

CHAPTER 18.

PUBLIC HEALTH AND SAFETY

18.1 AFFECTED ENVIRONMENT

18.1.1 Definition of Resource

This section discusses the potential public health and safety issues related to implementation of the proposed action and alternatives on Guam. The region of influence (ROI) for public health and safety concerns includes the entire island. The various divisions (i.e., Environmental Health, Public Health, and Public Welfare) of the Guam Department of Public Health and Social Services (Department) is responsible for ensuring the safety and health of individuals and workers on Guam. The Department ensures construction and daily activities on Guam are conducted in accordance with applicable federal and Guam laws and regulations to ensure a safe environment for Guam residents to live and work.

The Marine Corps practices Operational Risk Management as outlined in Operational Navy 3500.39A and Marine Corps Order 3500.27A. Requirements outlined in these documents provide for a process to maintain readiness in peacetime and achieving success in combat while safeguarding people and resources. The health and safety analysis presented in the following sections addresses issues related to the health and well being of both military personnel and civilians living on Guam in the vicinity of proposed military operations and training areas.

The health and safety issues discussed in this section include operational and construction safety, environmental health effects, notifiable diseases, mental illness, traffic accidents, unexploded ordnance (UXO), and reduction in access to public services. Notifiable diseases are diseases that are required by law to be reported to government authorities. This collation of information allows the authorities to monitor the disease and provides early warning of possible outbreaks. Mental illness includes various psychiatric conditions that cause impairment of an individual's behavior. A traffic accident is a road traffic incident that usually involves one automobile (e.g., car, truck, motorcycle) colliding with either another vehicle or a stationary roadside object. UXO includes ordnance items that were fired from a weapon and failed to function properly or munitions that were not fired but abandoned and were not properly disposed.

These concerns are addressed in relation to the current population of Guam and the per capita rates of occurrence for each of these public health and safety factors. Additional information pertinent to public health and safety issues is provided in Volume 2, Chapter 16, Socioeconomic and General Services).

18.1.2 Operational Safety

18.1.2.1 Aircraft Mishaps

Areas around airports are exposed to the possibility of aircraft accidents, even with well-maintained aircraft and highly-trained aircrews. Despite stringent maintenance requirements and countless hours of training, past history indicated that accidents may occur. The risk of people on the ground being killed or injured by aircraft accidents is small. However, an aircraft accident is a high-consequence event and, when a crash does occur, the result is often catastrophic. To address the potential for aircraft mishaps, the military approaches safety from a land-use planning perspective through its Air Installation Compatible Use Zone (AICUZ) program. Designation of safety zones around airfields and restriction of incompatible land uses reduces the public's exposure to safety hazards.

Accident Potential Zones (APZs) are established to delineate recommended surrounding land uses for the protection of people and property on the ground. APZs define the areas in the vicinity of an airfield that would have the highest potential to be affected if an aircraft mishap were to occur. AICUZ guidelines identify three types of APZs for airfields based on aircraft mishap patterns: the Clear Zone, APZ I, and APZ II. The standard Clear Zone is a 3,000 feet (ft) (915 meter [m]) by 3,000 ft (915 m) square area that extends from the end of a runway and has the highest probability of being impacted by a mishap. APZ I, which typically extends 5,000 ft (1,524 m) from the end of the Clear Zone, has a lower mishap probability. APZ II, which typically extends 7,000 ft (2,134 m) from the end of APZ I, has the lowest mishap probability of the three zones. APZs have been established for the airfield to minimize the results of a potential accident involving military aircraft operating on Guam.

The Federal Aviation Administration (FAA) is responsible for ensuring safe and efficient use of United States (U.S.) airspace by military and civilian aircraft and for supporting national defense requirements. In order to fulfill these requirements, the FAA has established safety regulations, airspace management guidelines, a civil-military common system, and cooperative activities with the Department of Defense (DoD). The primary concern with regard to military training flights is the potential for aircraft mishaps (i.e., crashes) to occur, which could be caused by mid-air collisions with other aircraft or objects, weather difficulties, mechanical failures, pilot error, or bird aircraft strikes.

Aircraft mishaps are classified as A, B, or C. Class A mishaps are the most severe with total property damage of \$1 million or more and a fatality and/or permanent total disability and is used for comparing mishap rates for various aircraft types. Class A mishap rates for aircraft associated with proposed Marine Corps operations on Guam are presented in Table 18.1-1.

Table 18.1-1. Class A Flight Mishaps

<i>Aircraft Type</i>	<i>Mishap Rate</i>
CH-53	1.76
MV-22	11.43
AH-1	4.04
UH-1	3.71

Notes: — The mishap rate is an average based on the total mishaps and 100,000 flying hours.

Sources: Congress Research Service 2002, Navy 2008.

The 2002-2008 annual average Navy flight mishap rate was 1.54 (Navy 2009). The mishap rate is an average based on the total mishaps and 100,000 flying hours.

18.1.2.2 Bird Aircraft Strike Hazards

Bird strikes constitute a safety concern because of the potential for damage to aircraft, injury to aircrews, or impacts to local populations if an aircraft strike and subsequent aircraft accident should occur in a populated area. Aircraft may encounter birds at altitudes of 30,000 ft (9,144 m) above mean sea level or higher; however, most birds fly close to the ground. Over 95% of reported bird strikes occur below 3,000 ft (915 m) above ground level. Approximately 49% of bird strikes occur in the airport environment and 15% during low-level cruise. Navy and Marine Corps commands are required to develop a Bird Aircraft Strike Hazards (BASH) plan to reduce hazardous bird activity relative to airport flight operations.

A BASH program is an ongoing process including both information dissemination and active/passive bird control techniques. Of these processes, the most critical is the aircrew notification and warning system. This system establishes procedures for the immediate exchange of information between ground agencies and aircrews concerning the existence and location of birds that pose a hazard to flight safety.

The standardized Bird Hazard Condition (BHC) warning system is used to warn aircrew and support personnel of the current bird threat to operations. These codes are identical for both the Navy and the Air Force as presented in section B of the DoD Flight Information Handbook. Bird locations are provided with the appropriate condition code.

BHC Red (Severe) is generally defined as heavy concentrations of birds (more than 15 large or 30 small) on or immediately adjacent to the active runway or other specific locations that present an immediate hazard to flight operations. Active dispersal is initiated and BASH Detection and Dispersal Team (BDDT) personnel are to remain on the airfield actively involved in dispersal techniques until this BHC is downgraded. Aircrews should apply applicable Go/No-Go criteria. BHC Red may also be declared when birds of any size or quantity present an immediate hazard.

BHC Yellow (Moderate) is generally defined as moderate concentrations of birds (5 to 15 large or 15 to 30 small) observable in locations that represent a probable hazard to flying operations. Actions may be taken to disperse the concentrations of birds that are causing the hazard.

BHC Green (Low) involves sparse bird activity on and above the airfield (less than described in Yellow) with a low probability of hazard.

With respect to bird dispersal procedures, the BDDT actively patrols the airfield. Prior to initiation of dispersal actions, the BDDT leader coordinates the location and dispersal methods with the control tower and ensures that BHC Red has been declared prior to dispersal activities on the airfield. Horns and bioacoustic distress calls are typically used before pyrotechnics are used. Pyrotechnics are typically used in conjunction with distress tapes. These consist of screamer, whistle banger, and cracker shells. Propane sound cannons may be placed around the airfield and moved periodically (once a day) to prevent habituation. If the dispersal methods above do not work or the birds become accustomed to the hazing, it may become necessary to remove birds via lethal methods to reinforce the dispersal methods. Lethal control methods would be conducted in accordance with appropriate depredation permit guidelines. Once the target flock or problem birds are dispersed, the control tower is notified so the BHC can be lowered.

The 8-year annual average for bird strikes at Andersen Air Force Base (AFB) on the northern portion of Guam is 3 per year (PACAF 2006).

18.1.2.3 Explosives Safety

Siting requirements for explosive materials storage (e.g., munitions) and handling facilities are based on safety and security criteria established by the DoD Explosive Safety Board. Explosive Safety Quantity Distance (ESQDs) arcs determine the distance between ordnance storage and handling facilities and inhabitable areas. Ammunition and bulk explosives are stored in magazines specifically designed, sited, and designated for this purpose. A magazine's ESQD arc is calculated by the type and amount of ordnance stored in that magazine. ESQD requirements and permissible storage capacities are established by Naval Sea Systems Command and approved by the DoD Explosives Safety Board.

