

Military Deployment
Periodic Occupational and Environmental Monitoring Summary (POEMS):
Ali Al Salem Air Base (AASAB) and Cargo City, Kuwait Calendar Years:
(January 2021 to December 2022)

AUTHORITY: This Periodic Occupational and Environmental Monitoring Summary (POEMS) has been developed in accordance with Department of Defense (DoD) Instructions 6490.03, 6055.05, and JCSM (MCM) 0028-07, See REFERENCES.

PURPOSE: This POEMS documents the Department of Defense (DoD) assessment of Occupational and Environmental Health (OEH) risk for AASAB, Cargo City and vicinity. It includes Camp Morell, Camp Virginia, and other military camps in the immediate vicinity where U.S. Personnel lived or worked. It presents a qualitative estimate of population-based health risks identified at these locations and their potential medical implications. The report is based on information collected from January 2021 through December 2022 to include deployment OEH sampling and monitoring data (e.g. air, water, and soil), field investigation and health assessment reports, as well as country and area-specific information on endemic diseases.

This assessment assumes that environmental sampling at AASAB, Cargo City and vicinity during this period was performed at representative exposure points selected to characterize health risks at the population-level. Due to the nature of environmental sampling, the data upon which this report is based may not be fully representative of all the fluctuations in environmental quality or capture unique occurrences. While one might expect health risks pertaining to historic or future conditions at this site to be similar to those described in this report, the health risk assessment is limited to January 2021 through December 2022.

The POEMS can be useful to inform healthcare providers and others of environmental conditions experienced by individuals deployed to AASAB, Cargo City, and vicinity during the period of this assessment. However, it does not represent an individual exposure profile. Individual exposures depend on many variables such as; how long, how often, where and what someone is doing while working and/or spending time outside. Individual outdoor activities and associated routes of exposure are extremely variable and cannot be identified from or during environmental sampling. Individuals who sought medical treatment related to OEH exposures while deployed should have exposure/treatment Example Text in their medical record on a Standard Form (SF) 600 (Chronological Record of Medical Care).

Health protective exposure assumptions are used in the assessment of all health risks, i.e. the resident population is assumed to be constantly exposed to environmental conditions. Small groups of personnel assigned to AASAB, Cargo City, or the other nearby sites addressed in this summary may be at greater risk than the general population due to operational requirements; these groups are identified when appropriate.

SUMMARY: Conditions with an estimated health risk of Moderate or greater are summarized in Table 2. Table 2 provides population based risk estimates for identified OEH conditions at AASAB, Cargo City, and/or camps in the vicinity. As indicated in the detailed sections that follow Table 2, controls established to reduce health risk are factored into this assessment. In some cases, e.g. ambient air, specific controls are noted, but not routinely available/feasible. Navigable links have been imbedded in Table 2 and the discussion sections of the POEMS so that the reader can easily move back and forth between the summary tables and detailed discussions.

POEMS

**Table 1: Summary of Occupational and Environmental Conditions
with MODERATE or Greater Health Risk**

Short-term health risks & medical implications:

Exposures associated with the following environmental stressors may be associated with potential acute health effects in some personnel during deployment at AASAB, Cargo City and local vicinity that includes Camp Morell and Camp Sparta:

Food/Waterborne Diseases: For personnel that consume non-approved local food, ice or water, there is a varying potential for food/waterborne diseases, (e.g., bacterial diarrhea, hepatitis A, typhoid fever, diarrhea-protozoal, brucellosis). The health effects of these diseases can temporarily incapacitate personnel (diarrhea) or result in prolonged illness (Hepatitis A, Typhoid Fever, Hepatitis E). Risks from food/waterborne diseases should be reduced with preventive medicine controls and mitigation, which includes hepatitis A and typhoid fever vaccinations and only drinking from approved water sources and eating from approved food sources in accordance with standing CENTCOM policy.

Endemic Diseases: Cutaneous/Visceral Leishmaniasis, Sandfly Fever, Typhus-Flea Born, West Nile Fever, Sindbis, Leptospirosis, Tuberculosis (TB), Meningococcal Meningitis, Rabies, Q Fever, H5N1 Fever.

Vector-Borne Endemic Diseases: May constitute a significant risk due to exposure to biting vectors which include the following diseases: Cutaneous Leishmaniasis, Sandfly Fever, Typhus-Flea Born, West Nile Fever, Sindbis. The risk is reduced to low by proper wear of the treated uniform, application of repellent to exposed skin and bed net, efforts by Pest Management to minimize the biting vectors, and appropriate chemoprophylaxis.

Respiratory Diseases: Personnel in close-quarter conditions may be at risk for person-to-person spread of tuberculosis and meningococcal meningitis.

Animal Contact Diseases: Rabies, Q fever, and H5N1 fever pose year-round risks. Effects of venom from animals and bugs vary with species from mild localized swelling to potential lethal effects; risks is reduced by avoiding contact and proper and timely treatment.

Heat Stress: Risk can be greater for susceptible persons including those older than 45, of low fitness level, un-acclimatized, or with underlying medical conditions. Risks from heat stress may be reduced with preventive medicine controls, work-rest cycles, and mitigation.

Air Quality: Exposures may result in mild to more serious short-term health effects (e.g., eye, nose or throat and lung irritation, increased cough and phlegm) in some personnel while at this site. Certain subgroups of the deployed forces (e.g., those with pre-existing asthma/cardio-pulmonary conditions) are at greatest risk of developing notable health effects.

Long-term health risks & medical implications:

Exposures associated with the following environmental stressors may be associated with potential chronic health effects in some personnel during deployment at AASAB, Cargo City and local vicinity that includes Camp Morell and Camp Sparta:

Food/Waterborne Diseases: The long-term effects of foodborne/waterborne diseases are still not fully understood. New findings unfold as research is performed. Illnesses caused by bacteria also increase the risk of developing irritable bowel syndrome. Other potential long-term effects include reactive arthritis and listeria monocytogenes.

Endemic Diseases: Mucosal leishmaniasis usually becomes clinically evident within several years (sometimes as long as decades) of the original cutaneous lesions. Several studies have shown that a relatively large group of patients suffer from persistent fatigue after acute Q-fever. This illness is also known as Post Q-fever Fatigue Syndrome, of which symptoms can last for as long as 10 years.

Water Contact Diseases: (leptospirosis) In approximately 10% of cases, there can be long-term effects after leptospirosis. If the acute phase is not properly diagnosed, the long-term effects may not become apparent until later medical treatment. These effects may be due to leptospire persisting in protected regions of the body (i.e., the eyes and brain).

Respiratory Diseases: When TB goes unnoticed and it is left untreated for a long duration, it might lead to permanent damage of the lungs and respiratory tracts.

Heat Stress: NIOSH reports that certain heart, kidney, and liver damage are thought by some researchers to be linked to long-term heat exposure. However, the evidence supporting these associations is not conclusive. Heat exposure has been associated with temporary infertility in both women and men, with the effects being more pronounced in men. Sperm density, motility, and the percentage of normally shaped sperm can decrease significantly when the temperature of the groin is increased above a normal temperature.

Air Quality: For particulate matter, control measures have limited efficacy. Thus the residual risk may be similar or identical to unmitigated risk. Although most effects from exposure to particulate matter should have diminished post-deployment, providers should be prepared to consider the relationship between deployment exposures and current complaints. Some individuals may have sought treatment for acute respiratory irritation during their time at AASAB. Personnel who reported with symptoms or required treatment while at this site should have exposure/treatment noted in medical record (e.g., electronic medical record and/or on a Standard Form (SF) 600 (Chronological Record of Medical Care)).

Table 2: Population-Based Health Risk Estimates – AASAB, Cargo City, and vicinity, Kuwait^{1,2}

Source of Identified Health Risk ³	Unmitigated Health Risk Estimate ⁴	Control Measures Implemented ⁵	Residual Health Risk Estimate ⁴
Air			
Particulate matter less than 10 microns in diameter (PM ₁₀) (see paragraph 2.3)	Short-term: Low-High Higher health effects during environmental disturbances. More serious effects possible in persons with existing respiratory issues	Limit strenuous physical activities when air quality is poor, minimize time outdoors, and keep doors, windows and tent flaps closed. Personnel are issued neck cravats and dust goggles.	Short-term: Low-High Particulate matter control measures have limited efficacy.
	Long-term: No defined health guidelines		Long-term: No defined health guidelines
Particulate matter less than 2.5 microns in diameter (PM _{2.5}) (see paragraph 2.4)	Short-term: Low-High Higher health effects during environmental disturbances. More serious effects possible in persons with existing respiratory issues	Limit strenuous physical activities when air quality is poor, minimize time outdoors, and keep doors, windows and tent flaps closed. Personnel are issued neck cravats and dust goggles.	Short-term: Low-High Particulate matter control measures have limited efficacy.
	Long-term: Moderate Individuals with pre-existing diseases have a higher risk for developing chronic conditions		Long-term: Moderate Particulate matter control measures have limited efficacy.
Airborne Metals (see paragraph 2.5)	Short-Term: Low Metals have not been detected above their corresponding short exposure MEGs	Limit strenuous physical activities when air quality is poor, minimize time outdoors, and keep doors, windows and tent flaps closed. Personnel are issued neck cravats and dust goggles prior to deployment	Short-Term: Low Airborne metal control measures have limited efficacy.
	Long-term: Low 17% of the samples are above the 14-day and 1-year negligible Cadmium MEG which is considered low risk.		Long-term: Low Airborne metal control measures have limited efficacy
Volatile Organic Compounds (VOC) (see paragraph 2.6)	Short-term: Low VOCs samples are below their corresponding MEGs	Fuel and other chemical spills are cleaned up quickly if they occur and do not represent exposures to an entire base population.	Short-term: Low Risks and health effects are determined based on specific chemicals in comparison to available MEGs.
	Long-term: Low No parameters exceeded the 1-year Negligible MEGs.		Long-term: Low No parameters exceeded the 1-year Negligible MEGs.

Table 2: Population-Based Health Risk Estimates – AASAB, Cargo City, and vicinity, Kuwait^{1,2}

Source of Identified Health Risk ³	Unmitigated Health Risk Estimate ⁴	Control Measures Implemented ⁵	Residual Health Risk Estimate ⁴
Soil			
Soil (see paragraph 3)	Short-Term: Not evaluated Not evaluated for short Term (acute) Health Risks.	The Kuwait oil fires of 1991 are not known to have significantly contaminated the soil at these locations.	Short-Term: Not evaluated Not evaluated for short Term (acute) Health Risks..
	Long-term: Low No soil samples were detected above corresponding MEG values.		Long-term: Low
Water			
Consumed Water (Water Used for Drinking) (see paragraph 4.1)	Short-term: Low All analytes are below the 14 day 15L/day negligible drinking water MEG values.	Bottled water is approved for consumption by Preventive Medicine/ Army Veterinary Services. Bottled water is the only authorize source of consumed water and is routinely sampled and monitored by BE.	Short-term: Low
	Long-term: Low All analytes are below the 14 day 15L/day negligible drinking water MEG values.		Long-term: Low
Water used for other purposes (non-drinking) (see paragraph 4.2)	Short-term: Low	Water surveillance programs monitors for disinfectant residual and contamination. Use of the host nation water for consumption is restricted by AFCENT	Short-term: Low
	Long-term: None identified		Long-term: None identified
Military Unique			
Chemical Biological, Radiological Nuclear (CBRN) Weapons (see paragraph 5.1)	Short-term: None identified Insufficient data exist upon which to base an assessment.	There are no exposures documented in the Defense Occupational and Environmental Health Readiness System or the Military Exposure Surveillance Library	Short-term: None identified Insufficient data exist upon which to base an assessment.
	Long-term: None identified Insufficient data exist upon which to base an assessment.		Long-term: None identified Insufficient data exist upon which to base an assessment.
Depleted Uranium (DU) (see paragraph 5.2.2.1)	Short-term: Low Minimal exposure time and only storage operations conducted by EOD personnel.	DU munitions that have been confiscated or discovered on base (from gulf war operations) are stored in classified locations by EOD. Minimal exposure time and only storage operations conducted by EOD personnel.	Short-term: Low
	Long-term: Low		Long-term: Low

