

Military Deployment
Periodic Occupational and Environmental Monitoring Summary (POEMS):
Ali Al Salem Air Base (AASAB) and Abdullah Al-Mubarak Air Base (AAMAB), Kuwait
Calendar Years: (2004 to 2015)

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, AAMAB 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 2004 through December 2015 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, AAMAB 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 2004 through December 2015.

The POEMS can be useful to inform healthcare providers and others of environmental conditions experienced by individuals deployed to AASAB, AAMAB, 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, AAMAB, 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 1. Table 2 provides population based risk estimates for identified OEH conditions at AASAB, AAMAB, and/or camps in the vicinity. As indicated in the detailed sections that follow Table 2, controls established to reduce health risk were 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, AAMAB and local vicinity that includes Camp Morell and Camp Virginia:

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-fleaborn, west Nile fever, sindbis, leptospirosis, Tuberculosis (TB), meningococcal meningitis, rabies, Q fever, H5N1 fever);

Vector-Borne Endemic Diseases:(cutaneous leishmaniasis, sandfly fever, typhus-fleaborn, west Nile fever, sindbis) These diseases may constitute a significant risk due to exposure to biting vectors; risk 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.

Water Contact Diseases: (leptospirosis) Activities involving extensive contact with surface water increase risk.

Respiratory Diseases: (tuberculosis, meningococcal meningitis) Personnel in close-quarter conditions could have been at risk for person-to-person spread.

Animal Contact Diseases: (rabies, Q fever, H5N1 fever) Pose year-round risk. For venomous animals (vipers, scorpions) and insects, effects of venom vary with species from mild localized swelling to potential lethal effects; risks 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, unacclimatized, 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, AAMAB and local vicinity that includes Camp Morell and Camp Virginia:

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 was 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 (PM), 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, AAMAB, 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 (PM₁₀) (see paragraph 2.3)	Short-term: Low-High (as per risk assessment of the data) Daily levels vary, acute health effects (e.g., upper respiratory tract irritation) more pronounced during environmental disturbances. More serious effects are possible in susceptible persons (e.g., those with asthma/existing respiratory diseases).	Typical or known control measures within CCMD such as following: Most personnel live and work in air conditioned buildings or tents. For those not working in air condition spaces, minimize time outdoors, and keep doors or tent flaps closed.	Short-term: Low-High for particulate matter (PM), control measures have limited efficacy. Thus the residual risk may be similar or identical to unmitigated risk.
	Long-term: Health guidelines not defined	Use of water and gravel for dust control on unpaved roads and work areas. Personnel are issued neck cravats and dust goggles prior to deployment.	Long-term: Health guidelines not defined
Particulate matter less than 2.5 microns in diameter (PM_{2.5}) (see paragraph 2.4)	Short-term: From <i>May 2005-Jan-2015</i> , the health risk associated with typical PM _{2.5} exposures was Low-High . The majority of the time no acute health effects such as eye, nose, or throat irritation from exposure was anticipated to have occurred. Mild acute (short-term) health effects were possible for those individuals who spent much of their time outdoors. Existing medical conditions (e.g., asthma or respiratory diseases) may be exacerbated.	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-High For particulate matter (PM), control measures have limited efficacy. Thus the residual risk may be similar or identical to unmitigated risk.
	Long-term: From <i>May 2005 – Jan 2015</i> , the		Long-term: Moderate

Table 2: Population-Based Health Risk Estimates – AASAB, AAMAB, 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
	<p>health risk associated with typical PM_{2.5} exposures was Moderate</p> <p>During periods of low risk, no anticipated chronic health effects from PM_{2.5} were anticipated to have occurred. And/or (to be included as per Risk Assessment worked out) At the moderate risk level, 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 (COPD), asthma, and other cardiopulmonary diseases. Those with a history of asthma or pre-existing cardiopulmonary disease have a higher risk for developing these chronic conditions.</p>		<p>For particulate matter (PM), control measures have limited efficacy. Thus the residual risk may be similar or identical to unmitigated risk.</p>
<p>Airborne Metals (see paragraph 2.5)</p>	<p>Short-Term: Low From May 2004 through Jan 2015, metals analysis was performed on 178 ambient air particulate matter samples (including PM10 and PM2.5) collected at AASAB. No metals were detected above their corresponding military exposure guidelines published in the USAPHC TG 230. The results would be the same at AAMAB.</p> <p>Long-term: Low</p>		<p>For metals associated with ambient dust, control measures have limited efficacy. Thus the residual risk may be similar or identical to unmitigated risk.</p> <p>Short-Term: Low</p> <p>Long-term: Low</p>
<p>Volatile Organic Compounds (VOC) (see paragraph 2.6)</p>	<p>Short-term: Low From May 2004 through Jan 2015, 18 air samples were collected at AASAB/AAMAB 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.</p> <p>Long-term: Low No parameters exceeded 1-year Negligible MEGs.</p>	<p>Fuel spills cleaned up quickly if they occur and do not represent exposures to an entire base population.</p>	<p>Short-term: Low.</p> <p>Long-term: Low</p>
<p>Soil</p>			
<p>Soil (see paragraph 3)</p>	<p>Short-Term: None evaluated: Soil sampling data was not evaluated for short Term (acute) Health Risks.</p> <p>Long-term: Low From the May</p>	<p>The Kuwait oil fires of 1991 were not known to have significantly contaminated the soil at these locations.</p>	<p>Short-Term: None evaluated Soil sampling data was not evaluated for short Term (acute) Health Risks.</p>

