Military Deployment
Periodic Occupational and Environmental Monitoring Summary (POEMS):
Kabul and Vicinity, Afghanistan
Calendar Years: (2003 to 2009)

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 (References 1-3).

PURPOSE: This POEMS documents the Department of Defense (DoD) assessment of occupational and environmental health (OEH) risk for Kabul and vicinity that includes Camp Eggers, Camp Phoenix, Camp Kabul Headquarters – International Security Assistance Forces (ISAF) and Resolute Support, Camp Julian, Kabul Military Training Center (KMTC) also known as Hadim Karzai International Airport (HKIA), Kabul Afghanistan International Airport (KAIA), Camp Morehead, Camp Policharki, Camp New Sarobi, National Military Hospital, and Camp Dubbs. It presents a qualitative summary of health risks identified at these locations and their potential medical implications. The report is based on information collected from 01 January 2003 through 31 December 2009 to include deployment OEHS 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 Kabul 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 01 January 2003 through 31 December 2009.

The POEMS can be useful to inform healthcare providers and others of environmental conditions experienced by individuals deployed to Kabul 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 noted in their medical record on a Standard Form (SF) 600 (Chronological Record of Medical Care).

SITE DESCRIPTION:

Kabul is situated 5,900 feet above sea level in a narrow valley and along the Kabul River. Kabul has a semi-arid, continental climate with precipitation concentrated in the winter (sometimes falling as snow) and spring months. Vehicle emissions are a major contributor to air pollution in the city of Kabul, which has a population of over 4 million people. Most of these vehicles are old and use substandard fuels. More common industries, such as brick factories, burn tire rubber, plastic waste and other combustibles as cheap energy sources. Rationed power exacerbates the situation as it forces people to use more polluting sources such as wood, coal, and heating oil for cooking and heating. Typical military operations, including vehicular traffic, generators and other local sources (including burning of waste) will also contribute to the ambient environment at these locations.

SUMMARY: Conditions that may pose a Moderate or greater health risk are summarized in Table 1. Table 2 provides population based risk estimates for identified OEH conditions at Kabul and 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.

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

Short-term health risks & medical implications:

The following hazards may be associated with potential acute health effects in some personnel during deployment at Kabul and vicinity:

Inhalable coarse particulate matter less than 10 micrometers in diameter (PM_{10}) from environmental dust and/or burning; food/waterborne diseases (e.g., bacterial diarrhea, hepatitis A, typhoid/paratyphoid fever, diarrhea-cholera, diarrhea-protozoal, brucellosis, hepatitis E); other endemic diseases (cutaneous leishmaniasis (acute), Crimean-Congo hemorrhagic fever, sandfly fever, scrub typhus (mite-borne), leptospirosis, Tuberculosis (TB), rabies, anthrax, Q fever); heat stress; and waste sites/waste disposal. For food/waterborne diseases (e.g., bacterial diarrhea, hepatitis A, typhoid/paratyphoid fever, diarrhea-cholera, diarrhea-protozoal, brucellosis, hepatitis E), if ingesting local food and water, the health effects can temporarily incapacitate personnel (diarrhea) or result in prolonged illness (hepatitis A, typhoid/paratyphoid fever, brucellosis, hepatitis E). Risks from food/waterborne diseases may have been reduced with preventive medicine controls and mitigation, which includes hepatitis A and typhoid fever vaccinations and only drinking from approved water sources in accordance with standing CENTCOM policy. For other vector-borne endemic diseases (cutaneous leishmaniasis (acute), Crimean-Congo hemorrhagic fever, sandfly fever, scrub typhus (mite-borne), 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, bed net use, and appropriate chemoprophylaxis, as well as minimizing areas of standing water and other vector-breeding areas. For water contact diseases (leptospirosis) activities involving extensive contact with surface water increase risk. For respiratory diseases (TB), personnel in close-quarter conditions could have been at risk for person-to-person spread. Animal contact diseases (rabies, anthrax, Q fever), pose year-round risk. For heat stress, risk can be greater during months of April through November, and greater for susceptible persons including those older than 45, of low fitness level, unacclimatized, or with underlying medical conditions. Risks from heat stress may have been reduced with preventive medicine controls, work-rest cycles, proper hydration and nutrition, and mitigation. For waste sites/waste disposal, solid waste management issues included a lack of lids for trash cans in food preparation areas, and dumpsters being left open and/or not cleaned regularly; there was no information about how wastes were disposed of, such as by land filling or burning.

Air quality: For inhalable coarse particulate matter less than 10 micrometers in diameter (PM_{10}), the PM_{10} overall short-term risk was 'Variable, Low to High' for Kabul and vicinity. For inhalable fine particulate matter less than 2.5 micrometers in diameter ($PM_{2.5}$), the $PM_{2.5}$ overall short-term risk was 'Variable, Low to Moderate for Kabul and vicinity. However, the entire Kabul and vicinity area is an arid and dust-prone desert environment, also subject to vehicle traffic. Consequently, exposures to PM_{10} and $PM_{2.5}$ may vary, as conditions may vary, and may result in mild to more serious short-term health effects (e.g., eye, nose or throat and lung irritation) in some personnel while at this site, particularly exposures to high levels of dust such as during high winds or dust storms. For PM_{10} and $PM_{2.5}$, 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. Although most short-term health effects from exposure to particulate matter should have resolved 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 Kabul and vicinity. Personnel who reported with symptoms or required treatment while at this site should have exposure and treatment noted in medical record (e.g., electronic medical record and/or on a Standard Form (SF) 600 (Chronological Record of Medical Care).