Table 2: Population-Based Health Risk Estimates – AASAB, Cargo City, and vicinity, Kuwait^{1,2}

Source of Identified Health Risk ³	Unmitigated Health Risk Estimate ⁴	Control Measures Implemented ⁵	Residual Health Risk Estimate ⁴
Ionizing Radiation (see paragraph 5.2)	Short-term: Low	Exempt quantities of radiation sources are documented and inventoried by BE and do not pose significant risks.	Short-term: Low
	Long-term: Low		Long-term: Low
Non-ionizing Radiation (see paragraph 5.3)	Short-term: Low PELs are not exceeded in occupied areas.	An Electromagnetic Radiation survey was conducted 25 - 27 January 2008 which determined PELs are not exceeded. The current inventory includes current hazard distances that are not exceeded in occupied areas.	Short-term: Low
	Long-term: Low PELs are not exceeded in occupied areas.		Long-term: Low
Endemic Disease	Infectious Disease Risk Assessment Database - Kuwait CDC Health Information - Kuwait		
Gastrointestinal (see paragraph 6.2)	Short-term: High Ingesting unapproved food/water can temporarily incapacitate personnel or result in illness.	Immunizations, the consumption of food and water only from approved sources, and habitability inspections.	Short-term: High Based on disease incident reporting from Kuwait, risks are low to high.
	Long-term: Low The majority of gastrointestinal diseases do not cause prolonged illness.		Long-term: Low Based on disease incident reporting from Kuwait, risks are low to high.
Arthropod Vector Borne (see paragraph 6.3)	Short-term: Moderate Moderate risk for sand-fly fever, West Nile fever, Crimean-Congo hemorrhagic fever, rickettsioses and Sindbis.	Proper wearing of treated uniforms and the application of insect repellent, removing vector harborage, and application of pesticides.	Short-term: Moderate Cutaneous Leishmaniasis and all other vector-borne diseases based on disease incident reporting from Kuwait.
	Long-term: Low Possible infection may not be clinically evident until redeployed.		Long-term: Low Based on disease incident reporting from Kuwait.
Water-Contact (see paragraph 6.4)	Short-term: Low Flooding can facilitate the spread of leptospirosis.	Avoidance of water sources, drainage areas, etc. Disinfection of water used for bathing and cooking	Short-term: Low Based on disease incident reporting from Kuwait.
	Long-term: Low Based on disease incident reporting from Kuwait.		Long-term: Low Based on disease incident reporting from Kuwait.

Table 2: Population-Based Health Risk Estimates – AASAB, Cargo City, and vicinity, Kuwait^{1,2}

Source of Identified Health Risk ³	Unmitigated Health Risk Estimate ⁴	Control Measures Implemented ⁵	Residual Health Risk Estimate ⁴
Respiratory (see paragraph 6.5)	Short-term: Moderate Transmissions of respiratory infections due to close living conditions. Middle Eastern Respiratory Syndrome is present in Kuwait.	Immunizations are given either before or during deployment. Local and third country national workers complete health screening prior to employment. Potential tuberculosis exposure is addressed in the Post Deployment Health Assessment.	Short-term: Moderate Potential respiratory infections, tuberculosis, and MERS.
	Long-term: Low The majority of respiratory diseases do not cause prolonged illness.		Long-term: Low Based on disease incident reporting from Kuwait.
Animal Contact (see paragraph 6.6)	Short-term: Moderate Highest in areas where livestock are present.	Prohibit contact with, adoption, or feeding of feral animals. Immunizations for anthrax and rabies	Short-term: Moderate Potential Q fever, Rabies and H5N1 based on disease incident reporting from Kuwait.
	Long-term: Low Based on disease incident reporting from Kuwait.		Long-term: Low Based on disease incident reporting from Kuwait.
Aerosolized Dust and Soil-Contact (see paragraph 6.7)	Short-term: Low Potential for Hantavirus hemorrhagic fever with renal syndrome	Avoid abandoned areas with rodent infestation.	Short-term: Low Cases have the potential to occur in areas with heavy rodent infestations.
	Long-term: Low Based on disease incident reporting from Kuwait.		Long-term: Low Based on disease incident reporting from Kuwait.
Venomous Animal/ Insects			
Snakes, scorpions, and spiders (see paragraph 7.1)	Short-term: High Vary with species from mild localized swelling to potentially lethal. There are 18 scorpion, 3 spider, and 5 snake species that are found in the area	Reduction of harborage for animals. Public education on avoidance.	Short-term: Low Based on efficacy of control measure as evidenced by lack of disease(s) reported in various medical surveillance databases
	Long-term: No long-term health risks identified		Long-term: No long-term health risks identified

Table 2: Population-Based Health Risk Estimates – AASAB, Cargo City, and vicinity, Kuwait^{1,2}

Source of Identified Health Risk ³	Unmitigated Health Risk Estimate ⁴	Control Measures Implemented ⁵	Residual Health Risk Estimate ⁴
Heat/Cold Stress			
Heat (see paragraph 8.2)	Short-term: Moderate Risk of heat injury for un-acclimatized personnel. Summer temperatures exceed 130 F°.	Adequate periods of acclimatization. Work-rest cycles based on monitoring of climatic conditions.	Short-term: Moderate Based on efficacy of control measure and incidence of heat injuries reported
	Long-term: Low		Long-term: Low
Cold (see paragraph 8.3)	Short-term: Low Dependent on clothing or equipment worn, operational work intensity and individual factors	Provision of adequate foul weather clothing and appropriate work/rest cycles during cold weather	Short-term: Low
	Long-term: Low		Long-term: Low
Noise			
Noise (Continuous) (see paragraph 9.1)	Short-term: Low	Use of hearing protection. Labeling noise hazardous areas. Enforcement of PPE.	Short-Term: Low Based on efficacy of control measure practiced.
	Long-term: Moderate		Long-term: Moderate
Impulse (see paragraph 9.2)	Short-term: Low	(see paragraph 9.2)	Short-term: Low
	Long-term: Moderate		Long-term: Moderate
Unique Concerns			
Any incident of fire or spill that may have happened (see paragraph 10.1)	Short-term: None Identified Insufficient data exist to base health risk assessments.	(see paragraph 10.1)	Short-term: None Identified Insufficient data exist to base health risk assessments.
	Long-term: None Identified Insufficient data exist to base health risk assessments.		Long-term: None Identified Insufficient data exist to base health risk assessments.
Waste Sites/Waste Disposal (see paragraph 10.2)	Short-term: Low Survey of Al-Jahra landfill, located 6 miles downwind of AASAB, determined no exposure potential exists.	A site assessment between BE and Environmental showed no evidence of mass chemical or biological exposure which could affect the base.	Short-term: Low
	Long-term: Low		Long-term: Low

Table 2: Population-Based Health Risk Estimates – AASAB, Cargo City, and vicinity, Kuwait^{1,2}

Source of Identified Health Risk ³	Unmitigated Health Risk Estimate ⁴	Control Measures Implemented ⁵	Residual Health Risk Estimate ⁴
Fuel/petroleum products/ industrial chemical spills (see paragraph 10.23)	Short-term: Low Spills are minimal and only affect those doing immediate remediation.	The average fuel spill air sampling is measured to be 5.4 ppm for a 2 hour clean-up of 50 gallon spills, below the 100 ppm PEL.	Short-term: Low
	Long-term: Low		Long-term: Low
Pesticides/Pest Control (see paragraph 10.4)	Short-term: Not evaluated: Insufficient data exist to base risk assessments	Mosquito fogging is conducted using Scourge Insecticide mixed 50/50 with water. Scourge insecticide is 4% Resmethrin and 12% Piperonyl Butoxide	Short-term: No data available:
	Long-term: No data available		Long-term: No data available
Asbestos (see paragraph 10.5)	Short-term: None identified All buildings built post 1980.	Asbestos has not been identified at AASAB or Cargo City.	Short-term: None identified
	Long-term: None identified		Long-term: None identified
Lead Based Paint (see paragraph 10.5)	Short-term: None identified All buildings built post 1980.	Lead based paint has not been identified at AASAB or Cargo City.	Short-term: None identified.
	Long-term: None identified		Long-term: None identified
Burn Pits (see paragraph 10.6)	Short-term: None identified	No burn pits at AASAB/Cargo City. Trash is removed by contract, and biological waste is taken to Camp Arifjan for disposal.	Short-term: None identified
	Long-term: None identified		Long-term: None identified

1. This Summary Table provides a qualitative estimate of population-based short-and long-term health risks associated with the occupational and environment conditions at AASAB, Cargo City, and other locations frequented by U.S. Military personnel in the immediate vicinity, Kuwait. It does not represent an individual exposure profile. Actual individual exposures and health effects depend on many variables. For example, while a chemical may be present in the environment, if a person does not inhale, ingest, or contact a specific dose of the chemical for adequate duration and frequency, then there may be no health risk. Alternatively, a person at a specific location may experience a unique exposure, such as at the burn pit, which could result in a significant individual exposure. Any such person seeking medical care should have their specific conditions of exposure documented on Form SF600.

2. This assessment is based on specific environmental sampling data and reports obtained from 1 January 2021 through 31 December 2022. Sampling locations are assumed to be representative of exposure points for the camp population, but may not reflect all the fluctuations in environmental quality or capture unique exposure incidents.

3. This Summary Table is organized by major categories of identified sources of health risk. It only lists those sub-categories specifically identified and addressed at AASAB and Cargo City. The health risks are presented as Low, Moderate, High or Extremely High for both acute and chronic health effects. The risk level is based on an assessment of both the potential severity of the health effects that could be caused and probability that exposure would occur at a level to produce such health effects.

Table 2: Population-Based Health Risk Estimates – AASAB, Cargo City, and vicinity, Kuwait^{1,2}

Source of Identified Health Risk ³	Unmitigated Health Risk Estimate ⁴	Control Measures Implemented ⁵	Residual Health Risk Estimate ⁴
Details can be obtained from the Army/AF Public Health Center. More detailed descriptions of OEH exposures that were evaluated are discussed in the following sections of this report.			
4. Risks in this Summary Table are based on quantitative surveillance thresholds (e.g. review of disease surveillance data) or screening levels (e.g. Military Exposure Guidelines (MEGs) for chemicals). Some previous assessment reports may provide slightly inconsistent risk estimates because quantitative criteria such as MEGs may have changed since the samples were originally evaluated and/or because this assessment makes use of all historic site data while previous reports may have only been based on a few samples.			
5. All OEH risk estimates represent residual risk after accounting for preventive controls in place. Occupational exposures and exposures to endemic diseases are greatly reduced by preventive measures in place. For environmental exposures related to airborne dust, there are limited preventive measures available and available measures have little efficacy in reducing exposure to ambient conditions.			

SITE DESCRIPTION: Kuwait is an affluent country fueled by the petrochemical industry. AASAB is located in a rural area approximately 45 kilometers (km) west of Kuwait City. The installation is surrounded by open deserts in every direction, and is the primary training center for the Kuwaiti Air Force. The three major tenants of the base are the Air Force’s 386 Air Expeditionary Wing (386 AEW) operating out of the “Rock” and the “Quarry,” and the Army operating out of the Life Support Area (LSA) and Camp Morell. AASAB was built in the 1970s and was briefly occupied by the Iraqi Air Force during the first Gulf War. The soil at AASAB consists primarily of dry silt and sand, and there are sparse trees and limited vegetation throughout the base (most of it planted and maintained by people). There is a large vegetation area (bamboo) located between the Rock and Camp Morell known as the Green Mile. This is where the base sewage lagoon is located. The structures on base are a mixture of tents, semi-permanent (living trailers), and permanent structures (staff and communication buildings, DFAC, gym, base theatre, and clinic). Most of the roads on the installation are paved. However, there are some areas that have unpaved roads, and parking lots that are covered by gravel. The base is mainly on commercial power. There are several back-up generator plants operated by 386 ECES, Power Production, on base and several facilities have specific backup generators.