Table 2: Population-Based Health Risk Estimates – AASAB, AAMAB, 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
	2004 through May 2006, total of 14 surface soil samples were collected. None of the VOCs, SVOCs, polycyclic aromatic compounds (PAH), heavy metals, PCB, fungicides, herbicides, insecticides, or radionuclides detected were at concentrations above their corresponding MEG values.		Long-term: Low
Water			
Consumed Water (Water Used for Drinking) (see paragraph 4.2)	Short-term: Low U.S. Army Veterinarian Service approved bottled water and packaged water from the Expeditionary Water Packaging System was provided for drinking. No analyte was detected above the 14 day 15L/day negligible drinking water military exposure guidelines.	U.S. Army Veterinary Service approved bottled water and Preventive Medicine/ Army Veterinary approved packaged water were supplied and consumed except for a brief period during the onset of the war. Active and ongoing drinking water surveillance program.	Short-term: Low
	Long-term: Low U.S. Army Veterinarian Service approved bottled water and packaged water from the Expeditionary Water Packaging System were provided for drinking. No analyte was detected above the 14 day 15L/day negligible drinking water military exposure guidelines.		Long-term: Low
Water used for other purposes (non-drinking) (see paragraph 4.3)	Short-term: Low	Water surveillance programs routinely monitor for disinfectant residual and bacteriological/chemical contamination	Short-term: Low
	Long-term: None identified		Long-term: None
Military Unique			
Chemical Biological, Radiological Nuclear (CBRN) Weapons (see paragraph 5.1)	Short-term: None identified no/insufficient data exist upon <i>which to base a health risk assessment.</i>	There were no specific hazard sources or exposure incidents documented in the Defense Occupational and Environmental Health Readiness System (DOEHRs) or the Military Exposure Surveillance Library (MESL) during the period January 2004 to July 2015 time frame.	Short-term: None identified no/insufficient data exist upon <i>which to base a health risk assessment.</i>)
	Long-term: None identified no/insufficient data exist upon which to base a health risk assessment.		Long-term: None identified no/insufficient data exist upon which to base a health risk assessment.
Depleted Uranium (DU) (see paragraph 5.2)	Short-term: Non-existent AASAB/AAMAB do not have any DU sources aside from counterweights, which are not maintained on-site.	There were no specific hazard sources or exposure incidents documented in DOEHRs or the MESL during the period from January 2004 to July 2015 time frame.	Short-term: None
	Long-term: Non-existent		Long-term: None

Table 2: Population-Based Health Risk Estimates – AASAB, AAMAB, 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
	AASAB/AAMAB do not have any DU sources aside from counterweights, which are not maintained on-site.		
Ionizing Radiation (see paragraph 5.3)	Short-term: Low	No specific hazard sources were documented in DOEHRS or the MESL from the January 2004 to July 2015 time frame.	Short-term: Low
	Long-term: Low		Long-term: Low
Non-ionizing Radiation (see paragraph 5.4)	Short-term: Low based on Naval Surface Warfare Center Hazards of Electromagnetic Radiation to Personnel (HERP) study performed 25 through 27 January 2008 which determined PELs were not exceeded at normally occupied areas.	No specific hazard sources were documented in DOEHRS or the MESL from January 2004 to January 2016 time frame.	Short-term: Low
	Long-term: Low based on Naval Surface Warfare Center Hazards of Electromagnetic Radiation to Personnel (HERP) study performed 25 through 27 January 2008 which determined PELs were not exceeded at normally occupied areas.		Long-term: Low
Endemic Disease	Infectious Disease Risk Assessment Database - Kuwait CDC Health Information - Kuwait		
Gastrointestinal (same as Food borne/Waterborne (e.g., diarrhea-bacteriological) (see paragraph 6.2)	Short-term: High If ingesting <u>unapproved</u> local food/water, the health effects can temporarily incapacitate personnel (diarrhea) or result in prolonged illness (hepatitis A, typhoid fever, brucellosis, hepatitis E). Viral gastroenteritis can present due to a high rate of personnel turnover and shared dining, berthing, bathroom facilities, and working spaces.	Standard Preventive Medicine measures: immunizations (hepatitis A and typhoid fever), the consumption of food and water from approved sources, and habitability inspections to ensure cleanliness/sanitation.	Based on the Infectious Disease Risk Assessment Database for Kuwait and clinical visits. For the 2015, the clinic averaged 6 GI patients/week. Short-term: High Based on disease incident reporting from Kuwait, bacterial gastrointestinal diseases are high risk, protozoal, hepatitis A and typhoid are moderate risk, and cholera, brucellosis, and hepatitis E infections present a low risk.
	Long-term: Low . The majority of gastrointestinal diseases do not cause prolonged illness.		Long-term: Low based on disease incident reporting from Kuwait.
Arthropod Vector Borne (see paragraph 6.3)	Short-term: Moderate for Leishmaniasis (cutaneous). Competent vectors and reservoirs for disease are present. Risk is Low for sandfly fever, West Nile fever, Crimean-Congo hemorrhagic fever, rickettsioses (tick-borne spotted fever group and murine typhus) and Sindbis.	Standard Preventive Medicine measures: proper wearing of insecticide-treated uniforms and the application of insect repellent to the skin, removal of vector harborages within camps, and the application of pesticides.	Based on the Infectious Disease Risk Assessment Database for Kuwait. Short-term: Moderate for cutaneous leishmaniasis and low for all other vector-borne diseases based on disease incident reporting from Kuwait.

