

## CHAPTER 19.

# PUBLIC HEALTH AND SAFETY

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### 19.1 INTRODUCTION

This chapter discusses the potential effects to public health and safety (i.e., disease, mental illness, traffic incidents, unexploded ordnance [UXO], and power plant fuel sources [i.e., Liquefied Natural Gas (LNG), Diesel Fuel No. 2, and/or No. 6 Fuel Oil]) from implementation of the alternatives within the region of influence (ROI). For a description of the affected environment, refer to the respective chapter of Volume 2 (Marine Corps Relocation – Guam). The chapters are presented in the same order as the resource areas discussed in this volume.

### 19.2 ENVIRONMENTAL CONSEQUENCES

This chapter discusses the potential effects to public health and safety (i.e., disease, mental illness, traffic incidents, UXO, and fuel sources) from implementation of the alternatives within the region of influence (i.e., the Island of Guam).

#### 19.2.1 Approach to Analysis

##### 19.2.1.1 Methodology

##### Utilities

The analysis of potential public health and safety impacts identified for proposed utility improvements are driven primarily by anticipated population increases on the Island of Guam; therefore, potential impacts would be the same if any of the alternatives were implemented and the term “All Alternatives” is used during the presentation of the analysis in this section.

Potential effects to public safety from implementation of the proposed utility projects were derived based upon information detailed in the descriptions of each alternative. Regarding personnel relocation to Guam, public health and safety concerns were addressed based on anticipated changes in the population of Guam, both from natural increases and from military personnel and their dependents moving to Guam. Average per capita incidents of notifiable diseases, mental illness, and traffic accidents were used to calculate the potential increase in these incidents as a result of the utility projects. Safety of construction workers would be the same as outlined in Volume 2. Proposed construction activities supporting utilities improvements would be conducted in accordance with federal and local safety guidelines to ensure a safe work environment.

With construction activities, there is a potential for standing water and water based vectors such as mosquitoes and related diseases. Most mosquitoes require 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 thuringiensis*) could be used to help control mosquitoes. Implementing these best management practices (BMPs) would reduce the opportunities for an outbreak of water-related diseases.

For purposes of analysis of potential health and safety impacts, proposed utility projects are considered “related actions,” in that they would be implemented as a result of the overall proposed action

(i.e., relocation of Marines to Guam [Volume 2], Navy aircraft carrier berthing [Volume 4], and Army Air and Missile Defense Task Force [Volume 5]). Analysis of the public health and safety concerns is provided in Volume 2. Potential health and safety concerns from the proposed utilities projects result primarily from ground-disturbing activities and storage/transfer of fuel sources to power producing facilities; therefore, the only public health and safety concerns to be addressed in detail within this chapter are UXO and power plant fuel sources. Because proposed utility improvements would result in adequate capacity for providing power, potable water, wastewater treatment, and solid waste disposal, no impact to public health and safety from utility system capacity are anticipated.

Information regarding the possible presence of UXO was obtained from various military (e.g., various Navy and Army Corps UXO records) and public sources (e.g., newspaper accounts). Information specific to the proposed movement of Marines to Guam was obtained from military sources.

### Roadways

Public health and safety concerns associated with the proposed roadway projects were identified based on the potential for the improved roadway network to:

- Substantially increase the risk of exposure to air pollutants from increased use of roadways
- Affect the frequency of automobile accidents
- Increase the risk of exposure to UXO.

The risk of exposure to air pollutants from vehicular sources that would use the new roadways is a health concern. Impacts of the Guam Road Network (GRN) project on air quality are addressed in Chapter 7, Air Quality, of this volume. Air pollutant emissions from the GRN project were evaluated in comparison to primary national ambient air quality standards established to protect human health, as well as secondary standards to protect the environment.

#### 19.2.1.2 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 utility projects would subject the public to increased risk of contracting a disease or experiencing personal injury. The significance determination evaluated the overall ability to mitigate or control potential public health and safety impacts and consequences from proposed utility infrastructure improvements. Significant impacts that cannot be mitigated to less-than-significant levels are considered unavoidable.

Public health and safety impacts as a result of the proposed roadway improvement projects are assessed following Federal Highway Administration Guidance for Preparing and Processing Environmental and Section 4(f) Documents (T 6640 8A).