Cargo City is part of the Kuwait International Airport complex, which serves U.S. government and affiliated aircraft. The air base is 9.6 miles south of Kuwait City and is headquarters for the Kuwait Air Force. The USAF facilities are all located along the length of the flight line. The base is staffed and supported 24 hours by the 387 AEG, who reside at AASAB. The only military residents of Cargo City are Fire Department personnel; all other personnel commute daily to work their shifts. The structures on base are mainly semi-permanent, with a few permanent structures. Climate, topography, and power conditions are the same as AASAB.

The roads at Cargo City are mostly paved with some gravel. Parking lots are also paved with some gravel. The non-potable water for the base is maintained by contract, being filled and chlorinated daily by hand. Because of this, chlorine levels fluctuate greatly.

Local Climate: The climate at AASAB and Cargo City is characterized by low rainfall and a large variation in temperature between day and night. Winds are predominantly from the northwest. There are nominally two seasons: Winter and summer. Summer conditions last from April to October. During the summer months, it is extremely hot and dry with temperature ranges from 64°F to 112°F. Peak temperatures have occasionally reached as high as 130°F in July and August. Winter runs from November to April. The low temperatures range from 45°F in January to 47°F in December.

1. Discussion of Health Risks at AASAB/Cargo City, Kuwait by Source

The following sections provide additional information about the OEH conditions summarized above. All risk assessments are performed using the methodology described in the U.S. Army Public Health Command Technical Guide 230, Environmental Health Risk Assessment and Chemical Exposure Guidelines for Deployed Military Personnel (USAPHC TG 230). All OEH risk estimates represent residual risk after accounting for controls measures in place. Occupational exposures and exposures to endemic diseases are greatly reduced by preventive measures. For environmental exposures related to airborne dust, there are limited preventive measures available, and available measures have little efficacy in reducing exposure to ambient conditions.

The following contains examples of information that may be provided about health risk assessments (short or long term). Each section, **air, water, soil, etc.** is divided into five parts:

Sample data/Example Texts: Overall total samples collected, Periods of sampling, range of concentration and overall average, and/or (if any) for each satellite sites around the hub site.

Approach: Including a brief description about how the data is treated/evaluated, including the relevance of peak and average values to acute or chronic Military Exposure Guidelines (MEGs).

Risk Summary: A brief summary of the overall short/long-term risk with an explanation of specific periods during which the risk is higher or lower than the overall risk for the site.

Medical Implications: A brief description of clinical outcomes may have been seen while in theater resulting from short-term exposures or those that may be seen in the future related to chronic, low dose exposures.

Confidence in the Risk Assessment: Based on the number of samples, frequency and consistency of sampling events and consistency of the results within the dataset.

2. Air

2.1. Area Specific Sources Identified

AASAB and Cargo City are situated in a dusty semi-arid desert environment. Inhalational exposure to high levels of dust and particulate matter, such as during high winds or dust storms may have resulted in mild to more serious short-term health effects (e.g., eye, nose or throat and lung irritation) in some personnel. Additionally, certain subgroups of the deployed forces (e.g., those with pre-existing asthma/cardio pulmonary conditions) are at greatest risk of developing notable health effects. The average wind conditions are 9.3 mph from the NW.

There are no off site industrial sources present in the immediate vicinity of the AASAB. However, onsite electric power generation by numerous tactical generators located throughout the base may have contributed air pollutants such as nitrogen oxide, carbon monoxide, hydrocarbons and particulates. The base is mainly on commercial power. However, there are several back-up generator plants operated by 386 ECES, Power Production, on base and several facilities have specific backup generators. The main generator plant is sited away from the general population. Cargo City is located approximately 9 mi south/downwind of Kuwait city, in the presence of many industrial areas. Most industrial facilities near Kuwait City are involved in oil refining, though all smokestacks are located far west of the airport and would not affect residents. Kuwait city also has chlorine and ammonia factories, but these would also not affect Cargo City unless a large release occurred.

Open air burning is not performed at AASAB/Cargo City, as it goes against the Final Governing Standard of solid waste disposal for Kuwait. The 386 ECES Fire Department owns an incinerator that is located at fire station 2 on the Quarry (flight line side) of AASAB. The incinerator was inoperable for 2014-2015 and from Jul 2018-Apr 2019. The incinerator was repaired and became operable in May 2019, during the Jan to Jul 2019 rotation. The incinerator remained operable and in use during the January 2020 to January 2021 rotation. An incinerator at Camp Arifjan was also used prior to May 2019, during the period of inoperability.

Vehicle and aircraft emissions can be other major contributors to the air pollution. Emissions from military vehicles and aircrafts as well as vehicles in surrounding communities, especially in developing countries, may have significant impacts on air quality. Special surveillance may be desirable for future evaluation at the new Cargo City location as facilities are located near the flight line serving both commercial and military aircraft. Cargo City is located northwest of the previous AAMAB location at KWI airport while mission, aircraft exhaust, and location to the flight line remain similar and potential exposures for the new location are expected to remain similar. Environmental surveillance occurred between 2004 and 2020. The summary of results follows.

2.2. Particulate Matter

Particulate matter (PM) is a complex mixture of extremely small particles suspended in the air. PM includes solid particles and liquid droplets emitted directly into the air by sources such as: power plants, motor vehicles, aircraft, tactical generators, construction activities, fires, and natural windblown dust. PM can include sand, soil, metals, volatile organic compounds, allergens, and other compounds such as nitrates or sulfates that are formed by condensation or transformation of combustion exhaust. PM composition and particle size vary considerably depending on the source. Generally particulate matter of health concern is divided into two fractions: PM₁₀, which includes coarse particles with a diameter of 10 micrometers or less (0.0004 inches or one-seventh the width of a human hair), and fine particles less than 2.5 micron (PM_{2.5}), which can reach the deepest regions of the lungs when inhaled. Exposure to excessive PM is linked to a variety of potential health effects.

2.3. Particulate Matter, less than 10 microns (PM₁₀)

2.3.1. Exposure Guidelines:

Short-term (24-hour) PM₁₀ (mg/m³):
 Negligible MEG = 0.250
 Marginal MEG = 0.420
 Critical MEG = 0.600

Long-term PM₁₀ MEG (mg/m³): Not defined.

2.3.2. Sample Data:

A total of 177 PM₁₀ air samples were collected from 2005 to 2020. A statistical analysis was performed in December 2020 which identified that 17 outliers of the sampling set. Outliers were removed due to significant differences in the large of amount of samples collected. Based on the statistical analysis, the maximum concentration of PM₁₀ is 0.553 mg/m³ and the average concentration is 0.176 mg/m³. Contact the 386 BE office for further information regarding sample values.

2.3.3. Short-Term (Acute) Health Risk for PM₁₀:

Approach: To assess acute (short term) risks associated with PM₁₀, a risk estimate was calculated using the TG-230 Risk Assessment Worksheet. This assessment utilized the maximum and average concentrations of PM₁₀ to identify hazard probability and severity which resulted in the risk summary for PM₁₀.

Risk Summary: Low to High: Short term risk determinations were made on the maximum and average concentrations of PM₁₀. The High risk determination is based on the peak measurement which has an “occasional” probability and “critical” severity. The Low risk determination is based on the average concentration which has an “occasional” probability and “negligible” severity. Reference the table below for specific PM₁₀ sampling risk assessments:

PM₁₀ Sampling Risk Assessment:

Concentration Range	# of Samples	% of Total Samples
Below MEG	129	81%
Negligible - Marginal	24	15%
Marginal - Critical	7	4%
Total Samples	160	

Medical Implications: A small number of individuals may have experienced eye, nose, and throat irritation and sought medical attention assuming the levels detected during the limited sampling are representative of general environmental conditions. In most of these individuals, the symptoms would have been mild and temporary requiring no medical treatment. During periods when airborne dust concentrations are higher than those detected, more individuals may be affected and the severity of symptoms increased. It is likely that more individuals may have sought medical attention with higher airborne dust concentrations. Symptoms associated with exposure to PM₁₀ would be expected to resolve after exposure ceased. Health effects in persons with pre-existing health conditions (e.g., asthma, or cardiopulmonary diseases) may be exacerbated.

Respiratory effects can increasingly impact real-time health and mission capabilities as they exceed higher levels of MEGs. Acute effects to relatively healthy troops are mostly eye, nose, and throat irritation, and respirator effects (sneezing, adaptive responses such as coughing, sinus congestion and drainage) that can be exacerbated by increased activity.

Confidence in the Risk Assessment: Confidence in the risk assessment is **High** based on the number of PM₁₀ air samples taken and statistical analysis performed.

2.3.4. Long-Term (Chronic) Health Risk for PM₁₀:

Health guidelines are not defined for PM₁₀. The United States Environmental Protection Agency has retracted its long-term standard (NAAQS) for PM₁₀ due to an inability to clearly link chronic health effects with PM₁₀ exposures.

2.4. Particulate Matter, Less Than 2.5 Microns (PM_{2.5})

2.4.1. Exposure Guidelines:

Short-term (24-hour) PM_{2.5} MEGs (mg/m³):

Negligible MEG	=	0.065
Marginal MEG	=	0.250
Critical MEG	=	0.500

Long-term (1year) PM_{2.5} MEGs (mg/m³):

Negligible MEG	=	0.015
Marginal MEG	=	0.065

2.4.2. Sample Data:

A total of 250 PM_{2.5} air samples were collected from 2005 to 2022. A statistical analysis was performed in December 2022 which identified that 23 outliers of the sampling set. Outliers were capped to the 95th percentile value due to significant differences in the large amount of samples collected. Based on the statistical analysis, the maximum concentration of PM_{2.5} is 0.20 mg/m³ and the average concentration is 0.067 mg/m³. Contact the BE office for further information regarding sample values.

The Royal Canadian Air Force (RCAF) also conducted three 24-hour samples at AASAB in 2015, ranging from 0.007-0.110 mg/m³ at the headquarters building, Canadian lodging, and the flight line.

2.4.3. Short-Term (Acute) Health Risk for PM_{2.5}:

Approach: To assess acute (short term) risks associated with PM_{2.5}, a risk estimate was calculated using the TG-230 Risk Assessment Worksheet. This assessment utilized the maximum and average concentrations of PM_{2.5} to identify hazard probability and severity which resulted in the risk summary for PM_{2.5}.

Risk Summary: Low: Short term risk determinations were made on the maximum and average concentrations of PM_{2.5}. The low risk determination is based on the peak measurement which has a “seldom” probability and “marginal” severity. The average concentration is also calculated to be low based on a “likely” probability and “negligible” severity. Reference the table below for specific PM_{2.5} sampling risk assessments:

PM_{2.5} Sampling Risk Assessment:

Concentration Range	# of Samples	% of Total Samples
Below MEG	159	64%
Negligible - Marginal	91	36%
Total Samples	250	

Medical Implications: Exposure to elevated levels of PM is frequent; the overall health effects variable, ranging from negligible to marginal on most days, with occasional short periods of hazardous HRA’s during environmental disturbances.

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At the **low** risk level, a small percentage of individuals may experience short-term health effects such as eye, nose, throat and lung irritation, coughing, sneezing, runny nose and shortness of breath. Some individuals might seek outpatient medical care although most individuals would have experienced only mild effects which would have typically resolve when exposure ceased. A small number of individuals may experience more pronounced effects such as decreased lung function and worsening of preexisting medical conditions such as asthma.

Confidence in The Risk Assessment: Confidence in the short-term PM_{2.5} health risk assessment is **low** (TG 230, Table 3-6) based on limited research data of the short-term and long-term health risks with this type of desert PM.

2.4.4. Long-Term (Chronic) Health Risk For PM_{2.5}:

Approach: For worst-case chronic health risk, it is assumed that the longest deployment lasted twelve to fifteen months. To assess chronic risk associated with PM_{2.5}, the overall yearly average concentration of PM_{2.5} was used to arrive at a long term health risk for 2005-2022. The average concentration is 0.067 mg/m³ which is above the negligible long-term MEG.

Risk Summary: Moderate: The moderate long-term risk determination is based on the average measurement which has a “frequent” probability and “negligible” severity.