Table 2: Population-Based Health Risk Estimates – AASAB, AAMAB, 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
	Long-term: Low It is possible to be infected during deployment with leishmaniasis, but not to have clinically evident disease until redeployed.		Long-term: Low based on disease incident reporting from Kuwait.
Water-Contact (e.g. wading, swimming) (see paragraph 6.4)	Short-term: Low The occurrence of flooding after heavy rainfall can facilitate the spread of leptospirosis already present in the soil	Avoidance of fresh water sources, such as puddles/standing water, drainage areas, etc. Treatment (primarily chlorination) process for non-drinking water (water used for bathing, cooking, etc.).	Based on the Infectious Disease Risk Assessment Database for Kuwait.
	Long-term: Low based on disease incident reporting from Kuwait.		Short-term: Low based on disease incident reporting from Kuwait. Long-term: Low based on disease incident reporting from Kuwait.
Respiratory (see paragraph 6.5)	Short-term: Risk is Moderate for tuberculosis and Low for meningococcal meningitis. The high rate of personnel turnover, shared dining, berthing, recreational facilities, and working spaces may allow for the easy transmission of upper respiratory infections, including influenza. Since 2012, Middle Eastern Respiratory Syndrome (MERS) has been present in the Arabian Peninsula, including Kuwait.	Influenza immunizations are given either before or during deployment. Local and third country national workers/contractors are required to complete health screening prior to employment. Potential tuberculosis exposure is addressed in the Post Deployment Health Assessment.	Based on the Infectious Disease Risk Assessment Database for Kuwait and clinical visits. For the first half of 2015, the clinic averaged 8 respiratory patients/week.
	Long-term: Low The majority of respiratory diseases do not cause prolonged illness.		Short-term: Moderate for upper respiratory infections, tuberculosis, and MERS. Low for meningococcal meningitis. Long-term: Low based on disease incident reporting from Kuwait.
Animal Contact (see paragraph 6.6)	Short-term: Moderate for Q fever. The risk from direct or indirect contact is likely to be highest in rural areas where livestock are present. Low risk for Rabies and H5N1 avian influenza.	Standard Preventive Medicine measures, as well as CCMD policy, generally prohibit contact with, adoption, or feeding of feral animals. Immunizations for anthrax and rabies (rabies vaccination and/or immune globulin given if clinically directed).	Based on the Infectious Disease Risk Assessment Database for Kuwait.
	Long-term: Low based on disease incident reporting from Kuwait.		Short-term: Moderate for Q fever and low for Rabies and H5N1 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 for Hantavirus hemorrhagic fever with renal syndrome (HFRS).	Standard Preventive Medicine measures – avoidance of abandoned areas and areas with potential rodent infestation. Hantavirus hemorrhagic fever is assessed as present, but levels are unknown; rare	Based on the Infectious Disease Risk Assessment Database for Kuwait.
	Long-term: Low based on		Short-term: Low for Hantavirus hemorrhagic fever with renal syndrome (HFRS). Long-term: Low based on

Table 2: Population-Based Health Risk Estimates – AASAB, AAMAB, 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
	disease incident reporting from Kuwait.	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.	disease incident reporting from Kuwait.
Venomous Animal/ Insects			
Snakes, scorpions, and spiders (see paragraph 7)	Short-term: High if bitten or stung. If bitten or stung by venomous snakes, scorpions or spiders, should be considered a medical emergency. Effects of venom vary with species from mild localized swelling (e.g. scorpion species e.g. <i>Scorpiops lindbergi</i>) to potentially lethal (e.g. saw-scaled viper or <i>Gloydius halys</i>) based on disease incident reporting from Kuwait. 18 species of scorpions, 3 species of venomous spiders, and 5 species of venomous snakes are found in the area of AASAB/AAMAB.	Standard Preventive Medicine measures, such as the reduction of harborage for these animals, as well as education on how to avoid them (shake out boots before donning, etc.), reduce the risk of exposure.	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.
	Long-term: No long-term health risk identified		Short-term: Low based on disease incident reporting from Kuwait.
Heat/Cold Stress			
Heat (see paragraph 8.2)	Short-term: Moderate risk of heat injury in summer months for un-acclimatized personnel. Summer temperatures in Kuwait are known to exceed 120 deg F.	Adequate periods of acclimatization for newly reporting or returning personnel.	Based on efficacy of control measure and incidence of heat/cold injury(ies) reported in various medical surveillance data bases e.g. TMDS, MERS, DRSi.
	Long-term: Low	Adjustment of work-rest cycles based on monitoring of climatic conditions.	Short-term: Moderate
Cold (see paragraph 8.3)	Short-term: Low risk for cold stress/injuries is largely dependent on clothing/equipment worn, operational work intensity and individual factors rather than environmental factors alone.	Provision of adequate foul weather clothing	Short-term: Low
	Long-term: Low	Appropriate work/rest cycles during cold weather	Long-term: Low
Noise			
Noise (Continuous) (Flightline, Power Production)	Short-term: Low	Use of hearing protection. Labeling noise hazardous areas.	Based on efficacy of control measure typically practiced.