18.1.2.4 Electromagnetic Emissions

Radar and other high-energy electromagnetic emissions can constitute a hazard to persons exposed to radiation above a threshold power density. Electromagnetic signals emanating from communication and other radar equipment can also interfere with and adversely affect stored ordnance and fuel. Electromagnetic radiation hazards occur when transmitting equipment generates sufficient field intensity to cause harmful or injurious effects to humans or wildlife; induce or couple currents and/or voltages of

magnitudes sufficient to initiate electro-explosive devices in ordnance; or create sparks or sufficient magnitude to ignite flammable materials.

Exposure to electromagnetic emissions is controlled in accordance with national exposure standards (e.g., federal and voluntary exposure standards), which are set by experts in biophysics, medicine, engineering, and epidemiology. The Institute of Electrical and Electronics Engineers International Committee for Electromagnetic Safety produces an electromagnetic emission standard that has been adopted by the American National Standards Institute as an Institute of Electrical and Electronics Engineers/American National Standards Institute standard. This voluntary standard is based on numerous sources of scientific information that are subject to rigorous review. After reviewing the biological effects database, scientific committees concluded that the threshold for potential adverse biological effects was 4 watts per kilogram of absorbed electromagnetic emission per unit mass of tissue. The standards-making organizations have adopted safety factors for electromagnetic emission exposures in occupational and general public settings. These safety factors are set at 10 for occupational exposures and 50 for general public exposures, thereby reducing the adverse biological effects threshold to 0.4 and 0.08 W/kg, respectively (Institute of Electrical and Electronics Engineers 1999).

18.1.3 Environmental Health Effects

18.1.3.1 Noise

Volume 2, Chapter 6 discusses the current noise environment associated with military activities on Guam. Currently, various activities occurring on Guam create noise; these activities include (depending on the location on Guam) aviation operations, range operations, traffic, construction, and general industrial activities. These activities are generally conducted in accordance with applicable regulations to protect the general population and workers from excessive noise exposure.

18.1.3.2 Water Quality

Volume 2, Chapter 4 discusses water quality issues that could potentially affect public health. The U.S. Environmental Protection Agency (USEPA) and Guam Environmental Protection Agency (GEPA) enforce Safe Drinking Water Act standards and related legislation to protect public health. Currently, Guam's water quality meets Safe Drinking Water Act standards.

18.1.3.3 Air Quality

Volume 2, Chapter 5 discusses the stationary and mobile source air emissions that can potentially affect public health. USEPA and GEPA set and enforce these standards to protect public health. Currently, ambient air quality standards are met for all areas excepting the area surrounding the Piti and Tanquisson power plants. At each of these sites, a 2.2 mile (3.5 km) radius surrounding each plant has been identified as non-attainment for sulfur dioxide. No other air quality issues have been identified that currently pose public health or safety risks from an air quality perspective.

18.1.3.4 Health Care Services

Volume 2, Chapter 16 discusses existing health care services conditions on Guam. The island is currently designated a Medically Underserved Area. Further, the island's remoteness exacerbates the ability to provide specialized health care services when needed and not available on island. As result, Guam falls below the national average in terms of health care provider to general population ratio. The service ratio for the number of physicians to the population of Guam is 1:2,821 (i.e., 1 doctor per 2,821 people). The service ratio for the number of nurses to the population of Guam is 1:453 (i.e., 1 nurse per 453 people).

18.1.4 Notifiable Diseases

18.1.4.1 AIDS

AIDS is an infectious disease caused by the human immunodeficiency virus (HIV). AIDS is the advanced form of infection with the HIV virus, which may not cause recognizable symptoms for a long period after the initial exposure. No vaccine is currently available to prevent HIV infection. At present, all forms of AIDS therapy are focused on improving the quality and length of life for AIDS patients by slowing or halting the replication of the virus and treating or preventing infections and cancers that take advantage of a person's weakened immune system. The average number of AIDS cases on Guam over the past 10 years is five cases per year. The average per capita occurrence of AIDS patients is 0.0000306. This equates to one case of AIDS for every 32,678 people on Guam (Table 18.1-2).

Table 18.1-2. AIDS Reports, Guam 1997-2006

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Average	Total
Cases	5	8	8	1	9	4	9	0	3	0	5	47
Rate	NA	NA	NA	NA	1/17,506	1/40,199	1/18,215	0	1/56,188	0	1/32,678	—

Note: — not applicable; NA Population of Guam not available to calculate rate.

Source: Department of Public Health and Social Services 2006.

18.1.4.2 Cholera

Cholera is an acute infectious disease characterized by watery diarrhea that is caused by the bacterium *Vibrio cholerae*. Cholera is spread by eating food or drinking water contaminated with the bacterium. Modern sanitation and the treatment of drinking water have virtually eliminated the disease in developed countries. Cholera outbreaks still occur from time to time in less developed countries. Between 2001 and 2006 Guam had three cases of Cholera reported. This makes the average per capita incidence of Cholera 0.00000612, which means that, on Guam, there is one case of Cholera for every 163,389 people. The current population on Guam is estimated at 171,091, meaning that there is statistically less than one case of Cholera reported in any given year (Table 18.1-3).

Table 18.1-3. Cholera Reports, Guam 1997-2006

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Average	Total
Cases	0	2	0	4	0	0	0	0	3	0	1	9
Rate	NA	NA	NA	NA	0	0	0	0	1/56,188	0	1/163,389	—

Notes: — not applicable; NA Population of Guam not available to calculate rate.

Source: Department of Public Health and Social Services 2006

18.1.4.3 Dengue

Dengue is an infectious tropical disease caused by an arbovirus transmitted by mosquitoes and characterized by high fever, rash, headache, and severe muscle and joint pain. The average number of dengue cases on Guam over the past 10 years is one per year. The average per capita rate of dengue cases on Guam is 0.00000612. This translates into one case of dengue per 163,389 people (Table 18.1-4). It should be noted that all reported cases of dengue were contracted off-island.

Table 18.1-4. Dengue Reports, Guam 1997-2006

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Average	Total
Cases	1	2	1	2	0	0	1	1	0	3	1	11
Rate	NA	NA	NA	NA	0	0	1/163,940	1/166,090	0	1/57,019	1/163,389	—

Note: — not applicable; NA Population of Guam not available to calculate rate.

Source: Department of Public Health and Social Services 2006.

18.1.4.4 Hepatitis C

Hepatitis C is a form of liver inflammation that primarily causes a long-lasting disease. The most common way of transmitting hepatitis C is by contact with infected blood. In 2006, there were no reported new cases of hepatitis C; however there have been over 30 cases in the past 10 years. The average per capita rate of hepatitis C cases on Guam is 0.0000190. This translates into one case of hepatitis C per 52,706 people (Table 18.1-5).

Table 18.1-5. Hepatitis C Reports, Guam 1997-2006

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Average	Total
Cases	3	1	2	3	0	0	5	9	8	0	3.1	31
Rate	NA	NA	NA	NA	0	0	1/32,788	1/18,454	1/21,071	0	1/52,706	—

Note: — not applicable; NA Population of Guam not available to calculate rate.

Source: Department of Public Health and Social Services 2006.

18.1.4.5 Malaria

Malaria is a serious infectious disease spread by certain mosquitoes. A person gets malaria when bitten by a female mosquito and is infected with the malaria parasite. The parasites enter the blood stream and travel to the liver. When the parasites re-emerge into the blood, symptoms appear. It is most common in tropical climates and is characterized by recurrent symptoms of chills, fever, and an enlarged spleen. The disease can be treated with medication, but it often recurs. The average number of malaria cases on Guam over the past 10 years is one case per year (Department of Public Health and Social Services 2006). The average per capita rate of malaria cases on Guam is 0.00000612. This translates into one case of malaria per 163,389 people (Table 18.1-6). It should be noted that all reported cases of malaria were contracted off-island.

Table 18.1-6. Malaria Reports, Guam 1997-2006

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Average	Total
Cases	0	2	1	2	1	0	1	0	0	3	1	10
Rate	NA	NA	NA	NA	1/157,5570	0	1/163,940	0	0	1/57,019	1/163,389	—

Notes: — not applicable; NA Population of Guam not available to calculate rate.

Source: Department of Public Health and Social Services 2006

18.1.4.6 Measles

Measles is an infection caused by a virus (*paramyxovirus*) that causes an illness displaying a characteristic skin rash. It is an extremely contagious infection, spread through the tiny droplets that may spray into the air when an individual carrying the virus sneezes or coughs. Once someone is infected with the virus, it takes about 7-18 days before they actually become ill. In the last 10 years, the highest number of cases in a year was nine, in 2002, which accounts for half the total number of measles cases on Guam in that same time period. The average per capita of measles cases is 0.0000102, which means that there is one case of measles for every 90,772 people (Table 18.1-7).