#### 19.2.1.3 Issues Identified during Public Scoping Process

The following analysis focuses on possible effects to public health and safety that could be impacted by the proposed utility and roadway projects. As part of the analysis, concerns related to public health and safety that were mentioned by the public, including regulatory stakeholders, during the public scoping meetings were addressed. The following public health and safety concerns were raised during public scoping meetings regarding the proposed relocation of military and civilian personnel to Guam:

- Potential increases in notifiable diseases including the following:
- Acquired Immune Deficiency Syndrome (AIDS)
- Cholera

- Dengue
- Hepatitis C
- Malaria
- Measles
- Rubella
- Sexually Transmitted Diseases (STDs) other than AIDS
- Typhoid fever
- Potential increases in mental illness
- Potential increases in traffic incidents
- Potential contact with UXO

As discussed above, potential health and safety concerns from the proposed utility projects result primarily from ground-disturbing activities and the storage/transfer of power plant fuel sources to power producing facilities; therefore, the only public health and safety concerns to be addressed in detail in this chapter are UXO and power plant fuel sources.

### 19.2.2 Power

There are no comprehensive ambient background air quality levels from recent monitoring available for Guam; therefore, the existing background air quality conditions around Guam are defined based on the current ambient air quality attainment status condition applicable for Guam:

- Attainment for all criteria pollutants, except for SO<sub>2</sub>.
- Two SO<sub>2</sub> nonattainment areas with a 2.2 mile (3.5 km) radius around the Piti and Tanguisson power plants.

Guam is exempt from using low sulfur content fuel; therefore, it is anticipated that the allowance of using high sulfur content fuel by power generation facilities is the primary cause of the current SO<sub>2</sub> nonattainment designation of the two areas.

The air quality analysis provided in Chapter 7 of this volume indicates that the overall permitted capacity and the operational scheme for the combustion turbines at the power plants would not change. The resulting potential air quality impact would remain the same as the current permitted conditions established previously during each facility permitting process. Power generation requirements would not result in an increase in air emissions at the power plant facilities under their permitted conditions and utilization or reconditioning of permitted sources is in compliance with applicable CAA air quality standards and would not result in a significant air quality impacts. Since no significant operational air quality impact would occur, mitigation measures would not be required.

Although power plant operations would not result in a significant increase in emissions, air pollutants generated during power plant operations could result in potential health impacts of nearby populations. Air pollution can harm individuals when it accumulates in the air in high enough concentrations. People exposed to high enough levels of certain air pollutants may experience:

- irritation of the eyes, nose, and throat
- wheezing, coughing, chest tightness, and breathing difficulties
- worsening of existing lung and heart problems
- increased risk of heart attack

In addition, long-term exposure to air pollution can cause cancer and damage to the immune, neurological, reproductive, and respiratory systems. In extreme cases, it can even cause death.

Some groups of people are especially sensitive to common air pollutants such as particulates and ground-level ozone. Sensitive populations include children, older adults, people who are active outdoors, and people with heart or lung diseases, such as asthma (Massachusetts Department of Environmental Protection [MDEP] 2009). Common health effects associated with specific air pollutants are provided below:

#### *Carbon Monoxide Health Effects*

Carbon monoxide (CO) is a poisonous gas that forms when the carbon in fuels such as gasoline, heating oil, natural gas, and wood does not burn completely. Concentrations of CO can be particularly high in areas with heavy traffic congestion or near industrial sources. CO enters the bloodstream through the lungs and binds to hemoglobin, the substance in blood that carries oxygen to cells. This reduces the amount of oxygen that reaches the body's tissues and organs, especially the heart and brain, as well as the central nervous system. The health threat from exposure to carbon monoxide is most serious for people who suffer from cardiovascular diseases. They may experience chest pain and other cardiovascular symptoms. In healthy individuals, exposure to higher levels of CO can lead to headaches and affect manual dexterity, mental alertness, work capacity, and vision (MDEP 2009).

#### *Nitrogen Dioxide Health Effects*

Nitrogen dioxide (NO<sub>2</sub>) is one of a group of highly reactive gases containing nitrogen and oxygen in varying amounts (known collectively as oxides of nitrogen, or NO<sub>x</sub>). NO<sub>x</sub> gases are produced by high-temperature fuel combustion. Primary sources of NO<sub>x</sub> emissions include motor vehicles, electric utilities, and other industrial, commercial, and residential sources that burn fuels. NO<sub>x</sub> reacts with other pollutants to form ground-level ozone. NO<sub>2</sub> irritates the nose and throat, especially in people with asthma, and can increase susceptibility to respiratory infections. Ground-level ozone, which is formed when NO<sub>2</sub> and other gases react in the presence of sunlight can also:

- irritate the respiratory system and cause coughing, throat irritation and uncomfortable sensations in the chest
- reduce lung function
- heighten sensitivity to allergens that commonly trigger asthma attacks
- inflame the lung lining (MDEP 2009)

#### *Particulate Matter Health Effects*

Particulate matter includes a mixture of solids and liquid droplets. Particulate matter can be bad at any time or location, but especially when the weather is calm, allowing pollution to build up; around factories, during rush hour, and near busy roads; and when there is smoke in the air from wood stoves, fireplaces, or burning vegetation.