Table 2: Population-Based Health Risk Estimates – AASAB, AAMAB, 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
(see paragraph 9.1)		Leadership enforcement of compliance with available PPE.	Short-Term: Low
	Long-term: Moderate		Long-term: Moderate
Impulse (see paragraph 9.2)	Short-term: Low		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 no/insufficient data exist upon which to base a health risk assessment.		Short-term: No data available no/insufficient data exist upon which to base a risk assessment.
	Long-term: None identified no/insufficient data exist upon which to base a health risk assessment.		Long-term: No data available no/insufficient data exist upon which to base a risk assessment.
Waste Sites/Waste Disposal (see paragraph 10.2)	Short-term: Low A site assessment of the Al-Jahra landfill, located approx. 6 miles downwind of AASAB, conducted Mar 2015 determined no exposure potential existed.	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
Fuel/petroleum products/ industrial chemical spills (see paragraph 10.2)	Short-term: Low Multiple spills of fuel or hydraulic fluid were documented between 2004 and 2015 at AASAB. All spills are minimal and only have the potential to affect those doing immediate clean-up or soil remediation. Average fuel spill air sampling was measured to be 5.4 ppm for a 2 hour clean-up of 50 gallon spills, well below the 100 ppm PEL.	There have been multiple spills during the period from January 2004 through January 2016 time frame.	Short-term: Low
	Long-term: Low		Long-term: Low
Pesticides/Pest Control (see paragraph 10.3)	Short-term: Not evaluated: no/insufficient data exist upon which to base a risk assessment	Mosquito fogging is conducted with a truck fogger using Scourge Insecticide mixed 50/50 with water. Scourge insecticide is 4% Resmethrin and 12% Piperonyl Butoxide	Short-term: No data available: no/insufficient data exist upon which to base a risk assessment.
	Long-term: No data available		Long-term: No data available
Asbestos (see paragraph 10.4)	Short-term: None identified All buildings built post 1980.	Asbestos has not been identified at AASAB or AAMAB.	Short-term: None identified no/insufficient data exist upon which to base a risk assessment.
	Long-term: None identified		Long-term: None identified
Lead Based Paint (see paragraph 10.4)	Short-term: None identified	Lead based paint has not been identified at AASAB or	Short-term: None identified

Table 2: Population-Based Health Risk Estimates – AASAB, AAMAB, 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
		AAMAB.	no/insufficient data exist upon which to base a risk assessment.
	Long-term: None identified		Long-term: None identified
Burn Pits (see paragraph 10.5)	Short-term: None identified	There are no burn pits at AASAB/AAMAB. Trash is removed by contract to the Al-Jahra Landfill, 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, AAMAB, 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 01 January 2004 through 15 January 2016. 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 AAMAB. 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. 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 (commando village), 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 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.

AAMAB is part of the Kuwait International Airport complex, which also 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 flightline. The base is fully staffed and supported 24 hours by the 387 AEG, who reside at AASAB. There are no permanent military residents of AAMAB, and personnel make the 33 mile trip daily to staff their positions. The structures on base are mainly semi-permanent (trailers for emergency services, offices, morgue, and dining facilities), with a few permanent structures (maintenance hangars). Climate, topography, and power conditions are the same as AASAB. Most of the roads on the installation are paved. However, there are some areas that have unpaved roads, and parking lots are covered by 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, generally on the high-end (4 ppm).

Local Climate: The climate at AASAB and AAMAB 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/AAMAB, Kuwait by Source

The following sections provide additional information about the OEH conditions summarized above. All risk assessments were 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 were 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, and

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

- a. AASAB/AAMAB 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) were at greatest risk of developing notable health effects. The average wind conditions are 9.3 mph from the NW.
- b. 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. AAMAB is located 9.6 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 AAMAB unless a large release occurred.
- c. Open air burning is not performed at AASAB/AAMAB, 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 flightline side of the base. The incinerator was inoperable for 2014-2015.
- d. Vehicle and aircraft emissions can be other major contributors to the air pollution, especially at AAMAB where all facilities are located on the flightline. AAMAB also has far greater airline activity, since it is both a commercial and military airstrip. Emissions from military vehicles and aircrafts as well as vehicles in surrounding communities, especially in developing countries, may have significant impacts on air quality.

Environmental surveillance occurred between 2004 and 2015. 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 193 valid PM₁₀ air samples were collected from 2004 to 2014. The range of 24-hour PM₁₀ concentrations was 0.027 mg/m³ – 4.62 mg/m³ with an average concentration of 0.30 mg/m³.

2.3.3 Short-term (acute) health risk for PM₁₀:

Approach:

To assess acute risk associated with PM₁₀, the peak concentrations of PM₁₀ were used to arrive at the acute risk for the period from 2004 to 2015. The peak concentrations ranged 0.03 mg/m³ to 4.62 mg/m³. A risk estimate for the highest peak concentration was calculated. If the highest peak posed a moderate or higher health risk, risk estimates for the next highest concentrations were repeated until the calculated risk dropped to low. Peaks with an estimated risk of moderate or higher are reported as periods of elevated risk.

Risk Summary: Low to High, short term risk is based on comparison of daily concentrations to 24-hr MEGs. The variability in the risk is due to significant fluctuation in the daily concentrations.

Overall 88/100 (88%) of the sampling days had concentrations below the 24-hour negligible MEG (LOW Risk); 10/100 (10%) of the sampling days were between the 24-hour negligible MEG and the 24-hour marginal MEG (LOW Risk); 2/100 (2%) of the sampling days were between the 24-hour marginal and the 24-hour critical MEG (MODERATE Risk); 10/100 (10%) of the sampling days were greater than the critical MEG (HIGH risk).

Medical implications: At the **low** risk level, 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 were higher than those detected, more individuals may have been 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 **medium** based on the number of PM₁₀ air samples taken.