Table 18.1-7. Measles Reports, Guam 1997-2006

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Average	Total
Cases	0	0	1	0	0	9	5	3	0	0	1.8	18
Rate	0	0	NA	0	0	1/17,866	1/32,788	1/55,363	0	0	1/90,772	—

Note: — not applicable; NA Population of Guam not available to calculate rate.

Source: Department of Public Health and Social Services 2006.

18.1.4.7 Rubella

Rubella, or the German Measles, is similar to the common Measles in that it is transmitted through the tiny droplets that may spray into the air when an individual carrying the virus sneezes or coughs. Rubella is caused by the rubella virus (*Rubivirus*) and symptoms are generally mild. The first visible sign of rubella is a red rash that begins on the face and rapidly moves downward to cover the whole body within 24 hours. Unlike the common measles, rubella is not commonly found on Guam. In the past ten years, there have been two cases of Rubella, making the average per capita of Rubella occurrences 0.00000122. (Table 18.1-8).

Table 18.1-8. Rubella Reports, Guam 1997-2006

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Average	Total
Cases	0	0	0	0	0	0	1	1	0	0	0.2	2
Rate	0	0	0	0	0	0	1/163,940	1/166,090	0	0	1/2,768,033	—

Note: — not applicable; NA Population of Guam not available to calculate rate.

Source: Department of Public Health and Social Services 2006.

18.1.4.8 Typhoid Fever

Typhoid fever is a severe infection caused by a bacterium, (*Salmonella typhi*). The most prominent symptom of Typhoid fever is persistent high fever. Typhoid fever is passed from person to person through poor hygiene, such as incomplete or no hand washing. In the past ten years on Guam there have been seven patients diagnosed with Typhoid fever. The average per capita occurrence for Typhoid fever cases is 0.00000428, making the incidence of Typhoid fever one case for every 233,412 people (Table 18.1-9).

Table 18.1-9. Typhoid Fever Reports, Guam 1997-2006

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Average	Total
Cases	2	0	0	0	3	0	0	1	1	0	0.7	7
Rate	NA	0	0	0	1/52,519	0	0	1/166,090	1/168,564	0	1/233,412	—

Note: — not applicable; NA Population of Guam not available to calculate rate.

Source: Department of Public Health and Social Services 2006.

18.1.4.9 STDs other than AIDS

STDs include Chlamydia, Gonorrhea, and Syphilis, which are all transmitted by sexual contact. The 10 year average for STD cases is 671 per year. This average includes all three diseases. The average per capita STD occurrences on Guam is 0.0041, which means that, in any given year, there would be one new case of an STD for every 243 people (Table 18.1-10).

Table 18.1-10. Sexually Transmitted Disease Reports, Guam 1997-2006

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Average	Total
Cases	442	507	524	558	465	682	669	930	974	961	671.2	6,712
Rate	NA	NA	NA	NA	1/339	1/236	1/245	1/179	1/173	1/178	1/243	—

Note: — not applicable; NA Population of Guam not available to calculate rate.

Source: Department of Public Health and Social Services 2006.

18.1.4.10 Tuberculosis

Tuberculosis (TB) is a potentially fatal contagious disease that can affect almost any part of the body but is mainly an infection of the lungs. It is caused by a bacterial microorganism, the tubercle bacillus or *Mycobacterium tuberculosis*. TB spreads when a TB patient exhales, coughs, or sneezes, tiny droplets of fluid containing tubercle bacilli are released into the air. TB is not, however, highly contagious compared to some other infectious diseases. Only about one in three close contacts of a TB patient, and fewer than

15% of more remote contacts, are likely to become infected. Unlike many other infections, TB is not passed on by contact with a patient's clothing, bed linens, or dishes and cooking utensils.

The 10-year average for TB cases is 67.5 per year. The average per capita TB occurrences on Guam is 0.0407, which means that, in any given year, there would be one new case of TB for every 2,416 people (Table 18.1-11).

Table 18.1-11. Tuberculosis Reports, Guam 1997-2006

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Average	Total
Cases	95	84	70	54	63	65	61	56	73	54	67.5	675
Rate	NA	NA	NA	NA	1/2,502	1/2,476	1/2,687	1/2,972	1/2,308	1/3,168	1/2,416	—

Note: — not applicable; NA Population of Guam not available to calculate rate.

Source: Department of Public Health and Social Services 2006.

18.1.5 Mental Illness

Mental illness can be any various psychiatric condition, usually characterized by impairment of an individual's normal cognitive, emotional, or behavioral functioning, and caused by physiological or psychosocial factors. The 6-year average for mental illness cases per year is 177. The average per capita mental illness occurrences on Guam is 0.00108, which means that, in any given year, there would be one case of a mental illness for every 923 people (Table 18.1-12).

Table 18.1-12. Mental Illness Reports, Guam 2000-2005

	2000	2001	2002	2003	2004	2005	Average
Population	NA	157,557	160,796	163,941	160,090	168,564	163,389
Cases	212	204	177	159	155	153	177
	NA	1/722	1/908	1/1,031	1/1,071	1/1,101	1/923

Note: — not applicable; NA Population of Guam not available to calculate rate.

Source: Department of Public Health and Social Services 2006.

18.1.6 Hazardous Substances

Volume 2, Chapter 17 discusses practices associated with hazardous materials and waste management on Guam. Current management practices and contingency plans for the use, handling, storage, transportation, and disposition of hazardous substances ensures exposure to the environment and human contact are minimized.

18.1.7 UXO

Guam was an active battlefield during World War II. As a result of the occupation by Japanese forces and the assault by Allied/American forces to retake the island, unexploded military munitions may still remain. Unexploded military munitions have been discovered periodically since the end of the war and may still be present on Guam. Unexploded military munitions can be classified into two main categories: UXO, which are ordnance items that were fired from a weapon and failed to function properly (i.e., explode). These items are fused and are considered more sensitive than the second category of unexploded military munitions, Discarded Military Munitions (DMM). DMM consists of munitions that were not fired but abandoned and were not properly disposed. DMM items could include munitions that were left behind by military personnel and intentionally buried (i.e., weapons cache) or unintentionally buried as a result of combat on the island. Additionally, the retaking of Guam by Allied/American forces required amphibious landings; therefore, UXO and DMM may also be present in waters off the assault beaches.

UXO and DMM items include, but are not limited to: aerial bombs, Naval and field artillery projectiles, aerial and barrage rockets, mortar rounds, bazooka rounds, hand grenades, landmines, flares, and other pyrotechnic devices. The aforementioned munitions would vary in size (e.g., 105-millimeter or 5-inch projectiles) and explosive hazard (e.g., high explosive, incendiary filler).

Clearances for unexploded military munitions have been conducted in the past to remove this hazard, and unexploded military munitions have been found and reported periodically since the end of the war. Although over 60 years have passed since the battle for Guam and portions of the island have been developed, unexploded military munitions may still be present.

18.1.8 Off Base Roadways

The proposed action include on base roadway construction projects that would be implemented by the DoD. An affected environment description for on base roadway construction projects is included beneath the appropriate subheadings in other sections of this chapter. The following section describes the affected environment for off base roadway construction projects that would be implemented by the Federal Highway Administration (FHWA).

18.1.8.1 North

Roadway projects in the north region of Guam include intersection improvements, pavement strengthening, road widening, and construction of a new road, as well as military access point construction for facilitating access to Finegayan and Andersen AFB. The roadway project action alternatives comprise nine projects proposed for the north region of Guam, as described in the Roadway Projects section of Volume 6.

The potentially affected public health and safety factors associated with road projects adopts the relevant resource definitions described in this Affected Environment section. The public health and safety aspects relevant to the proposed roadway improvements include (1) traffic incidents, as described in the Affected Environment section, Apra Harbor region, of this chapter; and (2) unexploded ordnance, as described in the Affected Environment section, south region, of this chapter. The subjects of notifiable diseases and mental illness have been evaluated in the Affected Environment section, North and Central regions, of this chapter.

The Guam Police Department has instituted traffic safety checkpoints and safety education programs across the island. Traffic accident data for the years 2001 through 2005 indicated that, despite the population increase over the 5-year period between 2001 and 2005, the number of traffic accidents has decreased. The number of traffic accident-related fatalities averages 18 per year.