Exposure to particulate matter can affect the lungs and the heart. Short-term exposure can lead to coughing, minor throat irritation and reduced lung function, while long-term exposure may increase the rate of respiratory and cardiovascular illness. Particulate matter has been linked to a number of significant health problems, including:

- asthma and chronic bronchitis
- acute respiratory symptoms, such as coughing and chest tightness
- decreased lung function, experienced as shortness of breath
- heart attacks
- premature death in people with heart or lung disease (MDEP 2009).

### *Sulfur Dioxide Health Effects*

Sulfur dioxide (SO<sub>2</sub>) is a colorless, reactive gas produced when sulfur-containing fuels such as coal and oil are burned. Major sources include power plants and industrial boilers. Short-term exposure to low levels of SO<sub>2</sub> in the air can:

- narrow the airways and cause breathing problems for children and adults who have asthma and are physically active outdoors
- cause wheezing, chest tightness, and shortness of breath among healthy people who do not have asthma.

Symptoms worsen as SO<sub>2</sub> levels in the air increase or when breathing becomes faster or deeper. Lung function typically returns to normal within an hour of exposure to SO<sub>2</sub> ending. Long-term exposure to SO<sub>2</sub> can cause respiratory illness, alter the lungs' defense mechanisms, and aggravate existing cardiovascular or lung disease (MDEP 2009).

### *Air Toxics Health Effects*

Toxic air pollutants, also known as air toxics, are pollutants that, at sufficient concentrations and exposure, are known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or to cause adverse environmental effects. The U.S. Environmental Protection Agency (USEPA) lists 188 toxic air pollutants that can have significant impacts on air quality and human health even when emissions of these toxics are controlled through best available technology.

Short-term exposures can include effects such as eye irritation, nausea or difficulty in breathing. Long-term exposures may result in damage to the respiratory, nervous, or reproductive systems, birth and developmental defects, and other serious health problems. While everyone is at risk of health problems from exposure to air toxics, many factors determine the extent to which different pollutants affect the health of any individual, including the level, duration, and frequency of exposure; the toxicity of the pollutant; overall health; and level of resistance or susceptibility (MDEP 2009).

Given the need for increased power production and the exemption to using low sulfur content fuel on Guam, power production using current fuel types would have the potential to increase air emissions on Guam. The potential for increased emissions could result in increased health impacts of nearby populations. Increases in health impacts as discussed above could result in an increase in:

- emergency room visits
- hospital admissions
- asthma attacks
- children absent from school
- deaths from lung and heart illness

As discussed in Section 7.0. Air Quality, use of cleaner fuel types would likely be required to prevent the occurrence of significant air quality impacts.

It is anticipated that Guam clinics and hospital will increase staffing to meet current health care service ratios and will be capable of handling a potential increase in air quality-related illnesses; therefore, less than significant impacts would be anticipated as a result of increased emissions from power plant operations. In the event health care staffing increases do not occur, individuals would likely experience:

- 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

Increasing health care staffing would eliminate the potential treatment impacts.

### 19.2.3 Potable Water

As discussed in Chapter 3, Guam Water Authority (GWA) water system infrastructure does not meet the basic flow and pressure requirements for all customers. These conditions can result in microbiological and other contaminants entering the distribution system potentially resulting in illness. The following discusses the types of contaminants and potential health problems related to potable water.

**Contaminants Affecting Drinking Water.** The levels of contaminants in drinking water are seldom high enough to cause acute (immediate) health effects (North Carolina Cooperative Extension Service, 1996). Examples of acute health effects are nausea, lung irritation, skin rash, vomiting, dizziness, and even death. Contaminants are more likely to cause chronic health effects - effects that occur long after repeated exposure to small amounts of a chemical. Examples of chronic health effects include cancer, liver and kidney damage, disorders of the nervous system, damage to the immune system, and birth defects.

**Microbial Pathogens.** Pathogens in drinking water are serious health risks. Pathogens are disease-producing micro-organisms, which include bacteria (such as giardia lamblia), viruses, and parasites. They get into drinking water when surface water sources are contaminated by sewage or animal waste, or when wells are improperly sealed and constructed. Pathogens can cause gastroenteritis, salmonella infection, dysentery, shigellosis, hepatitis, and giardiasis. The presence of coliform bacteria, which is generally harmless, may indicate other contamination to the drinking water system.