Medical Implications: A small percentage of individuals may have been at increased risk of developing chronic health conditions. These conditions include reduced lung function, chronic bronchitis, chronic obstructive pulmonary disease, asthma and certain cardiopulmonary diseases.

Those with a history of asthma or pre-existing cardiopulmonary disease have a higher risk for exacerbating these chronic conditions. However, as the majority of the population at Ali Al Salem and the adjacent camps did not work outdoors for more than eight to twelve hours/day the risk for these chronic conditions is likely overstated.

Confidence in The Risk Assessment: Confidence in the short-term PM_{2.5} health risk assessment is **low** (TG 230, Table 3-6) based on limited research data of the short-term and long-term health risks with this type of desert PM.

2.5. Airborne Metals

2.5.1. Sample Data:

From 2004 through 2015, metals analysis was performed on 403 ambient air particulate matter samples collected at Ali Al Salem (data can be applied to Cargo City). Cadmium was the only metal detected above its corresponding long term MEG with a peak measurement of 0.00043 mg/m³ and an average of 0.00017 mg/m³. Contact the BE office for further information regarding sample values.

Approach: For screening purposes, both peak and average concentrations of airborne metals detected were compared to their corresponding 1-year negligible MEG. Risk estimates based on the USAPHC TG 230 methodology are calculated for any compound detected at a concentration greater than its 1-year MEG in 5% or more of the samples collected. For this approach, only Cadmium was evaluated as it was the only airborne metal with detectable results.

2.5.2. Short-Term (Acute) Health Risk:

Risk Summary: Low: All contaminants were measured at concentrations below short-term MEGs. The low short-term risk determination is based on the peak measurement which has an “occasional” probability and “negligible” severity.

2.5.3. Long-Term (Chronic) Health Risk:

Risk Summary: Low: 17% of the samples collected between 2005 and 2014 are above both the 14-day and 1-year negligible MEG for Cadmium. There currently is no 14-day or 1-yr Marginal MEG established for Cadmium; however, none of the samples are greater than 2x the negligible limits. The low long-term risk determination is based on the average measurement which has a “likely” probability and “negligible” severity. Reference the table below for specific Cadmium risk assessments:

Airborne Metals (Cadmium) Risk Assessment:

Concentration Range	# of Samples	% of Total Samples
Below MEG	334	83%
Negligible - Marginal	69	17%
Total Samples	403	

Confidence in The Risk Assessment: Confidence in the short-term airborne metals health risk assessment is **Low** based on limitations in sampling data and analytical limits of detection. (TG 230, Table 3-6).

2.6. Volatile Organic Compounds (VOC)

2.6.1. Sample Data:

From 2004 through December 2022, 11 air samples were collected at Ali Al Salem and Cargo City Airbases for VOC analysis. VOCs were detected in some of the samples, but at levels below pertinent MEGs. Risks are determined based on comparison to available MEGs.

Approach: Most VOC sampling is either associated with a specific source or incident driven. Data of this type, especially when there is sparse sampling data exist, is generally not representative of exposure to an entire camp population.

For screening purposes, peak and average concentrations of all airborne VOCs detected were compared to their corresponding 1-year negligible MEG. Short-term risk estimates based on the USAPHC TG 230 methodology are determined for any compound detected at a concentration greater than its 1-year MEG and long-term risk estimates were determined where VOC were detected above their respective 1-year MEG in 5% or more of the samples collected.

2.6.2. Short-Term (Acute) Health Risk Of VOCs:

Risk Summary: None Identified: Based on the available sampling data, no parameters exceeded 1-year Negligible MEGs.

Medical Implications: All of sampled concentrations generally will not be representative of possible exposures to the entire camp population. Rather they only represent the population residing or working in proximity to the sample location. The overwhelming majority of others will have far less potential for exposure at the measured levels.

Confidence in The Risk Assessment: Confidence in this risk assessment is low based on the few samples taken and the laboratory's limited capability to quantify some VOC compounds.

2.6.3. Long-Term (Chronic) Health Risk Of VOCs:

Risk Summary: None Identified: Based on the available sampling data, no parameters exceeded 1-year Negligible MEGs.

Medical Implications: All of sampled concentrations generally will not be representative of possible exposures to the entire camp population. Rather they only represent the population residing or working in proximity to the sample location. The overwhelming majority of others will have far less potential for exposure at the measured levels.

Confidence in risk estimate: Confidence in the risk assessment is low based on 11 samples collected at AASAB and CCAB.

3. Soil

3.1. Site-Specific Sources Identified

3.1.2. Sample Data:

From 2004 through 2017, a total of 14 surface soil samples were collected at Ali Al Salem. Laboratory analysis of all soil samples included semi-volatile organic compounds (SVOCs), heavy metals, polychlorinated biphenyls (PCB), pesticides,

herbicides and radionuclides. The primary exposure pathways associated with soil are dermal contact and incidental ingestion. Individuals involved in construction, maintenance and post fire clean-up activities are at greatest potential for exposure to soil. These individuals comprise a relatively small proportion of the overall camp population. Analytical results can be applied to Cargo City due to soil consistency across Kuwait. However, the risk of exposure at Cargo City is far less than AASAB as individual dwell time is less and minimal PT sessions occur at Cargo City. Additional samples taken by the RCAF all measured below the exposure levels for VOCs, PAHs, and metals.

According to field data sheets, all samples were collected from areas and/or activities where there was high potential for soil exposure such as in maintenance areas, physical training (PT) areas, during excavation, while filling sand bags and/or during construction activities. Laboratory analysis of soil samples included volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), polycyclic aromatic hydrocarbons (PAHs), heavy metals, polychlorinated biphenyls (PCB), pesticides, fungicides, herbicides, insecticides, and radionuclides. The primary exposure pathways associated with soil are dermal contact and incidental ingestion. Individuals involved in construction, maintenance and/or post (in case of any fire incident at the site) fire clean-up activities are at greatest potential for exposure to soil. These individuals comprise a relatively small proportion of the overall camp population.

3.1.3. Short-Term (Acute) Health Risk for Soil:

Approach: Sampling data for soil is not evaluated for short term (acute) health risks.

Risk Summary: None Identified: Currently, sampling data for soil are not evaluated for short term (acute) health risks.

Medical Implications: None known.

Confidence in the Risk Assessment: Not applicable, soil is not evaluated for short-term health risks.

3.1.4. Long-Term (Chronic) Health Risk for Soil:

Approach: Sample results are compared with each corresponding long-term MEGs published in the USAPHC TG 230 screening purposes. Compounds detected without a single exceedance of the 1-year MEG were excluded from further consideration. Long-term risk estimates were based on the probability of exposure to the concentrations detected.

Risk Summary: Low: None of the VOCs, SVOCs, polycyclic aromatic compounds (PAH), heavy metals, PCB, fungicides, herbicides, insecticides, or radionuclides detected are at concentrations above their corresponding MEG values.

Medical Implications: None

Confidence in Risk Estimate: Confidence in the risk assessment is low based on 14 samples collected across regional soils.

4. Water

In order to assess the health risk to U.S. personnel from exposure to water in theater, the U.S. Army Public Health Command (USAPHC) identified the most probable exposure pathways. These were based on the administrative information provided on the field data sheets submitted with the samples taken over the time period being evaluated. Bottled water is the primary source of drinking water for all deployed personnel in Kuwait. The water distribution system on AASAB/Cargo City is used for personal hygiene and dishwashing. Cargo City water is delivered via truck by contractor and hand-chlorinated.

4.1. Consumed Water (Water for drinking or cooking consumption)

All bottled water companies must undergo an audit that consists of a pre-audit, a site visit, and water tests. Once the pre-audit is completed and passed, Army Preventative Medicine will visit the plant to inspect their entire bottled water process. The visit includes a sanitary survey of the plant and the water source, and an evaluation of the treatment, decontamination, texting, bottling, and distribution process IAW 21 CFR Part 129 and 165. In the sanitation surveys and evaluation are in compliance and meet the standard, the plant is then added to the USAPHC's list of approved bottled water sources.

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All approved sources are audited every 6-12 months by Army preventative Medicine and are subjected to frequent water testing using ISO17025 certified laboratories. Initially, the plant is tested for radiation, chemicals, and biologicals. After that, AASAB/Cargo City bottled water is tested annually for radiation, chemicals, and biologicals.

For the January 2021 – December 2022, DLA was under contract with Al-Rawdatain Water Bottling Co for AASAB and Vectrus for Cargo City. The most recent audit and bottled water tests for this company were conducted in September 2020.

4.1.1. Sample Data:

IAW CENTOM Regulation 40-2, Advanced Water Testing (AWT) on the bottled water is required annually. Water samples were analyzed for inorganic compounds, VOC, SVOC and various physical characteristics. Testing accomplished on the bottled water indicates that FDA and MEG standards are being met. Additionally, BE conducts routine testing of AASAB/Cargo City's (potable) bottled water once it is delivered. BE performs total coliform and E. Coli tests. Since there have been historically negative results, only four bottles per production date are sampled. BE has an established system with rations to ensure the bottled water is tested before it is distributed throughout the base.

4.1.2. Short-Term (Acute) Health Risk For Drinking Bottled Water:

Approach: In order to determine acute health risk associated with consumption of bottled water the following assumptions were made:

- Camp residents ingest 15 liters of bottled water per day or less.
- All U.S. personnel at this location are expected to remain at this site for approximately 1 year.

Risk Summary: None Identified: None of the maximum detected concentrations for each analyte exceeded its specific 14-day, Negligible MEG for consumption of up to 15 liters of water per day (15L/day) and the short-term Field water standards published in TB MED 577, Sanitary Control and Surveillance of Field Water Supplies.

Medical implications: None

Confidence in the risk assessment: Confidence in the risk assessment is **high** because U.S Army Preventative Medicine personnel performed quarterly audits of all bottled water suppliers to ensure consistency of quality throughout of the combat operation. Additionally, BE personnel perform bottled water sampling on every lot delivered to AASAB/Cargo City.

4.1.3. Long-Term (Chronic) Health Risk:

Approach: Bottled water is supplied to AASAB/Cargo City in distinct lots and from multiple vendors. Thus, it is inappropriate to average analytical results across the spectrum of water samples/suppliers. As a result, the maximum detected concentration for each analyte is used to perform the long-term health risk screening. This process could result in overestimation of the long-term health risk as it assumes that camp residents consume water at the maximum detected concentration consistently during their deployment.

Risk Summary: None Identified: Analytical results of the routine bottled water samples collected at AASAB/Cargo City revealed that no analytes were detected above their respective 1-year, 15 L/day drinking water MEG or the respective long-term potability standard published in TB MED 577.

Medical Implications: None

Confidence in The Risk Assessment: Confidence in the risk assessment is **high** because U.S. Army Preventative Medicine personnel performed quarterly audits of all bottled water suppliers to ensure consistency of quality throughout of the combat operation. Additionally, BE personnel perform bottled water sampling on every lot delivered to AASAB/Cargo City.

4.2. Water for Non-Drinking/Other Purposes

AFCENT has not approved the water distribution system at AASAB/Cargo City for drinking because it is deemed unprotected.

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Tap water is only authorized for hygienic purposes, such as showering, laundry, washing dishes, brushing teeth, filling the pool, and food preparation in conjunction with point of use filtration systems when approved by the Wing Commander.

Water at AASAB is delivered to the Kuwaiti Base via the lower Al Mitlaa pumping station located approximately 11 km east of the base and 1 km north of Al Jahra. The pumping station receives water from the upper Al Mitlaa pumping station which receives water from the desalination plant in Doha. BE has been unable to assess the upper Al Mitlaa pumping station to date. The Army Preventative Medicine technicians visit these water sites. Both Al Mitlaa stations are part of Kuwait's municipal drinking water system (controlled by the Kuwait Ministry of Water & Electric).

Water enters the Kuwaiti side of base at the Cistern inside two underground holding tanks. Water and Fuels Maintenance (WFSM) personnel check the AF & Kuwaiti tank levels daily to ensure accurate levels are maintained. They also check the pump house daily to look for any signs of malfunction and tampering. Water from the Cistern tanks is metered and pumped to the WFMS 500K gallon tanks located near the ECES complex within the Rock. Water from the tank is pumped into the Rock's distribution system after undergoing chlorination. Manual chlorination (tablets) is used to boost disinfectant residuals during automatic chlorinating system failures. The storage tank then supplies water to the entire Rock to be used for operations at the dining facility and base eateries, as well as other buildings to include the dorms for personnel sanitation (i.e. hand washing, showering, brushing teeth, laundry, etc.).