Guam DPW is conducting a safety and hazard elimination study to identify the most hazardous traffic locations on Guam. Preliminary results identified intersections with the highest frequency of fatal, non-fatal, or non-injury traffic accidents. Traffic incident information was reported by classifying information into categories reflecting:

- Type of accident
- Location information
- Involvement by automobile(s), motorcycle(s), and/or pedestrian(s)
- Weather conditions
- Time of day, day of week, month
- Type of maneuver
- Road characteristics

- Road surface
- Traffic controls, and
- Driver characteristics and behavior

Accident reports for 2005 and 2006 were reviewed, resulting in a preliminary list of the 50 most hazardous intersections. Based on a preliminary statistical trend analysis of fatal accidents on Guam:

- 26% of fatalities resulted from cars that ran off a roadway
- 20% of fatalities involved a pedestrian
- The greatest number of fatal crashes occurs at 8:00 a.m. and 9:00 p.m.
- The greatest number of total crashes occurs between 8:00 a.m. and 6:00 p.m.
- The greatest number of crashes occurs between Friday and Sunday
- The greatest number of crashes occurs between January and April, and also in October
- The greatest number of crashes occurs during clear and dry weather

In the north region, the intersection of Routes 1 and 28 has the highest frequency of collisions based on an analysis of 2005 and 2006 accidents at intersections on Guam. The North Region also exhibits a relatively low crash frequency near existing schools. Over the period of 2005 to 2006, there were between zero and 49 accidents within 0.25-mile (0.40-kilometer) of a school.

The Guam Territorial Transportation Improvement Plan (TTIP) contains 14 hazard elimination projects, six of which are specific locations. While there were no hazard elimination projects identified or funded for the North Region of Guam, islandwide projects include school zone signs, village road safety and warning signs, seashore protection, pavement markers, anti-skid surfacing, and guardrails.

18.1.8.2 Central

The central region has the greatest number of existing traffic safety hazards due to the concentration of roadways and population. Nine high crash frequency locations on Guam are located in the Central Region: Route 1/Route 14; Route 1/Route 3; Route 1/Route 18; Route 1/Route 26; Route 1/Route 14A; Route 1/Route 10A; Route 10/Tun Jose Salas; Route 8/Route 10/Route 16 (Tri-Intersectional); and Route 1/Route 30. .

The highest frequency of vehicle crashes near schools on Guam occurs in the Central Region. Over the period of 2005 to 2006, seven school sites reported from 50 to 197 accidents within 0.25-mile (0.40-kilometers) of a school. The highest frequency of accidents occurred near John F. Kennedy High School and Santa Barbara School.

A TTIP hazard elimination project on Route 1 (Deadman's Curve) is the only specific location project that has been funded in the central region.

18.1.8.3 Apra Harbor

The Apra Harbor region is characterized by a low number of existing safety hazards. No high crash frequency locations on Guam are in this region. There are no school locations in the Apra Harbor region. There were no TTIP hazard elimination projects identified for this region.

18.1.8.4 South

The south region has a low number of existing safety hazards. No high crash frequency locations on Guam are located in the South Region.

The South Region exhibits a relatively low crash frequency near existing schools. Over the period of 2005 to 2006, schools in the South Region exhibited between zero and 49 accidents.

A TTIP hazard elimination project on Route 4 (Jeff's Pirate Cove) is the only specific location project in the south region of Guam that has been funded.

18.1.9 Public Services

Police Service

Volume 2, Chapter 16 discusses existing police services on Guam. The Guam Police Department (GPD) is responsible for law enforcement outside of federal property. Police stations are located in Hagatna, Dededo, Agat, and the Tumon Bay resort area. The island currently experiences both violent and property crime levels well below the U.S. national average. Total arrests in 2007 were 3,315 (Guam Police Department 2007). In 2007, the GPD employed 309 sworn personnel and 66 civilian employees. The service ratio for the number of police officers to the population of Guam is 1:561 (i.e., 1 officer per 561 people).

Fire Service

Volume 2, Chapter 16 discusses existing fire suppression services on Guam. The Guam Fire Department (GFD) is the primary agency responsible for fire suppression, search and rescue, and emergency medical response for the territory of Guam. GFD operates 12 fire stations (5 in the northern district and seven in the southern district), two rescue bases, and the 911 Integrated Emergency Communications Center. GFD currently employs approximately 200 full-time sworn firefighters. The service ratio for the number of firefighters to the population of Guam is 1:846 (i.e., 1 firefighter per 846 people).

18.2 ENVIRONMENTAL CONSEQUENCES

This description of environmental consequences addresses all components of the proposed action for the Marine Corps on Guam. The components addressed include: Main Cantonment, Training, Airfield, and Waterfront. There are multiple alternatives for the Main Cantonment, Training-Firing Range, Training-Ammunition Storage, and Training-NMS Access Road. Airfield and Waterfront do not have alternatives. Although organized by the Main Cantonment alternatives, a full analysis of each alternative, Airfield, and Waterfront is presented beneath the respective headings. A summary of impacts specific to each alternative, Airfield, and Waterfront is presented at the end of this chapter. An analysis of the impacts associated with the off base roadways is discussed in more detail in Volume 6.

18.2.1 Approach to Analysis

18.2.1.1 Methodology

Public health and safety concerns were addressed based on anticipated changes in the population of Guam, both from natural increases and from population growth created by implementing the proposed action and alternatives. Average per capita incidents for notifiable diseases, mental illness, and traffic accidents were used to calculate the potential increase in these incidents as a result of the alternatives. Safety of construction workers would be conducted in accordance with Occupational Safety and Health Administration guidelines to ensure a safe work environment.

Data used for the analysis included information regarding the current and projected population of Guam as well as incident rates for notifiable diseases, mental illness, and traffic accidents. Population, notifiable disease, mental illness, and traffic accident data were obtained from various sources including the Guam

Bureau of Statistics and the Bureau of the Census. Information regarding the possible presence of UXO was obtained from various military and public sources. Information specific to the proposed movement of Marines to Guam was obtained from military sources (refer to Chapters 2.01 and 2.02 of this volume). Impacts due to environmental effects related to the proposed action were derived from appropriate chapters of this EIS/OEIS. These include air quality, water resources, noise, hazardous materials and waste, and socioeconomics.

18.2.1.2 Determination of Significance

Factors considered in determining whether an alternative would have a significant public safety impact include the extent or degree to which implementation of the alternative would subject the public to increased risk of contracting a disease or experiencing personal injury. For proposed military events conducted on or around Guam, there would be specific and documented procedures in place to ensure that the public is not endangered by military operations and training activities.

18.2.1.3 Issues Identified during Public Scoping Process

As part of the analysis, concerns relating to public health and safety that were mentioned by the public, including regulatory stakeholders, during public scoping meetings were addressed.

These include:

- Potential increases in diseases including:
 - AIDS
 - Cholera
 - Dengue
 - Hepatitis C
 - Malaria
 - Measles
 - Rubella
 - Tuberculosis
 - Typhoid Fever
 - STDs other than AIDS
- Potential increases in mental illness
- Potential increases in traffic incidents
- Potential contact with UXO

18.2.2 Alternative 1

18.2.2.1 Operational Safety

The safety of the public as well as personnel participating in military training events is a primary consideration for all training activities. The fundamental guidance adhered to during training is that the range must be able to safely contain the hazard footprints of the weapons and equipment employed. The Range Safety Officer ensures that these hazardous areas are clear of personnel during training activities. After a live-fire event, the participating unit ensures that all weapons are safe and clear of live rounds.

Standard Operating Procedures (SOPs) require that prior to conducting training activities, the public and non-participating personnel would be cleared from the area so that the only public health and safety issue would be if a training event exceeded the safety area boundaries. Risks to public health and safety are reduced by confirming that the training area is clear. The Navy would also notify the public of training activities through public notices.

Possible interactions between training activities within near shore areas would be minimized by ensuring the area is cleared. Recreational diving activities within near shore areas take place primarily at known diving sites and dive boats are typically well-marked with diver down flags. The Navy would also notify the public of training activities through Notices to Airmen and Notices to Mariners.

Public notification of training activities, use of established training areas, compliance with appropriate range safety procedures, and avoidance of non military vessels and personnel would reduce the potential for interaction between the public and personnel that are training. Specific and documented procedures would be in place to ensure the public is not endangered by training activities; therefore, Alternative 1 would result in no impacts to public health and safety (resulting from training activities).