**Organics.** People worry the most about potentially toxic chemicals and metals in water. Only a few of the toxic organic chemicals that occur in drinking water are regulated by drinking water standards. This group of contaminants includes:

- Trihalomethanes (THMs), which are formed when chlorine in treated drinking water combines with naturally occurring organic matter.
- Pesticides, including herbicides, insecticides, and fungicides.
- Volatile organic chemicals (VOCs), which include solvents, degreasers, adhesives, gasoline additives, and fuels additives. Some of the common VOCs are: benzene, trichloroethylene (TCE), styrene, toluene, and vinyl chloride. Possible chronic health effects include cancer, central nervous system disorders, liver and kidney damage, reproductive disorders, and birth defects.

**Inorganics.** These contaminants include toxic metals like arsenic, barium, chromium, lead, mercury, and silver. These metals can get into drinking water from natural sources, industrial processes, and the materials used in plumbing system. Toxic metals are regulated in public water supplies because they can cause acute poisoning, cancer, and other health effects. Nitrate is another inorganic contaminant. The nitrate in mineral deposits, fertilizers, sewage, and animal wastes can contaminate water. Nitrate has been associated with "blue baby syndrome" in infants.

As discussed in Chapter 3, implementation of the overall proposed action could result in potable water shortfalls in GWA system from 2010 till 2015. However, DoD has identified mitigation measures within DoD control and outside DoD control, including measures that GWA and Gov Guam could implement to address the shortfalls. Therefore, it is anticipated that public health and safety impacts from increased demand on potable water would be less than significant if the mitigation measures are implemented.

## Wastewater

Wastewater flows to the NDWWTP from military and civilian sources are projected to increase to a peak of 12.8 MGd (48.3 mld) in 2014, which is somewhat more than the design capacity of 12 MGd (45 mld). Adding chemical coagulants or increasing the surface overflow rate (within the normal design range) of the clarifier would be implemented to improve plant operations so that the primary clarifier would be able to treat the additional 0.8 MGd (2.8 mld) without adverse effects on the NDWWTP. DoD would coordinate with GWA to expedite the planned improvements and request for a NPDES permit modification to increase the effluent discharge limitation from 6.0 MGd (22.7 mld) to 12.0 MGd (45.4 mld), then comply with its modified NPDES permit requirements.

The USEPA denied GWA's application for a renewed variance from full secondary treatment on September 30, 2009, and concluded that the Clean Water Act (CWA) 301(h) criteria have not been met at the North District Wastewater Treatment Plant (NDWWTP) and the Hagatna Wastewater Treatment Plant (WWTP).

Microorganisms are present in large numbers in sewage treatment plant effluent and waterborne disease outbreaks have been associated with sewage-contaminated water supplies or recreational waters. Wastewater discharged from a treatment plant can enter the environment where human exposure may occur through the potable (drinking) water supply, recreation (swimming, snorkeling, etc.), or eating shellfish.

**NDWWTP Discharge.** The NDWWTP discharges into coastal waters on the northwestern shoreline of Guam. The coastal waters in the area of NDWWTP's new deep ocean outfall are considered "Category M-2 Good" marine waters (USEPA 2009b).

The previous outfall discharged effluent directly into the Philippine Sea at 2,160 feet (655 m) from shore at a depth of 60 feet (18.2 m), and 545 feet (166 m) beyond the reef line. The total length of the previous outfall was approximately 7,272 feet (2,216 m); including a diffuser that was 422 feet (129 m) long at the terminal end of the outfall. The previous outfall consisted of a 5,500 foot (1,676 m), 30 inch (76.2 cm) diameter pipe made mainly of Techite piping encased in concrete. The previous diffuser was oriented north to south and located parallel to the shoreline (USEPA 2009b).

The new outfall was completed and went into operation in January, 2009, although GWA has not yet installed the new diffuser system. The new outfall currently discharges 1,900 feet (580 m) from shore, and at a depth of 140 feet (42.6 m). A 400 foot (121 m) multiport diffuser was to be added to the end of the outfall; however, the diffuser has not yet been added to the new outfall. Because the proposed discharge would be farther away from shore and at a greater depth, and incorporates additional diffuser ports, the USEPA predicts that it would have higher dilution (USEPA 2009b).