The water for Cargo City is delivered via escorted water trucks to fill 25 above ground storage tanks that supply water to the base. Water trucks are filled at the off-base water fill point in Mishriff, located outside of Kuwait Air Force Entry Control Point (ECP) that has been assigned by the local municipality. The water delivery trucks are currently managed under a contract with Dyn Corporation. Chlorinated water is delivered to Cargo City every day, and all tanks are filled to capacity regardless of their current levels.

4.2.1. Sample Data:

IAW CENTOM Regulation 40-2, Advanced Water Testing (AWT) on the water distribution system is required annually. Water samples are analyzed for inorganic compounds, VOC, SVOC and various physical characteristics. Testing accomplished on the water distribution system indicates that FDA and MEG standards are being met. This testing gives support to use of the water distribution system as potable water in an emergency where bottled water was not available. Many reasons exist for the water distribution system to remain non-potable, primarily security and lack of AF control, but also a lack of backflow prevention devices and a cross connection control program.

4.2.2. Short-Term (Acute) And Long-Term (Chronic) Health Risks Associated With Water Uses Other Than Drinking:

Approach: Evaluation of disinfected fresh water did not reveal any exceedances of USAPHC TG 230 health risk screening criteria. All analytes measurements were below the detected short or long term MEGs. AASAB Records indicate that the routinely monitored parameters (pH, chlorine, bacteriological) are typically within acceptable limits.

Risk Summary: None Identified: No acute or chronic health risks associated with incidental ingestion of disinfected fresh water during showering are identified at Ali Al Salem.

Medical Implications: None identified

Confidence in the Risk Assessment: Even though there are relatively few samples in the data set, confidence in this risk assessment is high based on the limited potential for ingestion of host nation treated water.

5. Military Unique

5.1. Chemical Biological, Radiological Nuclear (CBRN) Weapons

No specific hazard sources are documented in Defense Occupational and Environmental Health Readiness System (DOEHRS), or the Military Exposure Surveillance Library (MESL) data portal between 2004 and 2020.

5.1.1 Short and Long-Term Health Risks:

Approach: There is no current or historical data is available that documents specific CBRN incidents or exposures upon which to base a risk assessment specific to Ali Al Salem Air Base.

Risk Summary: None Identified: No data exists upon which to base a risk assessment specific to AASAB and Cargo City

Medical Implications: None Identified: No data exists upon which to base a risk assessment specific to AASAB and Cargo City

Confidence in the Risk Assessment: Because there is no data upon which to base a risk assessment specific to AASAB and Cargo City the confidence in the risk assessment is **Low**.

5.2. Ionizing Radiation

5.2.1. Industrial Radiography

Medical and Dental radiography are utilized in the 386 EMDS clinic at AASAB. The radiology technician is the only individual enrolled in the optically stimulated luminescence (OSL) program, with no exposures above the action level recorded. Security Forces at AASAB and Cargo city operate radiography equipment at the main ECPs (vehicle backscatter and personnel scanner). Contractors at Cargo City operate an x-ray imaging device to scan luggage. 386 EMDS/SGXB has conducted a radiation scatter survey for each of the devices listed above between Jul 2018 and December 2022. Industrial radiography is also utilized by explosive ordnance disposal (EOD) for inspections.

5.2.2. Radioactive Material

There are no permitted radioactive materials or generally licensed devices at AASAB or Cargo City. All AASAB ionizing sources are limited to check sources for BE, EOD or CEX equipment and are considered "Exempt Quantities" IAW 10 CFR 30.18 and 10 CFR 30.71.

5.2.2.1. Depleted Uranium (DU)

DU munitions may at times be stored at AASAB by the local Explosive Ordinance Disposal (EOD) agency. DU munitions that have been confiscated or discovered on base (from gulf war operations) are stored in a classified location maintained by the local EOD agency until it can be shipped out for disposal.

Risk Summary: Low: Based on the procedures that are in place to maintain exposures as low as reasonable achievable and limited current operations that involve radioactive material.

Medical Implications: None Identified

Confidence in the Risk Assessment: Based on the procedures that are in place to maintain exposures as low as reasonable achievable and mostly qualitative data available, the confidence in this risk is **medium**.

5.3. Non-ionizing Radiation

5.3.1. Lasers:

The C-17, C-5, and C-130H-model aircraft have LAIRCM (AN/AAQ-24) with a Nominal Optical Hazard Distance (NOHD) of 200 ft. (61 meters). The MQ-9 has an illuminator with a NOHD of 0.32 km and a designator with a NOHD of 46.61 km. These are all Class 4 LASERS. Administrative procedures are in place to minimize incidents. LASERS are only operated in-flight and trigger switches are covered and only triggered when a target has been acquired. The biggest risk is lasing of aircrews while flying, which reportedly occurs frequently. All personnel lased with potential injury are evaluated by a flight surgeon, and if follow-on care is deemed necessary, an optometrist at Camp Arifjan.

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All reportable lasing occurrences are reported to the Installation Laser Safety Officer. This exposure is documented on SF600 and placed in their medical record. Aerospace Medicine files the report in the DoD Tri-Service Laser Injury Hotline. Three Class 3B LASERs are located on AASAB for emergency response chemical identification. These LASERs belong to Explosive Ordinance Disposal and CE Emergency Management. Administrative controls, and a shield attachment, eliminate exposure potential.

5.3.2. Radio Frequency (RF) Radiation:

Aircraft and ground-based emitters have administrative procedures in place to reduce the potential for exposures and ensure personnel are not within the uncontrolled environment hazard distance. Ground based emitters have been evaluated and have administrative controls in place that ensure personnel are not within the uncontrolled environment hazard distance. Operators of these systems are aware to notify 386 EMDG/SGPB for any potential exposure to EMF radiation to be investigated and documented. A Naval Surface Warfare Center HERP (Hazards of Electromagnetic Radiation to Personnel) study was performed from 25-27 January 2008. The study determined that Field intensity and contact current PELs are not exceeded at any normally occupied areas.

Risk Summary: The risk is Low due to procedures that are in place to maintain exposures below the permissible exposure limits.

Medical Implications: None Identified

Confidence in the Risk Assessment: Confidence in this risk assessment is High based on the HERP study performed and absence of RF related injuries between 2005-2022.

6. Endemic Diseases

6.1. Sample Data:

The assessed risk for endemic diseases addressed below represents the residual risk that exists in the presence of preventive measures.

Department of Defense Directive 6490.02 series, Comprehensive Health Surveillance, establishes policy for routine health surveillance of all DoD personnel throughout their military service. The Armed Forces Health Surveillance Branch (AFHSB) maintains archives of medical event reports for all Services. Medical event reports related to deployments in Kuwait did not identify specific locations within the country, nor did they describe the probable site of the exposure; therefore, epidemiological analysis of medical event data is limited to the country level.

Endemic diseases present in Kuwait were assessed by referring to the Defense Intelligence Agency's Infectious Disease Risk Assessment Database for CentCom: Kuwait at https://www.ncmi.detrick.army.mil/product/idra_db.php?co=KWT and the "Destinations" section of the Centers for Disease Control and Prevention (CDC) Travelers' Health website, <http://wwwnc.cdc.gov/travel/destinations/traveler/none/kuwait>. Where effective vaccines, such as those for Hepatitis A and B, are in place, risk to individuals is effectively reduced to none and these endemic diseases were excluded from further assessment.

Reporting of medical events from deployed environments is inconsistent. Identified reports of endemic disease associated with deployment to Kuwait are assumed not to represent all cases of reportable endemic disease events among service personnel deployed to Kuwait. Where available, additional relevant reports were used to supplement reportable medical event data for this assessment.

6.2. Gastrointestinal Diseases

U.S. Service members have little or no immunity to the food and waterborne diseases present in Kuwait. To prevent food and waterborne diseases among individuals deployed to Kuwait, food and water is purchased from approved sources. Food is prepared in facilities where there is public health oversight (certificate of sanitation, health screening, periodic inspections, etc.).

Due to the potential presence of disease causing organisms, as well as the high prevalence of improper food handling and preparation, local food and water are not approved for consumption. Viral gastroenteritis that is spread through contact or fomites (any inanimate object or substance capable of carrying infectious organisms) presents a recurrent risk due to a high rate of personnel turnover, and shared dining, berthing, bathroom facilities, and working spaces.

Approach: The health risk for fomite-borne gastrointestinal infections and endemic food and waterborne diseases to individuals deployed to Kuwait during the period of this assessment is epidemiologically assessed based on the combination of identified endemic diseases, knowledge of preventive measures in place, review of medical event reports associated with deployment to Kuwait, and review of military public health reports.

6.2.1. Short-Term Health Risks:

Risk Summary: Low to High: Due to a high rate of personnel turnover, shared dining, berthing, bathroom facilities, and working space, risks are not substantially different than that expected in similar settings within the United States. The short-term risks associated with foodborne and waterborne diseases in Kuwait are listed in the table below:

Short-Term Foodborne/Waterborne Disease Risks:

Disease Name	Risk Level
Bacterial Diarrhea	High
Protozoal Diarrhea	Moderate
Hepatitis A	Moderate
Typhoid Fever	Moderate
Paratyphoid Fever	Moderate
Viral Gastroenteritis	Moderate
Brucellosis	Low
Hepatitis E.	Low

Medical Implications: Gastroenteritis, particularly from viral agents, can cause periodic outbreaks in spite of preventive measures. A small number of infections may require greater than 72 hours convalescence and/or hospitalization.

Confidence in the risk assessment: Confidence in the risk assessment is Moderate. Food and water borne diseases, especially those with short convalescence and lack of long-term health effects are often underreported for deployed military populations.

6.2.2. Long-Term (Chronic) Health Risks:

Risk Summary: Low: The long-term risk associated with food and waterborne diseases is Low for protozoal diarrhea and brucellosis.

Medical implications: Long-term health effects resulting from infection with food and waterborne diseases are rare.

Confidence in The Risk Assessment: Confidence in the risk assessment is **High**. Incidence of protozoal diarrhea and brucellosis in the post deployment military population is known to be extremely low.

6.3. Arthropod Vector-Borne Diseases

The climate and ecological habitat found in Kuwait support populations of arthropod vectors, including mosquitoes, ticks, and sand flies. Risk for arthropod-borne disease is higher during warmer months (typically from April through November); with variable rates of disease transmission (vector-borne diseases occur at low or unknown levels throughout the country). Personnel may have been exposed to mosquitoes, ticks, sand flies, or other biting vectors both during the day or night. Risk is higher in urban and other densely populated areas, or near where animals are kept.

Removing vector harborages, spraying for vectors within base camps, avoiding animals or areas where they are kept, proper wearing of insecticide-treated (permethrin) uniforms, use of bed nets in field conditions, and the application of insect repellent to the skin (DEET) are the main protective measures against vector-borne diseases. Of the endemic vector-borne diseases present in Kuwait, malaria is the only disease for which chemoprophylaxis is available.

Approach: The health risk for endemic vector-borne diseases to individuals deployed to Kuwait during the period of this assessment is epidemiologically assessed based on the combination of identified endemic diseases, knowledge of preventive measures in place, review of medical event reports associated with deployment, and review of military public health reports.

6.3.1. Short-Term (Acute) Health Risks:

Risk Summary: Low to Moderate: Individuals who deployed from AASAB or the other camps in the immediate vicinity, to urban or rural outlying areas, may have experienced increased short-term risk. The short-term risk for the vector-borne diseases Sandfly fever, West Nile Fever, Sinbis, and typhus is **Low**. Individuals who deploy from AASAB/Cargo City, and/or supported base camps, to urban or rural outlying areas may experience increased short-term risk.