Aircraft Mishaps

The Navy would maintain detailed emergency and mishap response plans to react to an aircraft accident, should one occur. These plans assign agency responsibilities and prescribe functional activities necessary to react to major mishaps. Response would normally occur in two phases. The initial response focuses on rescue, evacuation, fire suppression, safety, elimination of explosive devices, ensuring security of the area, and other actions immediately necessary to prevent loss of life or further property damage. The initial response element usually consists of the Fire Chief, who would normally be the first on-scene commander, fire-fighting and crash-rescue personnel, medical personnel, security police, and crash-recovery personnel. The second phase is the mishap investigation, which is comprised of an array of organizations whose participation would be governed by the circumstances associated with the mishap and actions required to be performed.

Under Alternative 1, annual airfield operations would increase by 31,204 operations from 68,139 to 99,343 operations (see Table 6.2-1), a 46% increase when compared to the no-action alternative. Most of the aircraft operations increase (74%) would be helicopter operations, which, on average, have a lower flight mishap rate. The increase in aircraft operations could result in a small increase in the mishap rate; however, the average mishap rate would still remain approximately 1.54 based on the total number of Navy aircraft operations.

In addition, proposed construction and infrastructure improvements related to the Guam buildup and existing land uses near airfields would be consistent with established APZs. The APZs have been established to restrict surrounding land uses for the protection of people and property on the ground near the runway.

The increase in aircraft operations is not anticipated to significantly increase the flight mishap rate and AICUZ land use restrictions would remain in place to limit public exposure to aircraft mishaps; therefore, no impact to public health and safety from aircraft mishaps are anticipated.

Bird Aircraft Strike Hazards

Aircrews operating on Guam would be required to follow applicable procedures outlined in the BASH plan. When risk increases, limits would be placed on low altitude flight and some types of training (e.g., multiple approaches, closed flight patterns). Special briefings would be provided to pilots whenever the potential exists for greater bird strike hazards occur.

The total annual aircraft operations are anticipated to increase by about 37% when compared to the no-action alternative. Thus, bird aircraft strikes associated with airfield operations at Andersen AFB (where most aircraft would originate) would be expected to increase commensurate with the increase in aircraft

operations. Based on the 8-year average of three bird aircraft strikes per year, the increase in aircraft operations is estimated to result in one additional incident for a total of four annual bird aircraft strikes.

The overall potential for bird aircraft strikes is not anticipated to be significantly greater than current levels. Therefore, no impact to public health and safety from BASH incidents are anticipated.

Explosive Safety

Proposed construction and infrastructure improvements related to the Guam buildup would be consistent with established ESQD arcs. Therefore, construction activity and subsequent operations would not result in any greater safety risk. Ordnance would be handled and stored in accordance with Marine Corps explosive safety directives (Marine Corps Order P8020.10A, *Marine Corps Ammunition Management and Explosives Safety Policy Manual*), and all munitions handling would be carried out by trained, qualified personnel. Therefore, no impact related to explosives safety are anticipated.

Electromagnetic Safety

Proposed construction and infrastructure improvements related to the Guam buildup would be consistent with established electromagnetic radiation hazard zones. Exposure to electromagnetic emissions would also be limited by restricting access to emitters through the use of security fencing, posting warning signs, or locking out unauthorized persons in areas, where practical. Because electromagnetic emission sources would be constructed and operated in accordance with applicable safety standards and the public would be excluded from entering areas where emission sources are located, potential impacts from electromagnetic emissions on public health and safety would not result in any greater safety risk. Therefore, no impact to public health and safety related to electromagnetic emissions would occur.

Construction Safety

During construction activities, a health and safety program would be implemented by the construction contractors, based on industry standards for accident prevention. At a minimum, the construction health and safety program would comply with federal and local health and safety regulations. Elements of the safety program would include:

- Responsibilities of construction workers and subcontractors
- Job site rules and regulations
- Emergency response procedures
- Safety inspections and audits
- Location of medical services and first aid
- Safety meetings, employee training, and hazard communications
- Personal protective equipment
- Standard construction procedures
- Accident investigation and reporting

Because a health and safety program would be implemented for construction activities and the public would be excluded from entering construction areas, potential construction impacts on public health and safety would not result in any greater safety risk. Therefore, no impact to public health and safety related to construction activities would occur.

18.2.2.2 Environmental Health Effects

Noise

Construction and operational noise emissions associated with this alternative is discussed in Volume 2, Chapter 6. Increases in noise emissions associated with implementation of the construction phase of this alternative with identified best management practices would be less than significant. Therefore it is anticipated that overall impacts associated with noise to human health and safety would be less than significant. Operations associated with this alternative would be conducted in accordance with applicable AICUZ and other land use guidelines as appropriate; therefore, no long term impacts from noise to human health are anticipated.

Potential impacts to human health and safety from increased noise can be indirect or direct, and short-or long-term, or permanent. These impacts are a function of intensity and duration of noise. Indirect impacts to humans from noise can include annoyance, speech interference, difficulty concentrating, reduced efficiency, low morale, and adverse social behavior (OSHA, 2009).

The primary direct impacts of excessive noise exposure to human health and safety may include:

- *Acoustic trauma*, a temporary or permanent hearing loss due to a sudden, intense acoustic or noise event (i.e., an explosion).
- *Tinnitus*, a condition of "ringing in the ears." The predominant cause of tinnitus is long-term exposure to high sound levels, though it can also be caused by short-term exposure to very high sound levels, such as gunshots. Many people experience tinnitus during their lives. While the sensation is often only temporary, it can be both permanent and debilitating.
- *Noise-induced temporary threshold shift (NITTS)* is a temporary loss in hearing sensitivity. NITTS may be the result of the acoustic reflex of the stapedial muscle; short-term exposure to noise; or, fatigue of the inner ear. With NITTS, hearing sensitivity would return to the pre-exposed level in a matter of hours or days, assuming that there is not continued exposure to excessive noise.
- *Noise-induced permanent threshold shift (NIPTS)* is a permanent loss in hearing sensitivity due to the destruction of sensory cells in the inner ear. NIPTS can be caused by long-term exposure to noise, or acoustic trauma.

The noise analysis included estimation of Potential Hearing Loss (PHL). This analysis focuses on residents. The only residents exposed to 80 dB DNL or greater would be on-base at Andersen AFB, and only those associated with dormitory Buildings 25003 and 25017. The methodology for determining PHL employs the Leq_{24} metric (USEPA 1982). The estimated PHL for the no-action scenario would be approximately 3 dB. The estimated PHL for the proposed action would be identical to the no action (Czech 2009). Thus, this alternative would introduce no change to the no-action PHL and therefore considered less than significant. Based on the modeled noise for proposed activities, it is anticipated that overall impacts associated with noise to human health and safety would be less than significant.

Water Quality

Under the proposed action, there would be no reduction in the availability or accessibility of water resources. While groundwater production rates would increase, implementation of sustainability practices would reduce the amount of groundwater needed, which would help minimize impacts to groundwater availability. The resulting total annual groundwater production would be less than the sustainable yield and monitoring of groundwater chemistry would ensure no harm to existing or beneficial use.

Construction and operational activities associated with this alternative would be implemented in accordance with SOPs and BMPs, and in accordance with applicable regulations. Therefore, no impacts to water quality from construction and operational activities are anticipated and there would be no increased risk from environmental hazards to human health.

Air Quality

As discussed in Volume 2, Chapter 5, increased pollutants associated with construction and operational activities associated with this alternative would be less than significant. Air emissions associated with both construction and operational components of Alternative 1 would be well below the significance criteria of 250 TPY for all air pollutants except CO. However, a further CO dispersion modeling analysis described in Volume 6 shows that no exceedances of CO would occur from roadway traffic under the proposed action. The predicted SO₂ emissions would be below the 100 TPY *de minimis* level. Therefore, all project specific air quality impacts are considered less than significant for all areas for this action.

Although increased emissions would be less than significant, construction and operational activities would result in a measured increase in pollutant emissions, which could result in health impacts to some individuals on Guam.

Health Care Services

Volume 2, Chapter 16 discusses the impact of an increased patient to health care provider ratio as a result of population growth with implementation of this alternative. It is anticipated that short- and mid-term medical staffing requirements would increase over current requirements as a result of increased population. During the peak construction year (2014) 15 additional doctors (26% increase) and 91 additional nurses (26% increase) would be required to maintain the current service ratios; the number of additional doctors drops to 2 (4% increase) and nurses drops to 12 (3% increase) after construction activities are completed. These additional health care professionals would be hired in order to maintain current service ratios. Without corresponding increases in health care providers, potential health and safety impacts could include:

- Longer wait/response times for patients
- Fewer or no available providers on island for chronic or acute issues
- Complications or death from delayed treatment, and/or
- Requirements for patients to travel off-island to receive adequate treatment

According to the impact analysis in Chapter 16, significant adverse impacts would occur to public service agencies influenced by population increases. These impacts would be mitigated by assisting GovGuam in funding for health services personnel.