Based on available information, USEPA has concluded that discharge of primary treated effluent through the new deep ocean outfall would not ensure compliance with the requirements of 40 CFR 125.62(a) through (d). USEPA has determined that the proposed discharge would not comply with all Guam water quality standards; and may not provide for the attainment or maintenance of water quality which assures the protection and propagation of a BIP of shellfish, fish, and wildlife. Concentrations of lead have been predicted to exceed water quality criteria at the ZID for the proposed discharge. Further, USEPA has determined that the proposed discharge would not meet water quality criteria for bacteria at the ZID; thus, the proposed discharge may adversely affect recreational activities (USEPA 2009b).

Ocean waters within the vicinity of the WWTP discharge are not considered a source of public water supply. Drinking water has not been established as a designated use for Category M-2 marine waters of

Guam. Currently, drinking water supplies are derived from surface and groundwater sources. Therefore, USEPA has concluded that the WWTP discharge would not affect public water supplies (USEPA 2009b).

**Non-WWTP Discharges.** In addition to WWTP discharges, onsite wastewater systems disperse effluent into the soils near where people live and recreate. Properly designed, installed, and operated, on-site systems can be as effective as municipal WWTPs in reducing the public health risks associated with wastewater; however, contamination of drinking water and surface water due to on-site systems does occur and people can contract gastrointestinal and other illnesses from drinking groundwater or coming in contact with surface water impacted by wastewater.

Pathogens commonly found in wastewater effluent are *E. coli*, *Streptococcus*, *Salmonella*, *Shigella*, *mycobacterium*, *Pseudomonas aeruginosa*, *Giardia lamblia*, and enteroviruses. *Tacnia*, *Ascaris*, and hookworm ova may also be present in raw sewage.

Increased flow to the WWTPs would result from natural population increases as well as the increase in military personnel. Based on the increased population of Guam, issues associated with wastewater discharges on Guam, and the use of on-site treatment systems, an increase in the number of wastewater-related illnesses could occur.

It is anticipated that Guam clinics and hospital will increase staffing to meet current health care service ratios and will be capable of handling a potential increase in wastewater-related illnesses; therefore, less than significant impacts would be anticipated as a result of increased wastewater treatment and discharge activities.

#### **19.2.4 Solid Waste**

The DoD would continue using the Navy Sanitary Landfill at the Apra Harbor site for a short period from 2010, when Marine relocation begins, until July 2011, when the Layon Landfill is scheduled to open for disposal of municipal solid waste. The Layon Landfill is being constructed in compliance with federal RCRA Subtitle D requirements. Because this landfill would be compliant with RCRA Subtitle D, no impacts to public health and safety are anticipated from the increase in solid waste disposal on Guam.

The Navy Sanitary Landfill is unlined; therefore, leachate has the potential to affect the underlying groundwater. Studies are currently underway to assess whether or not the underlying groundwater has been affected by leachate. The conclusions of these studies show that further evaluation may be required.

#### **19.2.5 All Alternatives**

##### **19.2.5.1 Notifiable Diseases**

Proposed utility projects are considered “related actions,” in that they would be implemented as a result of the overall proposed action (i.e., relocation of Marines to Guam [Volume 2], Navy aircraft carrier berthing [Volume 4], and Army Air and Missile Defense Task Force [Volume 5]). Volume 2, Section 2.18 analyzes the potential increase in notifiable disease cases based on the population increase that would result from the implementation of the overall proposed action as well as the related actions such as the proposed utility projects.

##### **19.2.5.2 Mental Illness**

Proposed utility projects are considered “related actions,” in that they would be implemented as a result of the overall proposed action (i.e., relocation of Marines to Guam [Volume 2], Navy aircraft carrier berthing [Volume 4], and Army Air and Missile Defense Task Force [Volume 5]). Analysis of potential impacts to mental illness is provided in Volume 2. Therefore, implementation of the proposed utility



projects would result in no impacts to public health and safety (from mental illness).

#### 19.2.5.3 Traffic Incidents

Proposed utility projects are considered “related actions,” in that they would be implemented as a result of the overall proposed action (i.e., relocation of Marines to Guam [Volume 2], Navy aircraft carrier berthing [Volume 4], and Army Air and Missile Defense Task Force [Volume 5]). Analysis of potential increases in traffic incidents is provided in Volume 2. Therefore, implementation of the proposed utility projects would result in no impacts to public health and safety (from traffic incidents).

#### 19.2.5.4 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 still remain. Excavation for foundations, underground utilities, and other infrastructure could encounter unexploded military munitions in the form of UXO, discarded military munitions, and/or materials 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.

