternatives are described in detail in Volume 6, Chapter 2.

² Mitigation measures are included later in this chapter that minimize or avoid potential direct or indirect impacts.

Legend: GRN = Guam Road Network.

13.2.6.1 Alternative 1

Year 2014 (Peak Construction and Population)

North

None of the proposed roadway projects within the North Region would have the potential to directly or indirectly impact marine biological resources (i.e., marine flora and invertebrates, fish and EFH, special-status species, and non-native invasive species introductions). Runoff from these projects would attenuate due to thick vegetation and highly pervious limestone and none of the projects are proposed to occur within the marine environment.

Central

Because no GRN project is proposed to occur within marine environments in the Central Region, no direct impacts would occur to marine biological resources. The proposed road improvement projects for Alternative 1 in the Central Region that have the potential to indirectly impact marine biological resources include GRN #s 1, 2, 3, 6, 7, 13 - 21, 28, 29, 33, and 35. Impacts from construction activities may include loss of sediment into coastal waters and non-point source inputs into marine environments. Indirect impacts to marine resources include the potential for increased pollutant loading on road surfaces (e.g. substances containing hydrocarbon residues, sediments, and debris) relative to levels currently produced by existing traffic intensity. This increased potential for non-point source pollution may stress coral communities in marine environments along Route 1. Particular areas of concern are designated marine preserve areas, such as Sasa Bay Marine Preserve, Piti Bomb Holes Marine Preserve, and Tumon Bay Marine Preserve, although non-designated bays are also important marine environments. As discussed within this chapter, the downstream termini of drainages and rivers that would potentially carry

pollutants and sediments into marine environments are important, although degraded, marine communities.

Apra Harbor

Because no Apra Harbor Region GRN projects are proposed to occur associated with the marine environment, no direct impacts to marine biological resources would occur; all proposed projects (GRN #s 4, 5, 24, 26, and 50) within the Apra Harbor Region have the potential to indirectly impact marine biological resources through runoff or pollutants carried downstream. Portions of the proposed roadway improvements along Route 1 are adjacent to Sasa Bay Marine Preserve (on the west side of Route 1) and freshwater wetlands (on the east side of Route 1). These projects have the potential for runoff during the construction phase into Sasa Bay and Sasa River, Laguas River, Aguada River, and Atantano River, which terminate at Sasa Bay or Inner Apra Harbor. Other areas of concern include Outer Apra Harbor (south side of Route 11), and open water to the north of Route 11).

South

Because no South Region GRN projects are proposed to occur within marine environments, no direct impacts to marine biological resources would occur; projects (GRN #s 25, 27, and 52) within the South Region have the potential to indirectly impact marine biological resources. Although most of the portions of the proposed roadway improvements along Route 5 are adjacent residential areas (e.g., Apra Heights subdivision), some portions have potential for construction runoff into freshwater wetlands formed by the Namo River near the Agat Commercial Center. The Namo River terminates at Agat Bay, which would be considered a pathway for inputs into Agat Bay.

Year 2030

North

None of the proposed roadway projects within the North Region would have the potential to impact marine biological resources.

Central

In the long-term, none of the proposed roadway projects within the Central Region would have the potential to impact marine biological resources because there would be no net increase in impervious cover over existing conditions after the construction is complete.

Apra Harbor

In the long-term, none of the proposed roadway projects within the Apra Harbor Region would have the potential to impact marine biological resources because there would be no net increase in impervious cover over existing conditions after the construction is complete.

South

In the long-term, none of the proposed roadway projects within the South Region would have the potential to impact marine biological resources because there would be no net increase in impervious cover over existing conditions after the construction is complete.

In conclusion, implementation of Alternative 1 would not substantially impact marine biological resources within the North, Central, Apra Harbor, or South regions. Any potential affects from construction.