18.2.2.3 Notifiable Diseases

A potential increase in disease occurrences due to the addition of approximately 21,262 personnel and dependents and 18,374 construction employees (peak construction force in 2014) would be anticipated. A natural annual increase of 1.4% in the Guam population is also anticipated, resulting in a population of approximately 201,095 by the year 2019. With the increase in military and dependent personnel, the total Guam population would be approximately 222,357 in 2019 (see Chapter 16, Socioeconomics, in this volume for more detail on projected population growth patterns). Using the average per capita rates for notifiable diseases on Guam, the potential increase in disease occurrences was estimated based on the natural increase in population and the anticipated arrival of military personnel and their dependants. The construction workforce visiting Guam from other countries to support construction requirements (peak

construction force of 18,374 in 2014) would have the potential to contribute notifiable disease incidents during the construction period (2010 to 2016). A discussion of medical care and health screening for workers visiting Guam to support construction activities is provided in Section 16, Socioeconomics and General Services.

With construction activities, there is a potential for standing water and water based vectors such as mosquitoes and related diseases. Most mosquitoes require quiet, standing water or moist soil where flooding occurs to lay their eggs. Removal of standing water sources and/or promotion of drainage would eliminate potential breeding sites. To limit the amount of standing water at construction sites, stagnant water pools, puddles, and ditches would be drained or filled; containers that catch/trap water (e.g., buckets, old tires, cans) would be removed; and if necessary, pesticide application (e.g., *Bacillus thuringensis*) could be used to help control mosquitoes. Implementing these best management practices would reduce the opportunities for an outbreak of water-related diseases.

The potential increase in disease occurrences based on the estimated 2019 Guam population is presented in Table 18.2-1. Based on the anticipated 2019 population of Guam, the annual number of AIDS cases could increase by 1 to a total of 7 cases; the number of cholera, dengue, and malaria cases is not anticipated to increase and would remain at about one case annually; the number of cases of Hepatitis C is not anticipated to increase and would remain at about 4 cases annually; the number of cases of measles is not anticipated to increase and would remain at about 2 cases annually; the number of Rubella and Typhoid fever cases is not anticipated to increase and would remain at below one case annually; the number of STDs could increase by 77 to a total of 915 cases, and the number of TB cases could increase by 16 to a total of 79 cases.

Table 18.2-1. Potential Disease Occurrence Increase, Guam

Disease	Average Rate	Annual Average 1997-2006	Alternative 1 Increase	Alternative 2 Increase	Alternative 3 Increase	Alternative 8 Increase	No-Action Alternative Increase ^(b)	Difference ^(a)
AIDS	1/32,678	5	7	7	7	7	6	1
Cholera	1/163,389	1	1	1	1	1	1	0
Dengue	1/163,389	1	1	1	1	1	1	0
Hepatitis C	1/52,706	3.1	4	4	4	4	4	0
Malaria	1/163,389	1	1	1	1	1	1	0
Measles	1/90,772	1.8	2	2	2	2	2	0
Rubella	1/2,768,033	0.2	<1	<1	<1	<1	<1	0
Typhoid Fever	1/233,412	0.7	<1	<1	<1	<1	<1	0
STDs	1/243	671	915	915	915	915	838	77
TB	1/2,416	67.5	95	95	95	95	79	16

Notes: (a) Difference between Alternatives 1, 2, 3, and 8 increase in average number of diseases per year and the No-Action Alternative increase.

(b) Based on natural increase in population.

During the peak construction period (2014), the construction workforce visiting Guam from other countries would have the potential to contribute 76 cases of STDs and 7 cases of TB annually. The annual number of AIDS cholera, dengue, Hepatitis C, malaria, measles, rubella, and typhoid fever cases is not anticipated to increase and would remain at about one case annually. A discussion of medical care and health screening for construction workers visiting Guam is provided in Section 16, Socioeconomics and General Services.

As seen in Table 18.2-1, the largest potential increase in disease occurrences is that of STDs (8% increase/77 new cases annually). Young adults would be more likely to contract an STD. These increases; however, are not likely to impact the resources of the citizens of Guam. Military installations have hospitals and clinics that would treat military personnel; therefore, the presence of additional military personnel and their dependents is not expected to increase stress on the public hospital and other clinics on Guam. Additionally, military personnel are vaccinated against a myriad of diseases including measles, rubella, and Typhoid fever, which would preclude them from the potential increase in disease incidents. Vaccinations for AIDS or STDs are not available. Based on the small potential for increase in notifiable diseases (including construction workforce contribution) and the presence of a Navy hospital to treat military personnel, a less than significant impact on the health and safety of the citizens of Guam (from notifiable diseases) is anticipated.

18.2.2.4 Mental Illness

A potential increase in mental illness occurrences due to the addition of 21,262 personnel and dependents, construction workforce, as well as the natural population increase, would be anticipated. Based on the average per capita rates for mental illness on Guam, the potential increase in mental illness occurrences was estimated based on the natural increase in population as well as the anticipated military personnel moving to Guam. Based on the anticipated 2019 population of Guam, the annual number of mental illness cases could increase by 20 to a total of 247 cases. During the peak construction period, the construction workforce visiting Guam from other countries would have the potential to contribute 20 mental illness cases annually. Based on the small potential for increase in mental illness cases, no impact on the health and safety of the citizens of Guam (resulting from a potential increase in mental illness) is anticipated.

18.2.2.5 Hazardous Substances

Implementation of this alternative would result in an increase in the use, handling, storage, transportation and disposition of hazardous substances. These activities would be conducted in accordance with applicable hazardous material and waste regulations, and established BMPs and SOPs to ensure the health and safety of workers and the general public is maintained. BMPs and SOPs include:

- Implementing Hazardous Materials Management Plans
- Implementing Facility Response Plans
- Implementing Spill Prevention Control and Countermeasures plans (training, spill containment and control procedures, clean up, notifications, etc.). Also, ensure personnel are trained in accordance with spill prevention, control, and clean up methods
- Implementing hazardous materials minimization plans
- Ensuring DoD personnel are trained as to proper labeling, container, storage, staging, and transportation requirements for hazardous materials
- Ensuring that DRMO has sufficient hazardous materials storage, transportation, and disposal capacity prior to any expected increases.
- Verifying full compliance with federal, local, and DoD laws and regulations and implement corrective actions as necessary.

Because hazardous substance management activities would be conducted in accordance with applicable regulations and established BMPs and SOPs, no impacts to public health and safety are anticipated.

18.2.2.6 UXO

Excavation for building foundations, roads, underground utilities, and other infrastructure could encounter unexploded military munitions in the form of UXO, DMM and/or material potentially presenting an explosive hazard. Exposure to these Munitions and Explosives of Concern (MEC) could result in the death or injury to workers or to the public. The general public would be excluded from entering construction zones and training areas. To reduce the potential hazards related to the exposure to MEC, qualified UXO personnel would perform surveys to identify and remove potential MEC items prior to the initiation of ground disturbing activities. Additional safety precautions would include: UXO personnel supervision during earth-moving activities and providing MEC awareness training to construction personnel involved in grading and excavations prior to and during ground-disturbing activities. The identification and removal of MEC prior to initiating construction activities and training construction personnel as to the hazards associated with unexploded military munitions would ensure that potential impacts would be minimized and less than significant.

18.2.2.7 Traffic Incidents

As a result of the increase in military personnel and their dependents, there would potentially be more vehicles on the roadways resulting in more heavily congested roadways and, thus, more potential for accidents and traffic fatalities. Using the average per capita rates for traffic accidents and traffic fatalities on Guam, the potential increase in traffic accidents and traffic fatalities was estimated based on the natural increase in population as well as the anticipated military personnel and their dependents moving to Guam.

The potential increase in traffic accidents and traffic fatalities based on the estimated 2019 Guam population is presented in Table 18.2-2. It is estimated that the annual number of traffic accidents could increase by 743 to a total of 8,894 and the number of traffic fatalities could increase by 2 to a total of 24. Young adults that are of legal driving age would be more likely to experience a traffic incident. During the peak construction period, the construction workforce visiting Guam from other countries would have the potential to increase traffic incidents by 735. The annual number of traffic fatalities could increase by 2 due to the increase in construction population.