To reduce the potential hazards related to exposure to MEC, qualified UXO personnel would perform surveys to identify and remove potential MEC prior to initiation of ground-disturbing activities as necessary. Additional safety precautions would include providing UXO personnel supervision during earth-moving activities, and providing MEC awareness training prior to and during ground-disturbing activities to construction personnel who are involved in grading and excavations. These safety precautions would ensure that potential impacts are minimized; therefore, implementation of the proposed utility projects would result in less than significant impacts to public health and safety (from UXO).

### 19.2.6 Potential Mitigation Measures

No mitigation measures would be required.

### 19.2.7 Summary of Impacts

Table 19.2-1 summarizes the potential impacts of all alternatives. A text summary is provided below.

**Table 19.2-1. Summary of Potential Public Health and Safety Impacts**

<i>Potentially Impacted Resource</i>	<i>All Alternatives</i>
Power	LSI
Potable Water	LSI
Wastewater	LSI
Solid Waste	NI
Notifiable Diseases	NI
Mental Illness	NI
Traffic Incidents	NI
UXO	LSI
Power Plant Fuel Sources	NI

*Legend:* LSI= Less than Significant Impact; NI= No Impact.

Based on the increased population of Guam (natural and military increases), requirements for power production, potable water generation, wastewater treatment, and solid waste disposal could result in an increase in illness from airborne contaminants and water- and wastewater-related diseases. It is anticipated that Guam clinics and hospital will increase staffing to meet current health care service ratios and will be capable of handling potential increases in these utility-related illnesses; therefore, less than

significant impacts to public health and safety would be anticipated. No impacts are anticipated from increased solid waste disposal.

The potential increase in disease occurrences and mental illness as a result of the proposed utility projects would be low and is not likely to impact the citizens of Guam. The potential increase in the number of traffic accidents and fatalities would also be minimal, and no impact on the health and safety of the citizens of Guam from traffic incidents is anticipated.

Excavation for underground utilities and other infrastructure could encounter unexploded military munitions. To reduce the potential hazards related to the exposure to MEC, qualified UXO personnel would perform surveys to identify and remove potential items of MEC prior to the initiation of ground-disturbing activities. UXO supervision during earth-moving activities and providing MEC awareness training to construction personnel prior to and during ground-disturbing activities would also be undertaken. 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.

### **19.2.8 Roadways**

Construction activities would consist of intersection improvements, bridge replacements, pavement strengthening, road relocation, road widening, and construction of a new road. Typical activities associated with each of these types of projects are described in Table 2.5-3 of this volume. Most projects would involve construction work in developed and paved areas, and some roadway projects require work in undeveloped locations. Construction activities would occur during a 7-year period from 2010 through 2016, with the peak roadway construction year of 2013/2014.

The proposed GRN project and associated construction haul roads would be designed in accordance with the American Association of State Highway and Transportation Officials (AASHTO) standards and guidelines, with particular focus on improving safety and reducing traffic congestion. Construction of roadway segments and bridge replacement projects would require the use of temporary detours, limited road closures, and alternate routes that would be established during localized road work. These temporary routes would represent alternate ways of reaching destinations. While such detours may be perceived as an inconvenience to the public, temporary roadways would be established with safety measures, such as proper signage and reduced speed limits, as appropriate for temporary construction zones. With implementation of these protective measures, potential impacts to public health and safety would be reduced to a less than significant level.

Potential impacts to public health and safety can occur during roadway construction activities (i.e., cut and fill operations, removal of vegetation, and use of heavy equipment) and as a result of leaks and spills onto soils during construction. Impacts from potential exposure to contaminated soil, use of hazardous materials, and generation of hazardous waste can also result in a public health concern (see Section 18.2.6). Direct impacts that result in physical injury could occur during construction, while indirect impacts can result from the completed project (e.g., accidents and injuries that would occur in the future). To evaluate the potential public health and safety impacts of roadway improvement projects, physical activities associated with each project type were identified as shown in Table 19.2-2.

**Table 19.2-2. Activities Associated with GRN Roadway Project Types**

<i>Item</i>	<i>Project Type</i>	<i>Temporary Detours</i>	<i>Temporary Storage of Contaminants</i>	<i>Exposure to Unexploded Ordnance</i>
1	Intersection Improvement (including military access points)	•	•	•
2	Bridge Replacement	•	•	•
3	Pavement Strengthening	•	•	•
4	Road Relocation (Route 15 only)	•	•	•
5	Road Widening	•	•	•
6	Construction of New Road	•	•	•
7	Temporary placement of equipment laydown areas or storage areas for road demolition material		•	•

Based on the anticipated activities associated with each project type, it was determined that:

- Each of the roadway improvement project types would have the same degree of exposure to possible increased hazards from use of temporary road detours during the construction period. Temporary road detours would generally be required for all road work.
- The placement of temporary equipment laydown areas at any of the GRN project work sites would represent a moderate potential for impacts to public health and safety due to the potential storage of fuels, oils, and lubricants that would be used during the construction period. The health risk associated with this activity would only occur if the spill or leak is not addressed, contaminants leached into the soil, and petroleum products were to enter any drinking water supply. To avoid this impact, proper containment and use of these potential contaminants would be required at temporary construction staging areas. The potential for contaminants leaching into the soil would be prevented or managed through implementation of spill prevention and emergency spill response procedures. This would reduce the possibility for leaks or spills of contaminants to occur at equipment staging areas.
- Contaminated soils may be present in the roadway work area. Exposure to contaminated soils may pose a health risk for construction workers. To avoid this impact, roadway design may include an evaluation of potential contamination. Final roadway design would avoid known contaminated sites wherever possible and may include coordination with the responsible party to ensure that construction does not interfere with any ongoing remediation activities. This would reduce the possibility for exposure to areas of contamination.
- Each of the roadway improvement project types would have the same degree of potential exposure to possible hazards from encountering UXO during the construction period. To avoid this impact, qualified UXO specialists would perform surveys to identify and remove potential ordnance from the work site prior to the start of construction. This would reduce the possibility for public exposure to UXO.

Indirect impacts during operation of the new GRN roadway could also occur. These safety hazards would be limited to those associated with the lack of familiarity to the road system, the effects of improper maintenance, and the potential for contaminants leaching into the soil.

- Safety hazards from initial use of the new roadway network could occur if there is a lack of familiarity with the road system. Because the GRN project would result in a 7-year process of roadway improvements, safety hazards would not be expected because of improved signalization, signage, and lighting that would be installed on the existing roadway configuration. Pavement improvements to reduce accidental skidding would also improve safety. The GRN project includes

only one roadway relocation (Route 15) and one new roadway (Finegayan Connection). The new GRN system would include comprehensive improvements designed to prevent accidents or injury and improve congestion management. With ongoing and planned traffic safety programs, the new GRN system would not be expected to affect the frequency of automobile accidents. The new roadway network would be expected to result in a decrease in safety hazards.

- Improper maintenance can lead to road deterioration from erosion and pavement damage that can result in localized safety hazards. The maintenance of roads on Guam would continue to be the responsibility of the Guam Department of Public Works.
- The potential for spills of fuels, oils, and lubricants that could occur on the new roadway network would be increased due to the number of additional heavy vehicles that would use the new roads and bridges. The health risk associated with this activity would only occur if the spill is not contained, contaminants leached into the soil or water body, and contaminants were to enter a drinking water supply or water body that is used for edible fish. To avoid this impact, spill prevention and emergency spill response procedures would be implemented.

Projects with the most potential for increased vulnerability to safety hazard would be those located in areas of high liquefaction potential and those in or near karst geological formations (nearest to known sinkholes or caves). In general, the potential vulnerability to effects from seismic activity is consistent throughout the island because of the presence of known and inferred earthquake faults that transect Guam. The potential for safety hazard due to geologic considerations would be addressed by proper roadway or bridge design, as discussed in the geology and soils chapter in Volume 6.

#### 19.2.8.1 Alternative 1

Alternative 1 would result in direct potential impacts to public health and safety during the construction period as a result of exposure to possible increased hazards from the use of temporary road detours and possible hazards from encountering UXO. Impacts on geological resources could include soil disturbance and soil loss, localized erosion, and particulate emissions. Ground disturbance for roadway improvements would be conducted in accordance with standard construction BMPs, general requirements in accordance with the Government of Guam Soil Erosion and Sediment Control Regulations, and associated permit conditions, including applicable storm water pollution prevention plans. With implementation of BMPs, impacts to public health and safety would be less than significant.

#### North

GRN projects in the North Region would be designed and constructed with safety principles to ensure that exposure to hazards is prevented or minimized. With implementation of BMPs, impacts to public health and safety would be less than significant.

#### Central

GRN projects in the Central Region would be designed and constructed with safety principles to ensure that exposure to hazards is prevented or minimized. As stated in the geology and soils chapter, roadway improvements near known caves and sinkholes would be designed in accordance with recommendations of the site-specific geotechnical investigation. With implementation of BMPs, impacts to public health and safety would be less than significant.

#### Apra Harbor

GRN projects in the Apra Harbor Region would be designed and constructed with safety principles to ensure that exposure to hazards is prevented or minimized. With implementation of BMPs, impacts to

public health and safety would be less than significant.