Medical Implications: Sandfly fever, West Nile Fever, and typhus present in Kuwait have fairly short incubation periods ranging from days to weeks. Any of these diseases would initially present as acute fever and malaise, some accompanied by rash, and would lead to acute, sometimes severe illness. Cutaneous leishmaniasis typically presents as skin lesions, single or multiple, that start as a papule and enlarge into an ulcer.

Confidence in The Risk Assessment: Confidence in the risk assessment is **moderate**. Reports of vector borne disease, including leishmaniasis, are received through official DoD medical event reporting systems.

6.3.2. Long-Term (Chronic) Health Risks:

Risk Summary: Low: The long-term risk for leishmaniasis, cutaneous and visceral, is **low**.

Medical implications: Both visceral and cutaneous leishmaniasis may have extended incubation periods, ranging from a months to years. Although rare, it is possible to be infected during deployment, but not to have clinically evident disease until redeployed. Leishmaniasis should be considered in the differential diagnosis for any unusual skin lesions, or chronic, systemic disease. According to the U.S. AFCENT Pre-Deployment Medical Screening Procedures of 30 Jun 2014, malaria is not a concern in Kuwait. If any, *Plasmodium vivax* and *P. falciparum* malaria would be the predominate species of malaria found in Kuwait. Relapses following *vivax* blood stage treatment are possible due to hypnozoites that remain dormant in the liver.

Confidence in The Risk Assessment: Confidence in risk assessment is **moderate**. Incidence of visceral leishmaniasis in the post deployment military population is known to be low. Cases of cutaneous leishmaniasis are detected and treated post deployment. The military medical community is aware of the presence of leishmaniasis in Kuwait, and skin lesions in individuals with a history of time spent in Kuwait is evaluated with that in mind. No cases of relapsing malaria have been reported in the Service-mandated reporting systems.

6.4. Water Contact Diseases

Operations or activities that involve extensive fresh water contact may result in individuals being exposed to leptospirosis. The occurrence of flooding after heavy rainfall facilitates the spread of leptospirosis because, as water saturates the environment, leptospirosis present in the soil pass directly into surface waters. Activities such as wading or swimming in fresh water sources may result in exposures to enteric diseases such as diarrhea and hepatitis via incidental ingestion of water. Prolonged water contact also may lead to the development of a variety of skin conditions, such as bacterial or fungal dermatitis. Elimination of standing, and/or open, bodies of fresh water protects against the spread of water contact diseases.

Approach: The health risk for endemic water contact diseases to individuals deployed to Kuwait during the period of this assessment is epidemiologically assessed based on the combination of identified endemic diseases, knowledge of preventive measures in place, review of medical event reports associated with deployment to Kuwait, and review of military public health reports.

6.4.1. Short-Term (Acute) Health Risks:

Risk Summary: Low: The short-term risk for leptospirosis is **low**, peaking between April and October.

Medical Implications: Leptospirosis, which has an incubation period of 5-14 days, presents as acute fever with nonspecific symptoms that last for 1 week to several months.

Confidence in The Risk Assessment: Confidence in the risk assessment is **high**. No reported cases of water contact diseases have been identified from Kuwait during the assessment period.

6.4.2. Long-Term (Chronic) Health Risks: No long-term health risk are identified.

6.5. Respiratory Diseases

U.S. military populations living and working in close-quarter conditions are at risk for substantial person-to-person spread of respiratory virus infections such as the common cold and influenza. Primary exposure pathways for tuberculosis include prolonged close contact (generally several hours per day for greater than three days per week in a closed space) with the local population or third country national contractors. U.S. personnel who remained on base had limited to no contact with the local population, and local and third country national workers/contractors are required to complete health screening prior to employment.

Approach: The health risk for respiratory diseases to individuals deployed to Kuwait during the period of this assessment is epidemiologically assessed based on the combination of identified endemic diseases, knowledge of preventive measures in place, review of medical event reports associated with deployment to Kuwait, and review of military public health reports.

6.5.1. Short-Term (Acute) Health Risks:

Risk Summary: Low to Moderate: The short-term risk is due to a high rate of personnel turnover, shared dining, berthing, recreational facilities, and working spaces is not substantially different than that expected in similar settings within the United States. The short-term risk for tuberculosis is **moderate**. The short term health risk for meningococcal meningitis is **low**.

Medical implications: Upper respiratory infections, particularly from viral agents, can cause periodic outbreaks in spite of preventive measures. A small proportion of infections may require greater than 72 hours convalescence and/or hospitalization.

Symptoms of tuberculosis, including fever, weight loss, night sweats and cough, typically start within 1-6 months of infection. The lifetime risk for tuberculosis after becoming infected is 5-10%; half of this risk occurs in the first two years following infection.

Confidence in The Risk Assessment: Confidence in risk assessment is **moderate**. Upper respiratory infections, especially those with short convalescence and lack of long-term health effects are not reportable for deployed military populations. Tuberculosis prevalence in the local population is widespread, but no reports of tuberculosis have been identified for individuals deployed to Kuwait during the assessment period.

6.5.2. Long-Term (Chronic) Health Risks:

Risk Summary: Low: The long-term risk for tuberculosis is **low** as no reports of tuberculosis have been identified for individuals deployed to Kuwait during the assessment period.

Medical implications: Symptoms of tuberculosis can be delayed by two or more years following infection. Tuberculosis should be considered in assessing symptoms of fever accompanied by night sweats and cough.

Confidence in The Risk Assessment: Confidence in risk assessment is **high**. Prevalence of tuberculosis in the local population is widespread, but prevalence of tuberculosis in the post deployment military population is known to be extremely low.

6.6. Animal-Contact Diseases

Animals in Kuwait are not routinely vaccinated against vaccine preventable diseases such as rabies or anthrax. Q-fever, anthrax, and rabies are known to be present in Kuwait. Exposure to animals, and/or locations where animals are kept (stray dogs/cats, barnyards, slaughterhouses), are the primary infection sources for all these diseases, and avoidance of companion and farm animal contacts is the primary prevention strategy. Preventive measures in place include anthrax vaccination, which is effective in preventing both cutaneous and inhalation anthrax, and rabies post exposure prophylaxis, which is effective for preventing onset of rabies in exposed individuals.

Approach: The health risk for endemic animal contact diseases to individuals deployed to Kuwait during the period of this assessment is epidemiologically assessed based on the combination of identified endemic diseases, knowledge of preventive measures in place, review of medical event reports associated with deployment to Kuwait, and review of military public health reports.

6.6.1. Short-Term (Acute) Health Risks:

Risk Summary: Low to Moderate: The short-term risk for anthrax (naturally acquired), rabies and H5N1 avian influenza is low. The risk for Q-fever is moderate.

Medical Implications: Naturally occurring anthrax (non-weaponized) is an acute disease that usually affects the skin, while inhalation anthrax has mild and non-specific initial symptoms among unimmunized individuals. Symptoms of acute Q-fever, which may present one week to greater than one month after exposure, include fever, chills and weakness. Rabies presents as an acute, viral encephalomyelitis and is almost invariably fatal.

Confidence in The Risk Assessment: Confidence in risk assessment is high.

6.6.2. Long-Term (Chronic) Health Risks:

Risk Summary: Low: The long-term risk for Q-fever and rabies is low. However, Q-fever is diagnosed in a small number of personnel after they returned to the U.S.

Medical Implications: Q-fever is generally an acute febrile disease. However, considerable variation in severity and duration may be seen; infections may be unapparent or present as a nonspecific undifferentiated febrile syndrome or as pneumonia. Q-fever should be considered in the differential diagnosis of an undifferentiated febrile syndrome when personnel mention a history of being near or in areas where animals are kept or had been kept. The incubation period for rabies is typically 1–3 months, but may be more than one year in rare instances.

Confidence in The Risk Assessment: Confidence in risk assessment is high.

6.7. Aerosolized Dust and Soil-Contact Diseases

Hantavirus hemorrhagic fever with renal syndrome (HFRS) is assessed as present, but levels are unknown; rare cases are possible among personnel exposed to dust or aerosols in rodent-infested areas. Clusters of cases could occur in groups exposed to areas with very heavy rodent infestation.

6.7.1. Short-Term (Acute) Health Risks:

Risk Summary: Low: The short-term risk for HFRS is low.

Medical Implications: Potentially very severe disease typically requiring prolonged hospitalization, including intensive care; fatalities may occur. Puumala cases are typically less severe, but can debilitate personnel for several days. Incubation period is 14 to 28 days (maximum range: 3 to 60 days)

Confidence in The Risk Assessment: Confidence in risk assessment is moderate.

6.7.2. Long-Term (Chronic) Health Risks:

Risk Summary: Low: The long-term risk for HFRS is **low**.

Medical Implications: Hantavirus hemorrhagic fever with renal syndrome (HFRS) transmission to humans is associated with exposure to aerosolized virus excreted in the urine or feces of an infected rodent host.

The viruses survive in the environment for a period days to weeks and frequently become aerosolized in dusty conditions. Inhalation of dust can result in serious human infection. Infection typically is occupationally associated with activities such as farming, camping, and military exercises. Disturbance of earth, dust, soil, or debris in areas where the rodent host is active increases the risk of human exposure. Transmission can occur at any time of year.

Confidence in The Risk Assessment: Confidence in risk assessment is **moderate**.

7. Venomous Animals/Insects

The species listed below have home ranges that overlap the country of Kuwait, and may present a health risk if encountered. Information is taken from U.S. Army Public Health Command, Armed Forces Pest Management Board Living Hazards Database, and personal communication from previously deployed preventive medicine personnel. Little to no regional (within the country of Kuwait) animal range information is available. The below list should not be considered all inclusive; other venomous scorpions and snakes may be present in the region. See Section 10 for more information about pesticides and pest control measures.

7.1. Short-Term (Acute) Health Risks:

7.1.1. Spiders: Numerous species of spiders are found in Kuwait. The Black Widow Spider (*Latrodectus lugubris*) is the only known species whose bite presents a threat. Widow spider bites are mostly minor and even significant envenomation is unlikely to be lethal. Bite is usually felt as a "sting", with delayed (10+min) local pain, and sweating. More severe envenomation may produce regional pain, tender draining lymph nodes, nausea, hypertension, and malaise. Health risk is generally **low** due to mitigation efforts and education on avoidance. If bitten by a spider, immediate medical evaluation is required. Other spiders present include the Tarantula and the Yellow Sac Spider, whose bites cause swelling and can kill tissue around the wound.

7.1.2. Scorpions: Numerous species of scorpion are found in Kuwait. The majority of scorpions found in the region have stings that cause only short lived local effects, such as pain, without systemic effects. Serious envenomation may result in numbness, frothing at mouth, difficulty breathing, and convulsions. Various factors influence the severity of the envenomation to include health and age of patient, sting site, and size and age of scorpion. Most scorpion venom is neurotoxic with a mixture of other substances. If the patient is allergic to bee and wasp stings, extreme caution and care must be taken to prevent excessive morbidity and even possibly death.

The following three aggressive scorpions are listed as present in Kuwait and have known detrimental health effects, resulting in death from breathing or heart failure:

- *Androctonus amoreuxi* (Fat-tailed scorpion).
- *Androctonus crassicauda* (Arabian fat-tailed scorpion)
- *Leiurus quinquestriatus* (Death Stalker)

Overall risk of exposure to scorpions is **low** due to mitigation efforts and education on avoidance. If stung by a venomous scorpion, the health risk is **high** and immediate medical care and possibly antivenin is required.

7.1.3. Snakes: Numerous species of snakes are found in Kuwait. A number of poisonous snakes, whose range incorporates Kuwait, could have been encountered to include cobras, pit vipers, and vipers. The following list is not an all-inclusive list of snakes in the area, but rather those deemed most significant or potentially encountered.

- *Cerastes cerastes gasperetti* (Desert Horned Viper): Cause the majority of the bites. envenomation causes deep local tissue damage accompanied by stomach pain, sweating, nausea, possible fever in conjunction with gangrene

- *Macrovipera lebetina obtusa* (Leventine Viper): bleeding from punctures due to very long fangs and immediate burning pain. Swelling immediately occurs around bite site and spreads
- *Pseudocerastes persicus fieldi* (Field's Sand Viper): venom characterized as neurotoxic; little pain at bite site general weakness followed by paralysis
- *Pseudocerastes persicus persicus* (Persian Sand Viper): venom characterized as hemorrhagic; immediate and severe pain at bite site
- *Walterinnesia aegyptia* (Desert Black Snake): venom strongly neurotoxic with lesser anticoagulant activity.