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:

From 2004-2015, 244 ambient air PM_{2.5} samples were collected at AASAB (data can be applied to AAMAB). The range of 24-hour PM_{2.5} concentrations was 0.002 mg/m³ – 0.677 mg/m³ with an average concentration of 0.080 mg/m³.

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 flightline.

2.4.3 Short-term (acute) health risk for PM_{2.5}:

Approach: To assess acute risk associated with PM_{2.5}, the peak concentrations of PM₁₀ were used to arrive at the acute risk for the period from October 2005 to November 2014. The peak concentrations ranged 0.002 mg/m³ to 0.677 mg/m³. A risk estimate for the highest peak concentration was calculated. If the highest peak posed a moderate or higher health risk, risk estimates for the next highest concentrations were repeated until the calculated risk dropped to low. Peaks with an estimated risk of moderate or higher are reported as periods of elevated risk.

Risk Summary: The risk is **low-high**. Short term risk is based on comparison of daily concentrations to 24-hr MEGs. The variability in the risk is due to significant fluctuation in the daily concentrations. The risk assessment is based on sampling data from 2005-2015.

Overall 61/100 (61%) of the sampling days had concentrations below the 24-hour negligible MEG (LOW Risk); 39/100 (39%) of the sampling days were between the 24-hour negligible MEG and the 24-hour marginal MEG (LOW Risk); 0/100 (0%) of the sampling days were between the 24-hour marginal and the 24-hour critical MEG (MODERATE Risk); 0/100 (0%) of the sampling days were greater than the critical MEG (HIGH risk). As a result, risk is LOW for short-term (acute) health risk for PM_{2.5}:

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. 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 pre-existing medical conditions such as asthma.

Confidence in the risk assessment: Confidence in the short-term PM_{2.5} health risk assessment was **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 was 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 2004-2015. The average concentration was 0.08 mg/m³ which was above the marginal long-term MEG.

Risk Summary: Moderate, The long-term PM_{2.5} health risk assessment for AASAB/AAMAB was **moderate** based on PM_{2.5} concentrations and the likelihood of exposure at these hazard severity levels. A moderate health risk assessment suggests that long-term exposure to peak PM_{2.5} concentrations at AASAB/AAMAB were expected to have degraded mission capabilities in terms of the required mission standard and would result in reduced mission capability if hazards occurred during the mission.

Medical implications: At the **low to moderate** risk level, 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 was **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 304 ambient air particulate matter samples (including PM₁₀ and PM_{2.5}) collected at Ali Al Salem (data can be applied to AAMAB). One metal, Cadmium, was detected above its corresponding military exposure guidelines published in the USAPHC TG 230.

Approach:

For screening purposes, both peak and average concentrations of all 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.

2.5.2 Short-term (acute) health risk:

Risk Summary: Low: All contaminants were measured at concentrations below short-term MEGs and are not short-term hazards.

2.5.3 Long-term (chronic) Health risk:

Risk Summary: Low due to 4/47 samples collected in 2011 were above the 1-year negligible MEG for Cadmium.

Confidence in the risk assessment: Confidence in the short-term PM_{2.5} health risk assessment was **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 2015, 18 air samples were collected at Ali Al Salem for VOC analysis (data can be applied to AAMAB). VOCs were detected in some of the samples, but at levels below pertinent MEGs. Risks are determined based on comparison to available MEGs.

Approach: Typically, 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 18 samples collected at AASAB.

3 Soil

3.1 Site-Specific Sources Identified

3.1.2 Sample data:

From 2004 through 2015, 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 were 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 AAMAB due to soil consistency across Kuwait. However, the risk of exposure at AAMAB is far less than AASAB, as all operations occur on paved surfaces (parking lot not paved), and minimal construction projects/PT sessions occur at AAMAB. 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 were at greatest potential for exposure to soil. These individuals comprise a relatively small proportion of the overall camp population.

Approach:

Currently, sampling data for soil are not evaluated for short term (acute) health risks.

For long-term health risk, sample results were compared with each of the 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.

3.1.3 Short-term (acute) health risk for soil:

Risk Summary: Not an identified source of health risk. 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:

Long-Term: **Low** based on data

Risk Summary: None identified based on available sample data. None of the VOCs, SVOCs, polycyclic aromatic compounds (PAH), heavy metals, PCB, fungicides, herbicides, insecticides, or radionuclides detected was 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.

3.1.5 Six soil samples were collected in December 2008 in a new Security Forces training area. These samples are not applicable to the general population. Samples were analyzed for metals/inorganics as well as organics. All contaminants were below the MEGs.

3.1.5.1 Short -Term Health Risk: Currently sampling data for soil is not evaluated in an acute risk assessment.

3.1.5.2 Long-Term Health Risk: All contaminants measured at concentrations below MEGs. Confidence in this assessment is **medium**.

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. Desalinated seawater is the primary source of potable water in Kuwait. The water is filtered and treated to meet Kuwaiti Environmental Public Authority standards. The water distribution system on AASAB/AAMAB is used for personal hygiene, cooking, and dishwashing. The system at AASAB may become contaminated during distribution because of aging or corroded pipes, poor system integrity, pressure fluctuations from power shortages causing back siphoning, and subsequent microbial or chemical infiltration. A complete assessment of the Kuwait water distribution system is not possible due to the access and travel restrictions. AAMAB water is delivered via truck by contractor and hand-chlorinated.