Table 18.2-2. Potential Traffic Accident Increase, Guam

	Average Rate	Annual Average 2001-2005	Alternative 1 Increase	Alternative 2 Increase	Alternative 3 Increase	Alternative 8 Increase	No-Action Alternative Increase ^(b)	Difference ^(a)
Accidents	1/26	6,651	8,894	8,894	8,894	8,894	8,044	743
Fatalities	1/9,717	18	24	24	24	24	22	2

Notes: (a) Difference between Alternatives 1, 2, 3, and 8 increase in average number of traffic accidents and fatalities per year and the no-action alternative increase; (b) Based on natural increase in population.

The Navy has used focus group sessions with personnel at several bases to strategize potential measures to reduce the number of liberty incidents, including traffic incidents. Several common factors appear to contribute to liberty incidents including; young personnel, late night, impaired driving, and alcohol/drugs. Some of the measures that would be implemented to reduce traffic incidents during liberty include:

- Increase awareness training regarding the consequences of drugs and alcohol use;
- Declare specific off-base bars/clubs off-limits;
- Increase Shore Patrol activity; and
- Provide free shuttle bus runs to/from town.

Although implementing the proposed action or alternatives could potentially mean many more military personnel on the roads, the actual potential for increased traffic incidents is small (17% increase/1,736 traffic incidents annually). The potential increase in the number of traffic accidents and fatalities as a result of the increase in personnel (as well as the construction workforce contribution) would be minimal; therefore, a less than significant impact on the health and safety of the citizens of Guam (from traffic incidents) is anticipated.

18.2.2.8 Public Services

Police Service

Volume 2, Chapter 16 discusses staffing requirements for GPD necessary to cope with population increases associated with this alternative. It is anticipated that short- and mid-term GPD staffing requirements would increase over current requirements as a result of increased population. During the peak construction year (2014) the GPD would require 117 (38% increase) additional officers to maintain the current service ratio; the number of additional officers drops to 55 (17% increase) after construction activities are completed. The GPD would hire these additional personnel in order to maintain current service ratios. Without increases in police services (i.e., more police officers) to compensate for population increases, it would be expected that crime rates and police response times would also increase. As a result, the severity of consequences associated with crimes may worsen (i.e., there may be increased injury and or death associated with delayed police responses).

Because corresponding increases in GPD personnel are anticipated to occur to maintain existing service conditions, no impacts to police service are anticipated.

Fire Service

Volume 2, Chapter 16 discusses staffing requirements for GFD necessary to cope with population increases associated with this alternative. It is anticipated that short- and mid-term GFD staffing requirements would increase over current requirements as a result of increased population. During the peak construction year (2014) the GFD would require 59 (31% increase) additional firefighters to maintain the current service ratio; the number of additional firefighters drops to 11 (6% increase) after construction activities are completed. The GFD would hire these additional personnel in order to maintain current service ratios. Without increases in fire protection services (i.e., more firemen, trucks and stations) to compensate for population increases, it is anticipated that response times to incidents would increase. As a result, increases in property damage and injuries/deaths could be expected.

Because corresponding increases in GFD personnel are anticipated to occur to maintain existing service conditions, no impact to fire service are anticipated.

18.2.2.9 Summary of Alternative 1 Impacts

Based on the addition of approximately 21,262 military personnel and dependents, 18,374 construction employees (during peak construction in 2014), as well as the natural population increase, no impact is anticipated from operational safety concerns (i.e., aircraft mishaps, BASH, explosive safety, electromagnetic safety, and construction safety). No impacts are anticipated from mental illness as well. However, less than significant impact are anticipated from notifiable diseases, UXO, and traffic incidents due to the increase in military personnel and dependents, construction employees, and natural population increase.

18.2.2.10 Potential Mitigation Measures

No mitigation measures would be required.

18.2.3 Alternative 2 (Preferred Alternative)

Potential impacts to public health and safety from implementation of Alternative 2 would be the same as those discussed under Alternative 1.

18.2.4 Alternative 3

Potential impacts to public health and safety from implementation of Alternative 3 would be the same as those discussed under Alternative 1.

18.2.5 Alternative 8

Potential impacts to public health and safety from implementation of Alternative 8 would be the same as those discussed under Alternative 1.

18.2.6 No-Action Alternative

18.2.6.1 Operational Safety

Under the no-action alternative, no operational or training activities would occur on Guam. As a result, there would no potential risk to the public from operations and training activities. Therefore, the no-action alternative would result in no impacts to public health and safety.

18.2.6.2 Noise

No new impacts to public health and safety associated with noise would result from construction or operational activities on Guam. Therefore no impacts to public safety from noise would be expected from the no-action alternative.

18.2.6.3 Water Quality

No new impacts to public health and safety associated with water quality would result from construction or operational activities on Guam. Therefore no impacts to public safety from water quality would be expected from the no-action alternative.

18.2.6.4 Air Quality

No new impacts to public health and safety associated with air quality would result from construction or operational activities on Guam. Therefore no impacts to public safety from air emissions would be expected from the no-action alternative.

18.2.6.5 Health Care Services

No increases in demand for health care services would occur as a result of additional military activities on Guam. However, the natural increase in population would result in a slight increase in demand for these services. As a result of natural population increase on Guam, approximately 1 additional doctor and 3 additional nurses would be required to maintain the current service ratios. These additional health care professionals would be hired in order to maintaining current service ratios. Without corresponding increases in health care providers potential health and safety impacts could include:

- Longer wait/response times for patients
- Fewer or no available providers on island for chronic or acute issues
- Complications or death from delayed treatment, and/or

- Requirements for patients to travel off-island to receive adequate treatment

However, because corresponding increases in doctors and nurses are anticipated to occur to maintain existing service conditions, no impact to health care services from the no-action alternative are anticipated.

18.2.6.6 Notifiable Diseases

A potential increase in disease occurrences due to the natural increase in population would be anticipated. Using the average per capita rates for notifiable diseases on Guam, the potential increase in disease occurrences was estimated based on the natural increase in population.

The potential increase in disease occurrences based on the estimated 2019 Guam population is presented in Table 18.2-1. Based on the anticipated 2019 population of Guam, without the implementation of the proposed action, the annual number of AIDS cases could increase by one to a total of six cases; cholera, dengue, malaria, measles, rubella, and Typhoid fever cases are not anticipated to increase, and the number of cases of hepatitis C could increase by one to a total of four cases. The number of cases of STDs could increase by 167 to a total of 838 cases. Young adults would be more likely to contract an STD. The number of cases of TB could increase by 12 to a total of 79 cases. No adverse impact on the health and safety of the citizens of Guam (from notifiable diseases) is anticipated.

18.2.6.7 Mental Illness

A potential increase in mental illness occurrences due to the natural increase in population could occur. Using the average per capita rates for mental illness on Guam, the potential increase in mental illness occurrences was estimated based on the natural increase in population. Based on the anticipated 2019 population of Guam, the annual number of mental illness cases could increase by 44 to a total of 221 cases. No adverse impact on the health and safety of the citizens of Guam (resulting from mental illness) is anticipated.

18.2.6.8 Hazardous Substances

No increase in the types or quantities of hazardous substances would be anticipated under the no-action alternative. Management of hazardous substances would continue to be conducted in accordance with applicable hazardous material and waste regulations, and established BMPs and SOPs to ensure the health and safety of workers and the general public is maintained. Therefore no impacts to management of hazardous substances would be expected from the no-action alternative.

18.2.6.9 UXO

The Island of Guam was an active battlefield during World War II. As a result of the invasion, occupation, and defense of the island by Japanese forces and the assault by Allied/American forces to retake the island, unexploded military munitions may still remain. Under the no-action alternative, no excavation for building foundations, roads, underground utilities, and other infrastructure would occur in support of proposed action. As a result, there would not be an increase in the likelihood of encountering unexploded military munitions. No adverse impact on the health and safety of the citizens of Guam (from UXO) is anticipated.

18.2.6.10 Traffic Incidents

A potential increase in traffic accidents and traffic fatalities due to the natural increase in population could occur. Using the average per capita rates for traffic accidents and traffic fatalities on Guam, the potential increase in traffic accidents and traffic fatalities was estimated based on the natural increase in population.

The potential increase in traffic accidents and traffic fatalities based on the estimated 2019 Guam population is presented in Table 18.2-2. Based on the anticipated 2019 population of Guam, the annual number of traffic accidents could increase by 1,500 to a total of 8,151 and the number of traffic fatalities could increase by four to a total of 22. Young adults that are of legal driving age would be more likely to experience a traffic incident. No adverse impact on the health and safety of the citizens of Guam (from traffic accidents) is anticipated.