Overall, the risk of exposure to snakes is **low** due to mitigation efforts and education on avoidance. If bitten by a venomous snake, the health risk is **high** and immediate medical care and possibly antivenin is required. Most snake bites occur when people are walking in sandals or barefoot in rural areas at night, without a flashlight, or working bare-handed with crops. There have been casualties, but at decreased levels compared to Desert Storm in consideration of strength and length of troop deployment.

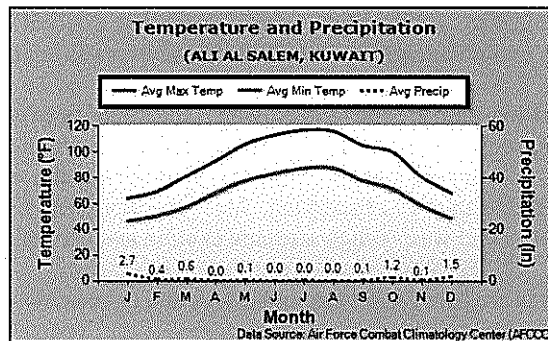
7.2. Long-Term (Chronic) Health Risks: **No long-term health risks are identified based on available data.**

Medical Implications: Long-term health effects resulting from interaction with snakes is **Low** based on efficacy of control measure as evidenced by lack of disease(s) reported in various medical surveillance data bases e.g., TMDS, MERS, DRSi as per incident reporting from Kuwait.

Confidence in The Risk Assessment: Confidence in risk assessment is **high** based on disease(s) incident reporting from Kuwait.

8. Heat/Cold Stress

8.1. Site-Specific Conditions: Kuwait's climate is subtropical desert climate with two distinct seasons. Summer is May through October, and winter is November through April. During the summer months frequent sand storms are caused by arid shamal winds which blow across the Persian Gulf. Average daily wind speed is 9.4 mph. Winter brings all of Kuwait's annual precipitation (0.2-1 inch), which is sometimes heavy enough to produce minor local flooding.



8.2. Heat

8.2.1. Heat Exposure Guidelines

The risk of heat injury is based on the Wet Bulb Globe Temperature Index as follows:

- Low** (80-84.9 °F)
- Moderate** (85-87.9°F)
- High** (88-89.9°F)
- Extremely High** ($\geq 90^\circ\text{F}$)

8.2.2. Short (acute) and long-term (chronic) health risk:

Approach: No heat casualty or medical event reports involving heat injuries are available in the Defense Occupational and Environmental Health Readiness System or the Military Exposure Surveillance Library for any of the camps covered in this assessment. Accordingly, risk estimates are based strictly on existing climatologic data.

Risk Summary: Low: The highest health risk of heat injury in un-acclimatized personnel from April to October, and Low from November to March. The short term risk of heat injury is low due to the risk being reduced through preventive measures.

Long-term health risks from heat injuries are low but can occur, especially from more serious injuries such as heat stroke. However, the health risk may be greater to certain susceptible persons—those older (i.e., greater than 45 years), in lesser physical shape, or with underlying medical/health conditions.

Medical Implications: Severity of heat injury can range from mild clinical signs such as clamminess, nausea, disorientation or headache to life threatening symptoms requiring hospitalization. Long-term medical implications from heat injuries are rare but can occur, especially from more serious injuries such as heat stroke. Individuals with a history of heat injury, even when medical attention is not sought, are at increased risk for future heat injury; repeat heat injury may have increased severity.

Confidence in The Risk Assessment: Because the occurrence of heat stress/injury is strongly dependent on operational factors (work intensity and clothing), confidence in the health risk estimate is low (TG230, Table 3-6). Many operations, especially near the flight line, did not have adequate shade or mitigation measures. Individuals who experienced mild symptoms of heat injury may not have sought medical attention; this may lead to an underestimation of the risk.

8.3. Cold

Even on warm days there can be a significant drop in temperature after sunset by as much as 40 °F. There is a risk of cold stress/injury when temperatures fall below 60 °F, which can occur from November to March. The health risk assessment for non-freezing cold injuries (chilblain, trench foot, and hypothermia) is Low based on historical temperature and precipitation data. Frostbite is unlikely to occur because temperatures rarely drop below freezing. However, personnel may encounter significantly lower temperatures during field operations at higher altitudes. As with heat stress/injuries, cold stress/injuries are largely dependent on operational and individual factors instead of environmental factors alone.

8.3.1. Short (Acute) and Long-Term (Chronic) Health Risks:

Approach: No cold injury data is available in the Defense Occupational and Environmental Health Readiness System or the Military Exposure Surveillance Library for any of the camps covered in this assessment. Accordingly, risk estimates are based strictly on existing climatologic data.

Risk Summary: Low: The risk for cold stress/injuries is largely dependent on clothing/equipment worn, operational work intensity and individual factors rather than environmental factors alone. The acute and chronic risk for non-freezing cold injuries, such as chilblain, trench foot, and hypothermia is low.

Medical Implications: The cooling of body parts may result in various cold injuries - nonfreezing injuries, freezing injuries and hypothermia which is the most serious.

Toes, fingers, ears and nose are at greatest risk because these areas do not have major muscles to produce heat. In addition, the body will preserve heat by favoring the internal organs and thus reducing the flow of blood to the extremities under cold conditions. The most severe cold injury is hypothermia which occurs from excessive loss of body heat and the consequent lowering of the body's core temperature.

Confidence in The Risk Assessment: Individuals who experienced mild symptoms of cold injury may not have sought medical attention; this may lead to an underestimation of the risk. Based on available information on climatic conditions and the absence of reported cold injuries, confidence in risk assessment is **medium** for short-term and long-term risks (TG230, Table 3-6).

9. Noise

9.1. Continuous

9.1.1. Exposure Guidelines:

The Services have established occupational exposure limits (OEL) for continuous or intermittent noise at 85 decibels on the A-weighted scale (dBA), 84 dBA for the Navy, as an eight-hour time-weighted average (TWA). The A-weighted scale of noise measurement is used because it mimics the human ear's response to sound. All Services require that individuals routinely exposed to noise levels greater than the OEL be enrolled in the hearing conservation program. Generally, routinely exposed is defined as when the 8-hour TWA exceeds 85 dBA on average more than 2 days in any month.

9.1.2. Site Specific Conditions:

Sources of potential noise include flight line operations, associated with both fixed and rotary wing aircraft, tactical generators and various hand tools in maintenance shops. Due to the inherent noise hazard in flight line operations, personnel are required to wear dual hearing protection. Occupational and Environmental Health Assessments at AASAB/Cargo City indicate the potential for hazardous when working on or near the flight line and/or industrial shops. Appropriate hearing protection is provided for all individuals in shops which generate or are exposed to hazardous noise. Site-specific workplace surveillance data is available in DOEHS and/or MESL.

Sound level measurements at Ali Al Salem Air Base and Cargo City were taken during IH surveys. Sound level measurements were taken for various potential noise generating activities, including hand tools, compressors and fans; some levels exceeded the OEL and were measured at up to 119 dBA (concrete saw). 26 12-hr samples were taken around AASAB's CV lodging in May 2015; 13 during the day and 13 during the night. This was done to determine the noise exposures around the transient lodging facilities. Personnel in this area may be asleep at all hours of the day due to differing shifts or while awaiting forward deployment. The average daily exposure is 72.8 dBA, and at night is 62.7 dBA – well above the AFOSH STD 48-20 recommended sleeping level of 45 dBA.

A noise dosimetry project for Cargo City was completed in May 2015. Dosimeters were placed along the length of the U.S.-side of the base adjacent to the nearest taxiway. 6 12-hr samples resulted in an average daytime exposure of 53.8 decibels. It is unlikely that a similar study at the new Cargo City location would yield in a statistically relevant difference in result and is not recommended at this time.

9.1.3. Short (Acute) And Long-Term (Chronic) Health Risk:

Approach: Knowledge of the Service hearing conservation programs and typical sound pressure level measurements associated with the various potential noise generating sources were used to complete the health risk assessment.

Risk Summary: Low: Few exposed individuals are expected to have experienced noticeable short-term health effects such as annoyance, speech interference, fatigue and temporary hearing threshold shifts during deployment. The short and long-term risk of noise induced hearing loss with appropriate hearing protection use is **low**.

Confidence in The Risk Assessment: Confidence in the health risk assessment is **low to moderate**. Hearing protection is readily available and generally worn by individuals with known occupational exposures across the Services. However, the limited availability of information about specific noise sources and enforcement of the use of personal protective equipment diminishes confidence (TG 230, Table 3-6).

9.2. Impulse

While some potential for impulse noise may be from shop equipment such as jackhammers in Heavy Equipment, most of the impulse exposure is from weapons qualification training at the Udairi Range. The Udairi Range is located north of AASAB near Camp Buehring and consists of 20-30 individual outdoor ranges.

Security Forces personnel train on this range approximately five times per month on weapons including the M-4, M-9, M-240B, M-243, M-249, and MK-19. Disposable earplugs are available for use.

9.2.1. Short-Term (Acute) and Long-Term (Chronic) Health Risks:

Risk Summary: Low: Short-term and long-term risk of noise injury with appropriate hearing protection use is **Low**.

Confidence in the Risk Assessment: Confidence in the health risk assessment is **moderate**. Hearing protection is readily available and generally worn by individuals with known occupational exposures across the Services. However, the limited availability of information about specific noise sources and enforcement of the use of personal protective equipment diminishes confidence (TG 230, Table 3-6).

10. Unique Concerns

10.1. Potential Environmental Contamination Sources

In addition to environmental exposures already discussed, there may be specific occupational exposure pathways associated with aircraft, vehicle and site maintenance. DoD personnel are exposed to various chemical, physical, ergonomic, and biological hazards in the course of performing their mission. These types of hazards depend on the mission of the unit and the operations and tasks which the personnel are required to perform to complete their mission. The health risk associated with these hazards depends on a number of elements including what materials are used, how long the exposures last, what is done to the material, the environment where the task or operation is performed, and what controls are used. These process and hazards are identified and evaluated in DOEHS for the corresponding work centers. Exposures to these occupational hazards can occur through inhalation (air), skin contact, absorption, or ingestion; however exposures through air are generally associated with the highest health risk.

10.2. Waste Sites/Waste Disposal

Approach: Knowledge of the U.S. Central Command and Service specific policies and procedures served as the basis of this risk assessment.

10.2.1. Site Specific Sources Identified:

Four sources of waste exist at both Ali Al Salem and Cargo City: medical, non-hazardous solid waste, hazardous industrial waste, and sanitary sewer/latrine waste. Base personnel have minimal contact with this waste and risk to any exposure is low. Hazardous medical waste (red-bagged) generated by the medical group at AASAB is staged in an outdoor locked connex that is controlled by medical staff. The medical waste is delivered by medical technicians every-other week to camp Arifjan for incineration. Medical waste from Cargo City's TMEP (morgue) is also taken by its staff to Camp Arifjan.

Non-hazardous solid waste generated by base residents at AASAB and Cargo City is disposed of in various trash bins throughout the base. The garbage collection and disposal is conducted by host nation contractors. All solid waste is disposed of at the Al-Jahra landfill, approximately 6 km east of AASAB. A site inspection performed in Mar 2015 determined there are no chemical disposal sites capable of affecting AASAB or CCAB. Upon opening Cargo City in May 2019, there is no known history of chemical disposal sites. Non-hazardous waste continued to be disposed of in the same manner as AAMAB. Further information can be gathered from 386 ECES/Environmental.

Currently, proper handling, storage, and disposal of industrial waste generated on base are coordinated at the unit level. Waste is turned in to the central short term storage hazardous material/waste satellite storage site which is managed by the base environmental coordinator (contract personnel). Industrial waste is generally disposed of through Camp Buehring. The waste is removed by host nation contract personnel. In Oct 2015, a construction project unearthed one 40-gallon, and two 80-gallon drums containing unknown substances on Quebec Loop, by HAZ 7. The 40-gallon drum contained a reddish-brown liquid, identified as a petroleum based industrial product. The two 80-gallon drums contained silica gel. No health risks are expected to personnel in that area.