4.1 Site-Specific Sources Identified

Historically, commercial bottled water was provided for drinking at AASAB/AAMAB in Kuwait. Three vendors were identified as having provided bottled water at some point during AASAB/AAMAB military operations in Kuwait: Aqua Gulf, Arwa and Al-Rawdftain Water.

Disinfected water from the onsite cistern (from desalinization plant) was also supplied for non-drinking purposes at AASAB. The disinfected water was used only for personal hygiene such as hand washing, showering, laundry, brushing teeth and cleaning.

4.2 Consumed Water (Water for drinking or cooking consumption)

The distributors and all brands of bottled water utilized on AASAB/AAMAB are approved by the USAPHC. Bottled water is produced by filtering municipal water, which has been desalinated. The current water provider, Aqua Gulf, filters municipal water through a carbon filter, a sand filter, a 5µm pore filter, reverse osmosis, UV treatment, and fluoride/mineral addition. Each shipment of bottled water purchased for AASAB/AAMAB is tested by Bioenvironmental Engineering upon receipt IAW AFI 48-138. The monitoring includes total coliform presence/absence and E. coli for four bottles per lot. In addition, one random bottle of water is tested monthly for evidence of chemical agent contamination using the M-272 kit.

4.2.1 Sample data/notes:

One sample was collected in July 2007. All analytes were not detected at levels above the short or long term MEGs. Routine monitoring results are within acceptable limits. Records of these measurements are available in DOEHRS.

4.2.2 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 were expected to remain at this site for approximately 1 year.

Based on these assumptions, the maximum detected concentration for each analyte was compared to its respective 14-day, Negligible MEG for consumption of up to 15 liters of water per day (15L/day) and/or the short-term Field water standards published in TB MED 577, Sanitary Control and Surveillance of Field Water Supplies.

Risk Summary: None identified based on available sample data.

Medical implications: None

Confidence in the risk assessment: Confidence in the risk assessment is **high** because U.S. Army veterinary personnel performed quarterly audits of all bottled water suppliers to ensure consistency of quality throughout of the combat operation. Additionally, Air Force Bioenvironmental Engineering personnel perform bottled water sampling on every lot delivered to AASAB/AAMAB.

4.2.3 Long-term (chronic) health risk:

Approach: Bottled water was supplied to the camps in Kuwait 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 was 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: No health risk identified based on available sampling data. Analytical results of the routine bottled water samples collected at AASAB 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 veterinary personnel performed quarterly audits of all bottled water suppliers to ensure consistency of quality throughout of the combat operation. Additionally, Air Force Bioenvironmental Engineering personnel perform bottled water sampling on every lot delivered to AASAB/AAMAB.

4.3 Water for Non-Drinking/Other purposes (RO and other sources of treated water)

The non-potable water for AASAB is provided by a desalination plant in Doha that is fed to a cistern and four tanks on the Kuwaiti side of the base through a pumping station in Jahra. There is one line from the cistern that feeds the "Rock" where the water is chlorinated and then distributed on the "Rock." This system is also looped back to the "Quarry" where it is also connected to the water provided to the Kuwaiti/Camp Morell/Canadian side of the base. Army LSA, DFAC wash station, and morgue wash station are filled via water truck by ECES/CEOU personnel; water is pulled from fill station by ECES. Routine testing of tap water is conducted monthly on the "Rock" and Quarry" by 386 EMDG/SGPB. Monitoring includes total coliform presence/absence and *E. coli*, pH, chlorine residual, and monthly M272. Additionally, an annual comprehensive screening analysis is taken and submitted to USAPHC IAW *TB Med 577*. All Results are loaded in DOEHRS DoD Surveillance program office. While the water provided in the distribution systems meets *TB Med 577* for water potability, the systems are classified as non-potable due to lack of backflow prevention devices and the risk of infiltration to the aging system. The system can be used for brushing teeth, washing clothes, washing dishes, and taking showers.

For AAMAB, water is delivered via truck through contract. The water source is the same desalinated water that supplies AASAB. The water arrives hand-chlorinated to be pumped into gravity-fed water tanks. Routine testing of tap water and ice is done biweekly by 386 EMDG/SGPB for the same standards as AASAB.

Although the primary route of exposure for most microorganisms is ingestion of the contaminated water, dermal exposure to some microorganisms, chemicals, and biological contaminants may have also caused adverse health effects. Complete exposure pathways would have included drinking, brushing teeth, personal hygiene, cooking, providing medical and dental care using a contaminated water supply or during dermal contact at vehicle or aircraft wash racks.

4.3.1 Sample data/notes:

Exposure Guidelines:

15 samples collected from 2004 - 2015 were evaluated for this health risk assessment. Water samples were analyzed for inorganic compounds, VOC, SVOC and various physical characteristics.

4.3.2 Short-term (acute) and long-term (chronic) health risks associated with water uses other than drinking:

4.3.2.1 **Disinfected Fresh Water (used for personal hygiene).**

Evaluation of the 15 advanced water samples of disinfected fresh water taken did not reveal any exceedances of USAPHC TG 230 health risk screening criteria. All analytes were not detected at levels above the short or long term MEGs.

Records indicate that the routinely monitored parameters (pH, chlorine, bacteriological) are typically within acceptable limits. Deviations from acceptable limits are investigated and corrected as they occur. Records of these measurements are available in DOEHRS.

Risk Summary: No acute or chronic health risks associated with incidental ingestion of disinfected fresh water during showering were identified at Ali Al Salem.

Medical Implications: None identified.