Proposed Mitigation Measures

As impacts to marine resources (i.e., marine flora, invertebrates and associated EFH, fish and EFH, special-status species, and non-native invasive species introductions) are indirect and temporary (during the construction phase of the bridge and culvert replacements), no mitigation measures are identified at this time. The use of BMPs as described in Volume 7 would be implemented as appropriate to avoid and minimize negative impacts to marine resources. The Navy is developing the MBP and is implementing interim biosecurity measures to minimize impacts from non-native invasive species associated with the construction phase of the road improvements and bridge and culvert replacements. Because the eight bridge and culvert replacements occur within potential waters of the U.S., the FHWA would be engaging the USACE Honolulu District Office in the Section 404 CWA permitting process. During this process, additional BMPs or mitigations may be required as part of the permit conditions.

13.2.6.2 Alternative 2 (Preferred Alternative)

Proposed road projects under Alternative 2 are the same as the proposed road projects under Alternative 1, with the exception of military access point locations at NCTS Finegayan. The difference in locations of these access gates does not vary the potential impact of Alternative 2 relative to Alternative 1. Therefore, impacts to marine biological resources for Alternative 2 are the same as those for Alternative 1 for each region.

Proposed Mitigation Measures

The mitigation measures for Alternative 2 are the same as those for Alternative 1.

13.2.6.3 Alternative 3

The proposed road projects under Alternative 3 are the same as the proposed road projects under Alternative 1, except that Alternative 3 includes GRN #s 38, 39, 47, 48, 49, 63, and 74, and it excludes GRN #s 20, 31, 38A, 39A, 41, 41A and 124. GRN #s 47 and 48 are associated with new access to Barrigada (Navy); however, these projects would occur in upland areas where stormwater runoff would be expected to attenuate before reaching marine habitats. Gate locations for Alternative 3 are the same for Alternative 1, except that NCTS Finegayan Main Gate and commercial gate locations (GRN #s 38 and 39) are in different locations than the Main Gate and commercial gate locations in Alternative 1 (GRN # 38A and 39A). Again, these gate locations are within upland areas where stormwater runoff would be expected to attenuate before reaching marine habitats. Therefore, impacts to marine biological resources of Alternative 3 are similar to Alternative 1 for each region.

Proposed Mitigation Measures

The mitigation measures for Alternative 3 are the same as those for Alternative 1.

13.2.6.4 Alternative 8

The proposed road projects under Alternative 8 are the same as those under Alternative 1 with the exception of the military access gate location at Barrigada (Air Force). The impact conclusion for this gate location project included as part of Alternative 8 (GRN # 49A) is the same for the access gate project included as part of Alternative 3 (GRN # 49); therefore, impacts to marine biological resources of Alternative 8 are similar to Alternative 1 and Alternative 3 for each region.

Proposed Mitigation Measures

The mitigation measures for Alternative 8 are the same as those for Alternative 1.

13.2.6.5 Firing Range Options

The alternatives described in Volume 2, Chapter 2, for the relocation include the Main Cantonment action alternatives with either a Firing Range Option A or B. Option A would require the realignment of Route 15 (GRN #36), while Option B does not require realignment of Route 15. Neither option would impact marine biological resources.

13.2.6.6 Summary of Impacts

Table 13.2-12 summarizes the potential impacts of each alternative. The proposed road projects in the North and South regions would not directly or indirectly impact marine biological resources. Only projects within the Apra Harbor and Central regions were assessed for potential impacts to marine biological resources, and the projects within these study areas do not require construction within coastal waters.

13.2.6.7 Summary of Proposed Mitigation Measures

No mitigation measures are required for roadway projects impacts to marine biological resources.

Table 13.2-12. Summary of Potential Impacts

<i>Potentially Affected Resource</i>	<i>Alternative 1</i>	<i>Alternative 2*</i>	<i>Alternative 3</i>	<i>Alternative 8</i>
Marine Flora, Invertebrates and Associated EFH	LSI	LSI	LSI	LSI
Fish and Associated EFH	LSI	LSI	LSI	LSI
Special-Status Species	LSI	LSI	LSI	LSI
Non-native Species Introductions	LSI	LSI	LSI	LSI

Legend: EFH = Essential Fish Habitat; LSI = Less than significant impact.* Preferred Alternative.