The sanitary sewer is a plumbed system from all buildings on AASAB and Cargo City. At both bases, the sewage drains to a low-point holding tank. This tank is pumped out at least daily by contract personnel and, at AASAB, is transported to the base sewage lagoon, commonly referred to as "The Green Mile" (AASAB). No U.S. personnel come into contact with the sewage or the lagoon. Cargo City waste and chemical latrines are pumped out by trucks and waste is disposed off-base by contract personnel. No specific health risks associated with these waste management operations have been identified.

10.2.2. Short-Term (Acute) and Long-Term (Chronic) Health Risks:

Risk Summary: Low: Short and long-term risk is low based on available data.

Medical Implications: None Identified

Confidence in the risk assessment: Confidence in the risk assessment is **medium**.

10.3. Fuel/petroleum products/industrial chemical spills:

Numerous small POL spills occur throughout the installation from aviation fuel, diesel fuel, and hydraulic fluid. No direct exposure to skin has occurred. Direct reading instruments had petroleum hydrocarbon readings below 20 ppm. This primarily impacts the Fuels Management Flight (386 ELRS/LGRF) personnel who may be impacted in the performance of their duties and Fire & Emergency Services (386 ECES/CEF) personnel who may be impacted while responding to contain spills and mitigate soil contamination.

Between 2008 and 2022 there have been numerous fuel spills each rotation involving either JP-8 or diesel fuel, ranging in size from 30-1,000 gallons. Though mostly contained/adsorbed on the asphalt, some leached into the soil around India Ramp and transmission lines, requiring remediation. BE measured a 50 gallon spill to result in inhalation exposures of 5.4 ppm during a two hour clean-up procedure, well below the recommended exposure level of 100 ppm.

10.3.1. Short-Term (Acute) and Long-Term (Chronic) Health Risks:

Risk Summary: Short-term risk is low based on available data.

Medical Implications: None.

Confidence in the risk assessment: Confidence in the risk assessment is **high**. Spills are generally in relatively low volumes. Procedures for storage, handling, use and disposal of hazardous materials are in place throughout the theater of operations to minimize health risk.

10.4. Pesticides/Pest Control:

Military vector control personnel mitigated pests and vectors in accordance with mandated integrated pest management practices. The overwhelming majority of these efforts at AASAB are in the reduction of filth flies, rodents, and feral animals. Non-chemical measures such as exclusion measures and sanitation are the first and primary efforts. Secondary measures included the use of targeted bait applications for flies and rodents, and various animal trapping methods. Tertiary measures included the application of pesticides which contained active ingredients that degraded rapidly in the Kuwait environment. On-site or regional oversight is provided as available to ensure compliance with Theater, Navy, and DoD practices and regulations.

Much of the pest control at this site consists of trapping and small area treatment for ants, spiders, rodents, and beetles with baits, glue boxes, and pyrethroids. Larvicides (i.e., Agnique and/or Altosid Briquettes) are used for mosquito larval control. Some limited area residual pest control is performed to control mosquitoes. Personnel may have been incidentally exposed to very low levels of pesticide during pest control operations. Occasionally pest management will use PT565 aerosol for treatment of ants and fog with Scourge Insecticide at 50% concentration for mosquitoes (Piperonyl Butoxide). As of Apr 2015, Pest Management personnel conducted all fogging operations with hand-foggers. The majority of fogging operations occur near the Green Mile where no personnel reside. Camp Canada, hosts approximately 300 Canadian Army personnel, which are stationed downwind of the Green Mile.

10.4.1. Short and Long-Term (Chronic) Health Risk

Approach: The Integrated Pest Management Plan for AASAB is reviewed for compliance with DoDI 4150.07 requirements. In addition, U.S. military entomologists who served at AASAB are consulted about their knowledge of pest management activities at these camps.

Risk Summary: Low: Short Term medical effects are not expected at concentrations and quantities used, but Piperonyl Butoxide may cause ocular and dermal irritation, vomiting, diarrhea, and minor central nervous system depression at levels of 1.2 – 13 mg/m³. No long-term health risk is identified based on available data.

Confidence in The Risk Assessment: Confidence in the risk assessment is **medium**. The integrated pest management plan emphasizes non-chemical control over the use of chemical pesticides. The potential for camp residents to come in contact with improperly formulated insecticides is remote.

10.5. Asbestos and Lead-Based Paint

10.5.1. Site-Specific Conditions:

All structures occupied by U.S. personnel during the period were erected as new or borrowed from the Host Nation. There is no exposure to potential sources of asbestos containing material (ACM) or peeling paint that could contain lead.

10.5.2. Short-Term (Acute) Health Risk:

Risk Summary: Negligible: Short-term risk is **negligible** based on available data.

Medical Implications: None Identified

Confidence in the Risk Assessment: Confidence in assessment is **high** based on available data.

10.5.3. Long-term (chronic) health risk:

Risk Summary: Negligible: Long-term risk is **negligible** based on available data.

Medical Implications: None Identified

Confidence in the Risk Assessment: Confidence in assessment is **high** based on available data.

10.6. Burn Pits

While not specific to Ali Al Salem or Cargo City, the consolidated epidemiological and environmental sampling and studies on burn pits that have been conducted as of the date of this publication have been unable to determine whether an association does or does not exist between exposures to emissions from the burn pits and long-term health effects (Reference 7).

The committee's review of the literature and the data suggests that service in Iraq or Afghanistan (i.e., a broader consideration of air pollution than exposure only to burn pit emissions) may be associated with long-term health effects, particularly in susceptible (e.g., those who have asthma) or highly exposed subpopulations, such as those who worked at the burn pit.

Such health effects would be due mainly to high ambient concentrations of PM from both natural and anthropogenic sources, including military sources. If that broader exposure to air pollution turns out to be relevant, potentially related health effects of concern are respiratory and cardiovascular effects and cancer. Susceptibility to the PM health effects could be exacerbated by other exposures, such as stress, smoking, local climatic conditions, and co-exposures to other chemicals that affect the same biologic or chemical processes.

Individually, the chemicals measured at burn pit sites in the study are below concentrations of health concern for general populations in the United States. However, the possibility of exposure to mixtures of the chemicals raises the potential for health outcomes associated with cumulative exposure to combinations of the constituents of burn pit emissions and emissions from other sources.

10.6.1. Site-Specific Conditions:

There are currently no burn pits in operation on Ali Al Salem or Cargo City Bases.

10.6.2. Short-Term (Acute) Health Risk:

Risk Summary: Low: Short-term risk is **low** based on available data.

Medical Implications: None Identified

Confidence in The Risk Assessment: Confidence in assessment is **high** based on available data.

10.6.3. Long-Term (Chronic) Health Risk:

Risk Summary: Low: Short-term risk is **low** based on available data.

Medical Implications: None Identified

Confidence in the Risk Assessment: Confidence in assessment is **high** based on available data.

11. References

POEMS developed according to:

1. DoDI 6490.03, Deployment Health, 2006.
2. JCSM (MCM) 0028-07, Procedures for Deployment Health Surveillance, 2007.
3. DoDI 6055.05, Occupational and Environmental Health, 2008.
4. Klaassen, C.D. Casarett & Doull's Toxicology: the Basic Science of Exposures, Chapter 2, Principles of Toxicology; Fifth Edition, McGraw Hill, New York.

Site description and baseline information obtained from:

5. Occupational and Environmental Health Site Assessment for Ali Al Salem Air Base, Survey ID: 228175, September 20, 2014 and Survey ID: 244633, January 17, 2015

Sampling data was obtained from:

6. Defense Occupational and Environmental Health Readiness System (referred to as the DOEHRS-EH database) at <https://doehrs-ih.csd.disa.mil/Doehrs/>. Some of the data may be classified or otherwise have some restricted distribution. See discussion below.
7. Military Exposure Surveillance Library: <https://mesl.apgea.army.mil/mesl/>. Some of the data and reports used may be classified or otherwise have some restricted distribution.

Additional environmental health reports/survey documents are from:

8. Integrated Pest Management Plan – AASAB – Sep 2014 – Aug 2019 Restricted link only from Armed Forces Pest Management Board, <http://www.afpmb.org/>
9. Kuwait – Camp Bastion Profile – GlobalSecurity.Org <http://www.globalsecurity.org/military/facility/ali-al-salem.htm>

Chemical hazards (air, water, soil) evaluated based on military exposure guidelines (MEGs) and risk assessment methodology in:

10. USACHPPM June 2010 Revision, Technical Guide (TG230), "Environmental Health Risk Assessment and Chemical Exposure Guidelines for Deployed Military Personnel". For further information, contact USAPHC Environmental Health Risk Assessment Program at: commercial 410-436-2953 or DSN 584-2953.
11. Department of the Army Technical Bulletin Medical (TB MED) 577, Sanitary Control and Surveillance of Field Water Supplies, TB Med 577, NAVMED P-5010-10, AFMAN 48-138, 1 May 2010.
12. USACHPPM, Particulate Matter Factsheet No. 64-009-0708, 2008.

Regional/country information on endemic/infectious disease and heat/cold from the:

13. Centers for Disease Control and Prevention (CDC) Travelers' Health website (<http://wwwnc.cdc.gov/travel/destinations/traveler/none/kuwait>), "Destinations" section, Kuwait.
14. U.S. AFCENT Pre-Deployment Medical Screening Procedures, 30 Jun 2014
15. Defense Intelligence Agency Infectious Disease Risk Assessment Database, CENTCOM: Kuwait (https://www.ncmi.detrick.army.mil/product/idra_db.php?co=KWT)

The DOEHRS-EH database was queried to obtain the available sample data for air, soil, and drinking and nondrinking water sources at Ali Al Salem Air Base, Cargo City, and associated site (Camp Morell/Camp Virginia), Kuwait. The data are currently assessed using the TG 230 June 2010 Revision as described above contains, the general method involves an initial check of the data which eliminates all chemical substances not detected above 1-year negligible MEG. Those substances screened out are not considered acute or chronic health hazards so are not assessed further. For remaining substances, acute and chronic health effects are evaluated separately for air and water (soil is only evaluated for long-term health risk). This is performed by deriving separate short-term and long-term population exposure level estimates (referred to as population exposure point concentrations (PEPC) that are compared to MEGs derived for similar exposure durations. If less than or equal to negligible MEG, the risk is Low. If levels are higher than negligible, then there is a chemical-specific toxicity and exposure evaluation by appropriate subject matter experts, which includes comparison to any available marginal, critical, or catastrophic MEGs. For drinking water, 15 liters/day (L/day) MEGs are used for the screening while site specific 5–15 L/day are used for more detailed assessment.

For nondrinking water (such as that used for personal hygiene or cooking) the 'consumption rate' is limited to 2L/day (similar to the U.S. Environmental Protection Agency (USEPA)), which is derived by multiplying the 5-L/day MEG by a factor of 2.5. This value is used to conservatively assess nondrinking uses of water.

12 Where Do I Get More Information?

If a provider feels that the Service member's or Veteran's current medical condition may be attributed to specific OEH exposures at this deployment location, he/she can contact the Service-specific organization below. Organizations external to DoD should contact Deputy Assistant Secretary of Defense for Health Readiness Policy and Oversight (HRP&O).
Army Public Health Center Phone: (800) 222-9698. http://phc.amedd.army.mil/
Navy and Marine Corps Public Health Center (NMCPHC) (formerly NEHC) Phone: (757) 953-0700. http://www.med.navy.mil/sites/nmcphc/Pages/Home.aspx
U.S. Air Force School of Aerospace Medicine (USAFSAM) (formerly AFIOH) Phone: (888) 232-3764. http://www.wpafb.af.mil/afri/711hpw/usafsam.asp
DoD Health Readiness Policy and Oversight (HRP&O) Phone: (800) 497-6261. http://fhpr.dhhq.health.mil/home.aspx