Confidence in the 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 were documented in Defense Occupational and Environmental Health Readiness System (DOEHRs), or the Military Exposure Surveillance Library (MESL) data portal between 2004 and 2015.

5.1.1 Short and long-term health risks:

Not Evaluated - No data were available upon which to base a risk assessment specific to Ali Al Salem Air Base.

Risk Summary: None - insufficient data exists upon which to base a risk assessment specific to Ali Al Salem Air Base.

Medical Implications: None - No data were available upon which to base a risk assessment specific to Ali Al Salem Air Base.

Confidence in the Risk Assessment: None - No data were available upon which to base a risk assessment specific to Ali Al Salem Air Base.

5.2 Depleted Uranium (DU)

DU munitions/counterweights are not stored or worked on at AASAB/AAMAB. There is no evidence of exposure to personnel.

5.3 Ionizing Radiation

5.3.1 Industrial Radiography

Medical and Dental radiography are utilized in the EMEDS clinic at AASAB. The radiology technician is the only individual enrolled in the thermoluminescent dosimetry (TLD) program, with no exposures recorded.

Industrial radiography is utilized by explosive ordnance disposal (EOD) for inspections, and at the personnel search area at the Marauder Gate.

5.3.2 Radioactive Material

There are no permitted radioactive materials or generally licensed devices at AASAB, and no sources at all at AAMAB. All AASAB ionizing sources are limited to check sources for BE, EOD or CEX equipment, and those contained in aircraft.

5.3.3 Short and long-term health risks:

Thirty-day TLD studies were performed throughout the EMDG buildings and at the base ECP. The results of these two studies showed a deep dose of 0 mrem. Indicated exposures are well below the general population authorized dose of 100 mrem per year.

Risk Summary: The risk is **low** due to procedures that are in place to maintain exposures as low as reasonable achievable.

Medical Implications: None.

Confidence in the Risk Assessment: Confidence in this risk is **medium**.

5.4 Non-Ionizing Radiation

5.4.1 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-1 has the MTS-A Firefly (AN/AAS-52) with a NOHD of 1 km, the MQ-9 has an illuminator with a NOHD of 0.32 km and a designator with a NOHD of 46.61 km. LASER System information for the Army Gray Eagles is pending. 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. 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 Ordnance Disposal and CE Emergency Management. Administrative controls, and a shield attachment, eliminate exposure potential.

5.4.2 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 were not exceeded at any normally occupied areas.

5.4.3 Short and long-term health risks:

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

Medical Implications: None.

Confidence in the Risk Assessment: Confidence in this risk assessment is medium.

6 Endemic Diseases

6.1 Sample data/notes:

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 identified related to deployment 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 was 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 are purchased from approved sources. Food is prepared in facilities where there is public health oversight (certificate of sanitation, health screening of food service workers, 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 were 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 was 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 assessment:

The short-term risk associated with foodborne and waterborne diseases in Kuwait were **high** for bacterial diarrhea. The short-term risk is **moderate** for protozoal diarrhea, hepatitis A, and typhoid/paratyphoid fever and **low** for brucellosis and hepatitis E.

The short-term risk for **viral** gastroenteritis was **moderate**. Risk due to a high rate of personnel turnover, shared dining, berthing, bathroom facilities, and working spaces is not substantially different than that expected in similar settings within the United States.

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 assessment: The long-term risk associated with food and waterborne diseases was 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 was High. Incidence of protozoal diarrhea and brucellosis in the post deployment military population is known to be extremely low.

[Return to Table 2](#)

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 were kept. Removing vector harborages, spraying for vectors within base camps, avoiding animals or areas where they were 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) were 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 was 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 assessment:

The short-term risk for cutaneous leishmaniasis was **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 was **Low**. Individuals who deploy from AASAB/AAMAB, 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, were received through official DoD medical event reporting systems.

6.3.2 Long-term (chronic) health risks:

Risk assessment:

The long-term risk for leishmaniasis, cutaneous and visceral, was **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 was 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 were detected and treated post deployment. The military medical community was/is aware of the presence of leishmaniasis in Kuwait, and skin lesions in individuals with a history of time spent in Kuwait were/are evaluated with that in mind. No cases of relapsing malaria have been reported in the Service-mandated reporting systems.

[Return to Table 2](#)

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 was 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 assessment: The short-term risk for leptospirosis was **low**, peaking between Apr and Oct.

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 were identified from Kuwait during the assessment period.

6.4.2 Long-term (chronic) health risks:

No long-term health risk was identified.

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6.5 Respiratory Diseases

U.S. military populations living and working in close-quarter conditions were 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 were 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 was 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 assessment: The short-term risk for upper respiratory infections was **Low**. Risk 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 was **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 were identified for individuals deployed to Kuwait during the assessment period.

6.5.2 Long-term (chronic) health risks:

Risk assessment: The long-term risk for tuberculosis was **low**.

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.

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6.6 Animal-Contact Diseases

Animals in Kuwait were 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 were kept (stray dogs/cats, barnyards, slaughterhouses), were the primary infection sources for all these diseases, and avoidance of companion and farm animal contacts was 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 was 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 assessment: The short-term risk for anthrax (naturally acquired), rabies and H5N1 avian influenza was **low**. The risk for Q-fever was **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 assessment: The long-term risk for Q-fever and rabies was **low**. However, Q-fever was 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 were 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**.

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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 assessment: 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 assessment: The long-term risk for HFRS **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 was 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 was 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 risk:

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 was 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 envenomations 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 risk:

No long-term health risks were 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.