18.2.6.11 Public Services

Under the no-action alternative, natural increases in population on Guam would result in an increased need for police and firefighting presence on the island. As a result of natural population increase on Guam, approximately 3 additional police officers and 5 additional firefighters would be required to maintain the current service ratios. The GPD and GFD would hire these additional personnel in order to maintain current service ratios. Without increases in police and fire services (i.e., more police officers and firefighters) to compensate for population increases, it would be expected that response times would increase. As a result, the severity of consequences associated with crimes and fire may worsen (i.e., there may be increased injury and or death associated with delayed responses). However, because corresponding increases in police and fire service are anticipated to occur to maintain existing service conditions, no impact to public services from the no-action alternative are anticipated.

18.2.7 Summary of Impacts

Tables 18.2-3, 18.2-4, 18.2-5, and 18.2-6 summarize the potential impacts of each action alternative associated with the Main Cantonment, firing range training, ammunition storage, and NMS access roads. Table 18.2-7 summarizes the potential impacts of other training, airfield, and waterfront components of the proposed action. A text summary is provided below.

Table 18.2-3. Summary of Main Cantonment Impacts – Alternatives 1, 2, 3 and 8

<i>Main Cantonment Alternatives 1, 2, 3, and 8</i>	
Construction	
LSI	<ul style="list-style-type: none"> • Less than significant impacts due to UXO and traffic incidents • Less than significant impacts to noise and to air quality during construction • Less than significant impacts to notifiable diseases
NI	<ul style="list-style-type: none"> • No impacts to public, military personnel or worker safety due to construction hazards • No impacts to health care services, mental illness, water quality, and hazardous substances • No impacts to operational safety (aircraft mishaps, bird aircraft strike hazards, explosives safety, electromagnetic safety, and construction safety)
LSI	<ul style="list-style-type: none"> • Less than significant impacts due to UXO and traffic incidents • Less than significant impacts to noise, and to air quality during operation • Less than significant impacts to Notifiable diseases
NI	<ul style="list-style-type: none"> • No impacts to public, military personnel or worker safety due to construction hazards • No impacts to health care services, mental illness, water quality, and hazardous substances

Legend: *SI* = Significant impact, *SI-M* = Significant impact mitigable to less than significant, *LSI* = Less than significant impact, *NI* = No impact.

Table 18.2-4. Summary of Training Impacts – Training Range Complex Alternatives

<i>Training Range Alternatives A and B</i>	
Construction	
LSI	
<ul style="list-style-type: none"> • Less than significant impacts due to UXO and traffic incidents • Less than significant impacts to noise, and to air quality during construction 	
NI	
<ul style="list-style-type: none"> • No impacts to public, military personnel or worker safety due to construction hazards • No impacts to water quality and hazardous substances 	
Operation	
LSI	
<ul style="list-style-type: none"> • Less than significant impacts due to UXO and traffic incidents • Less than significant impacts to noise and air quality 	
NI	
<ul style="list-style-type: none"> • No impacts to water quality and hazardous substances • No impacts to operational safety (explosives safety) 	

Legend: SI = Significant impact, SI-M = Significant impact mitigable to less than significant, LSI = Less than significant impact, NI = No impact.

Table 18.2-5. Summary of Training Impacts – Ammunition Storage Alternatives

<i>Ammunition Storage Alternative A (South)</i>	<i>Ammunition Storage Alternative B (South)</i>
Construction	
LSI	
<ul style="list-style-type: none"> • Less than significant impacts due to UXO and traffic incidents • Less than significant impacts to noise, and to air quality during construction 	
Operation	
NI	
<ul style="list-style-type: none"> • No impacts to public, military personnel or worker safety due to construction hazards • No impacts to water quality and hazardous substances 	

Legend: SI = Significant impact, SI-M = Significant impact mitigable to less than significant, LSI = Less than significant impact, NI = No impact.

Table 18.2-6. Summary of Training Impacts – NMS Access Roads Alternatives

<i>Access Road Alternative A (South)</i>	<i>Access Road Alternative B (South)</i>
Construction	
LSI	NI
<ul style="list-style-type: none"> • Less than significant impacts due to UXO and traffic incidents • Less than significant impacts to noise and air quality during construction 	<ul style="list-style-type: none"> • No construction
NI	
<ul style="list-style-type: none"> • No impacts to public, military personnel or worker safety due to construction hazards • No impacts to water quality and hazardous substances 	
Operation	
LSI	LSI
<ul style="list-style-type: none"> • Less than significant impacts due to UXO and traffic incidents • Less than significant impacts to noise and air quality during operation 	<ul style="list-style-type: none"> • The impacts would be the same as for Alternative A
NI	NI
<ul style="list-style-type: none"> • No impacts to water quality and hazardous substances • No impacts to operational safety (explosives safety) 	<ul style="list-style-type: none"> • The impacts would be the same as for Alternative A

Legend: LSI = Less than significant impact, NI = No impact.

Table 18.2-7. Summary of Other Training, Airfield, and Waterfront Component Impacts

<i>Other Training (North/Central/South)</i>	<i>Airfield (North)</i>	<i>Waterfront (Apra Harbor)</i>
Construction		
LSI <ul style="list-style-type: none"> • Less than significant impacts due to UXO and traffic incidents • Less than significant impacts to noise and air quality during construction 	LSI <ul style="list-style-type: none"> • Less than significant impacts due to UXO and traffic incidents • Less than significant impacts to noise and air quality during construction 	LSI <ul style="list-style-type: none"> • Less than significant impacts due to UXO and traffic incidents • Less than significant impacts to noise and air quality during construction
NI <ul style="list-style-type: none"> • No impacts to public, military personnel or worker safety due to construction hazards • No impacts to water quality and hazardous substances 	NI <ul style="list-style-type: none"> • No impacts to public, military personnel or worker safety due to construction hazards • No impacts to water quality and hazardous substances 	NI <ul style="list-style-type: none"> • No impacts to public, military personnel or worker safety due to construction hazards • No impacts to water quality and hazardous substances
Operation		
LSI <ul style="list-style-type: none"> • Less than significant impacts due to UXO and traffic incidents • Less than significant impacts to noise and air quality during operation 	LSI <ul style="list-style-type: none"> • Less than significant impacts due to UXO and traffic incidents • Less than significant impacts to noise and air quality during operation 	LSI <ul style="list-style-type: none"> • Less than significant impacts due to UXO and traffic incidents • Less than significant impacts to noise and air quality during operation
NI <ul style="list-style-type: none"> • No impacts to water quality and hazardous substances • No impacts to operational safety (aircraft mishaps, bird aircraft strike hazards, explosives safety, electromagnetic safety, and construction safety) 	NI <ul style="list-style-type: none"> • No impacts to water quality and hazardous substances • No impacts to operational safety (aircraft mishaps, bird aircraft strike hazards, explosives safety, electromagnetic safety, and construction safety) 	NI <ul style="list-style-type: none"> • No impacts to water quality and hazardous substances • No impacts to operational safety (explosives safety, electromagnetic safety, and construction safety)

Legend: LSI = Less than significant impact, NI = No impact.

The identification and removal of MEC prior to initiating construction activities, and training construction personnel regarding hazards associated with MEC, would ensure that potential impacts would be minimized and would be less than significant.

Prior to conducting training activities, training areas would be cleared of non-participating personnel and the public so that the only public health and safety issue would be if a training event exceeded the safety area boundaries. Public notification of training activities, use of established training areas, compliance with appropriate range safety procedures, and avoidance of non military vessels and personnel would reduce the potential for interaction between the public and personnel that are training. Therefore, no impacts to public health and safety from training activities are anticipated. Military operations on Guam would be conducted in accordance with applicable regulations and specific safety precautions would be in place to ensure the health and safety of the public and military personnel.

The potential increase in disease occurrences and mental illness as a result of the increase in personnel is considered low. The largest potential increase in disease occurrences is that of STDs (increase of 77 cases

annually); however, these increases are not likely to impact the resources of the citizens of Guam. Military installations have hospitals and clinics that would treat military personnel; therefore, the presence of additional military personnel and their dependents is not expected to increase stress on the public hospital and other clinics on Guam.

Although the increase in personnel could potentially result in more military personnel on the roads, the actual potential for increased traffic incidents is considered small (increase of 743 traffic incidents annually); therefore, no adverse impact on the health and safety of the citizens of Guam (from traffic incidents) is anticipated.

18.2.8 Summary of Potential Mitigation Measures

No mitigation measures would be required.