#### South

GRN projects in the South Region would be designed and constructed with safety principles to ensure that exposure to hazards is prevented or minimized. With implementation of BMPs, impacts to public health and safety would be less than significant.

#### Potential Mitigation Measures

No mitigation measures would be required. In addition to the potential mitigation measures identified for Hazardous Materials and Waste (Section 18), the following BMPs would be implemented for activities that could impact public health and safety in the project area:

- Individual roadway projects would be designed and constructed in accordance with AASHTO standards and guidelines.
- Ensure that contaminants (i.e., oils, greases, lubrication fluids for heavy equipment) are properly stored at the work site and at temporary construction staging areas to avoid spills and leaks.
- Ensure that emergency response plans are in place for responding to leaks or spills of construction contaminants.
- Conduct surveys to identify and remove potential ordnance from the work site would be conducted by qualified UXO specialists prior to the start of construction. As an added precaution, UXO personnel would conduct munitions and explosives training of construction crews, and be assigned to monitor earthmoving activities.

#### 19.2.8.2 Alternative 2 (Preferred Alternative)

##### North

Impacts would be similar to Alternative 1.

##### Central

Impacts would be similar to Alternative 1.

##### Apra Harbor

Impacts would be similar to Alternative 1.

##### South

Impacts would be similar to Alternative 1.

#### Potential Mitigation Measures

No mitigation measures would be required. BMPs would be identical to Alternative 1.

#### 19.2.8.3 Alternative 3

##### North

Impacts would be similar to Alternative 1.

##### Central

Impacts would be similar to Alternative 1.

Apra Harbor

Impacts would be similar to Alternative 1.

South

Impacts would be similar to Alternative 1.

Potential Mitigation Measures

No mitigation measures would be required. BMPs would be identical to Alternative 1.

19.2.8.4      Alternative 8

North

Impacts would be similar to Alternative 1.

Central

Impacts would be similar to Alternative 1.

Apra Harbor

Impacts would be similar to Alternative 1.

South

Impacts would be similar to Alternative 1.

Potential Mitigation Measures

No mitigation measures would be required. BMPs would be identical to Alternative 1.

2013/2014 (Peak Construction)

The year 2013/2014 represents the roadway network without any future plans for improvements for the military buildup. While no construction associated with the planned military buildup would occur, Government of Guam would have initiated construction of road segment and intersection improvement projects along segments of Routes 1, 7, 10A, and 27 (extension), and the Tiyan Parkway, as identified in Table 2.5-4.

2030

The year 2030 represents the roadway network without any future plans for improvements for the military buildup. While no construction associated with the planned military buildup would occur, Government of Guam would have completed construction of road segment and intersection improvement projects along segments of Routes 1, 2, 4, 7A, 16, 25, and 26, as identified in Table 2.5-4.

19.2.8.5      Summary of Impacts

Table 19.2-3 summarizes the potential impacts of each interim alternative. An analysis of long-term alternatives was not developed because the alternatives are not ready for project-specific analysis. A text summary is provided below.

**Table 19.2-3. Summary of Potential Impacts to Public Health and Safety-Roadway Project**

<i>Potentially Impacted Resource</i>	<i>Alternative 1</i>	<i>Alternative 2*</i>	<i>Alternative 3</i>	<i>Alternative 8</i>
Temporary Detours – Exposure of public to traffic hazards during roadway construction	LSI	LSI	LSI	LSI
Exposure to contaminants that have leached into the soil	LSI	LSI	LSI	LSI
Increased exposure to hazards from UXO	LSI	LSI	LSI	LSI
Improper maintenance resulting in road deterioration from erosion and pavement damage.	LSI	LSI	LSI	LSI

*Legend:* LSI = Less Than Significant Impact. \*Preferred Alternative.

Construction activities would consist of intersection improvements, bridge replacements, pavement strengthening, road relocation, road widening, and construction of a new road. Each type of roadway construction project would require the use of temporary road detours. Improper storage of construction materials could result in spills or leaks that could result in contaminants leaching into the soil and water bodies. There would be a potential for encountering UXO in the construction zone. For these reasons, specific BMPs would be implemented to avoid or minimize these potential effects on public health and safety. Roadways and bridges would be designed in accordance with specific geotechnical considerations to prevent risk from geologic hazards. The proposed GRN project would not be expected to subject the public to an increased risk of personal injury from automobile crashes or from exposure to UXO. With implementation of BMPs for roadway construction, impacts to public health and safety would be less than significant.

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