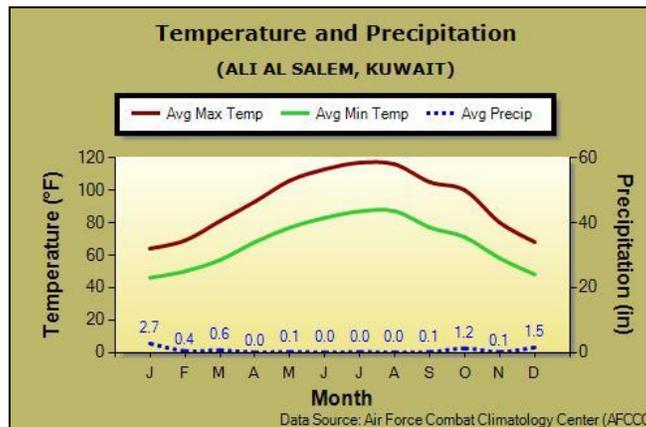
Confidence in the risk assessment: Confidence in risk assessment is **high** based on disease(s) incident reporting from Kuwait.

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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 (≥ 90°F)

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

Approach: No heat casualty, medical event reports involving heat injuries or heat stress monitoring data were 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:

Short-term (acute) health risk: **Unmitigated Variable – Mitigated Low**, high health risk of heat injury in unacclimatized personnel from April to October, and Low from November to March. The risk of heat injury was reduced through preventive measures. Because the occurrence of heat stress/injury is strongly dependent on operational factors (work intensity and clothing), confidence in the health risk estimate was low (TG230, Table 3-6). Many operations, especially near the flightline, did not have adequate shade or mitigation measures.

Long-term health risk: **Low**, long-term health implications from heat injuries are rare 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 was not sought, are at increased risk for future heat injury; repeat heat injury may have increased severity.

Confidence in the risk assessment: Based on generally available information on climatic conditions and the absence of reported heat injuries, confidence in risk assessment is **medium**. 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 were 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: 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 was **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: Based on generally available information on climatic conditions and the absence of reported cold injuries, confidence in risk assessment is **medium** for short-term risks and **high** for long-term risks. Individuals who experienced mild symptoms of cold injury may not have sought medical attention; this may lead to an underestimation of the risk.

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 (dB(A)), 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 TWA exceeds 84 dB(A) 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 were required to wear dual hearing protection.

Occupational and Environmental Health Assessments at AASAB/AAMAB indicate the potential for hazardous when working on or near the flightline 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 DOEHRS and/or MESL. Sound level measurements at Ali Al Salem Air Base and Al Mubarak were taken as IH surveys were completed. 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 was 72.8 dBA, and night was 62.7 dBA – well above the AFOSH STD 48-20 recommended sleeping level of 45 dBA.

A noise dosimetry project for Al Mubarak AB 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.

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:

Short-term health risk: The short-term risk of noise induced hearing loss with the use of appropriate hearing protection use was **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.

Long-term health risk: The 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**. There is a well-established hearing conservation program; 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. Additionally, some personnel have the combat earplug. Such impact noise is not expected at AAMAB.

9.2.1 Short-term (acute) and Long-term (chronic) health risks:

Low: Short-term and long-term risk of noise injury with appropriate hearing protection use is Low. Confidence in the health risk assessment is medium (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 Al Mubarak: 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 AAMAB's TMEP (morgue) is also taken by its staff to camp Arifjan.

Non-hazardous solid waste generated by base residents at AASAB and AAMAB is disposed of in various trash bins throughout the base. The trash bins are emptied through host nation contractor KMS. Office trash is collected and disposed of by the base janitorial contract personnel. 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 were no chemical disposal sites capable of affecting AASAB or AAMAB.

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/AAMAB. 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". No U.S. personnel come into contact with the sewage or the lagoon. AAMAB 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: Short and long-term risk is **low** based on available data.

Medical Implications: None.

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 2016 there were eight fuel spills 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 were generally present in relatively low volumes. Procedures for storage, handling, use and disposal of hazardous materials were 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 those efforts at AASAB were in the reduction of filth flies, rodents, and feral animals. Non-chemical measures such as exclusion measures and sanitation were 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 was provided as available to ensure compliance with Theater, Navy, and DoD practices and regulations. AAMAB did not have/need pest control capabilities.

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 occurred near the Green Mile where no personnel resided. Camp Canada, hosting approximately 300 Canadian Army personnel, is stations downwind of the Green Mile.

10.4.1 Short and Long-term (chronic) health risk

Approach: The Integrated Pest Management Plan for AASAB (current Sep 2014 – Aug 2019) was reviewed for compliance with DoDI 4150.07 requirements. In addition, U. S. military entomologists who served at AASAB were consulted about their knowledge of pest management activities at these camps.

Risk Summary: Low based on available data.

Short-term health risk: 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.

Long-term health risk: No long-term health risk was 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 was 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: Short-term risk is **negligible** based on available data.

Medical Implications: None.

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

10.5.3 Long-term (chronic) health risk:

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

Medical Implications: None.

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

10.6 Burn Pit

While not specific to Ali Al Salem or Al Mubarak Air Bases, 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 were generally 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 Al Mubarak Air Bases.

10.6.2 Short-term (acute) health risk:

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

Medical Implications: None.

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

10.6.3 Long-term (chronic) health risk:

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

Medical Implications: None.

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 were obtained from the:

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 the:

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, Al Mubarak Air Base, 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 (Provisional) 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>