Long-term health risks & medical implications:

The following hazards may be associated with potential chronic health effects in some personnel during deployment at Kabul and vicinity:

For waste sites/waste disposal, solid waste management issues included a lack of lids for trash cans in food preparation areas, and dumpsters being left open and/or not cleaned regularly; there was no information about how wastes were disposed of, such as by landfilling or burning.

Air quality: For inhalable fine particulate matter less than 2.5 micrometers in diameter ($PM_{2.5}$) from environmental dust, the overall long-term risk was 'Moderate' for Kabul and vicinity. Inhalable coarse particulate matter less than 10 micrometers in diameter (PM_{10}) from environmental dust was not evaluated for long-term risk due to no available health guidelines. However, the entire Kabul and vicinity area is an arid and dust-prone desert environment, also subject to vehicle traffic, and conditions may have varied. For inhalational exposure to high levels of dust, PM_{10} and $PM_{2.5}$, such as during high winds or dust storms, and for exposure to burning, it is considered possible that some otherwise healthy personnel who were exposed for a long-term period to dust and particulate matter while at Kabul and vicinity could develop certain health conditions (e.g., reduced lung function, cardiopulmonary disease). Personnel with a history of asthma or cardiopulmonary disease could potentially be more likely to develop such chronic health conditions. While the dust and particulate matter exposures and exposures to burning are acknowledged, at this time there were no specific recommended, post-deployment medical surveillance evaluations or treatments. Providers should still consider overall individual health status (e.g., any underlying conditions/susceptibilities) and any potential unique individual exposures (such as burn pits/barrels, incinerators, occupational or specific personal dosimeter data) when assessing individual concerns.

Long-term health risks & medical implications: *continued*

Certain individuals may need to be followed/evaluated for specific occupational exposures/injuries (e.g., annual audiograms as part of the medical surveillance for those enrolled in the Hearing Conservation Program; and personnel covered by Respiratory Protection Program and/or Hazardous Waste/Emergency Responders Medical Surveillance).

Table 2. Population-Based Health Risk Estimates - Kabul and vicinity [1, 2]

Source of Identified Health Risk[3]	Unmitigated Health Risk Estimate[4]	Control Measures Implemented	Residual Health Risk Estimate[4]
AIR			
Particulate matter less than 10 micrometers in diameter (PM_{10})	Short-term: Variable, Low to High. Daily levels vary, acute health effects (e.g., upper respiratory tract irritation) more pronounced during peak days. More serious effects are possible in susceptible persons (e.g., those with asthma/pre-existing respiratory diseases).	Limiting strenuous physical activities when air quality is especially poor; and actions such as closing tent flaps, windows, and doors.	Short-term: Variable, Low to High. Daily levels vary, acute health effects (e.g., upper respiratory tract irritation) more pronounced during peak days. More serious effects are possible in susceptible persons (e.g., those with asthma/pre-existing respiratory diseases).
	Long-term: No health guidelines		Long-term: No health guidelines
Particulate matter less than 2.5 micrometers in diameter ($PM_{2.5}$)	Short-term: Variable, Low to Moderate. Daily levels vary, acute health effects (e.g., eye, nose, and throat irritation and respiratory effects) more pronounced during peak days. Increased symptoms are possible in susceptible persons (e.g., those with asthma/pre-existing respiratory diseases).	Limiting strenuous physical activities when air quality is especially poor; and actions such as closing tent flaps, windows, and doors.	Short-term: Variable, Low to Moderate. Daily levels vary, acute health effects (e.g., eye, nose, and throat irritation and respiratory effects) more pronounced during peak days. Increased symptoms are possible in susceptible persons (e.g., those with asthma/pre-existing respiratory diseases).
	Long-term: Moderate. A small percentage of personnel may be at increased risk for developing chronic conditions. Particularly those more susceptible to acute effects (e.g., those with asthma/pre-existing respiratory diseases).		Long-term: Moderate. A small percentage of personnel may be at increased risk for developing chronic conditions. Particularly those more susceptible to acute effects (e.g., those with asthma/pre-existing respiratory diseases).
ENDEMIC DISEASE			
Food borne/Waterborne (e.g., diarrhea-bacteriological)	Short-term: Variable; High (bacterial diarrhea, hepatitis A, typhoid fever) to Moderate (diarrhea-cholera, diarrhea-protozoal, brucellosis, hepatitis E) if ingesting local food/water, the health effects can temporarily incapacitate personnel (diarrhea) or result in prolonged illness (hepatitis A, Typhoid fever, hepatitis E, brucellosis).	Preventive measures include Hepatitis A and Typhoid fever vaccination and consumption of food and water only from approved sources.	Short-term: Low to none
	Long-term: none identified		Long-term: No data available
Arthropod Vector Borne	Short-term: Variable; Moderate for leishmaniasis - cutaneous (acute), Crimean-Congo hemorrhagic fever, sandfly fever, typhus-miteborne; and Low for, the plague, malaria, and West Nile fever.	Preventive measures include proper wear of treated uniform, application of repellent to exposed skin, bed net use, minimizing areas of standing water and appropriate chemoprophylaxis.	Short-term: Low
	Long-term: Low for Leishmaniasis-visceral infection.		Long-term: No data available
Water-Contact (e.g. wading, swimming)	Short-term: Moderate for leptospirosis	Recreational swimming in surface waters not likely in this area of Afghanistan during this time period.	Short-term: Low for leptospirosis.
	Long-term: No data available		Long-term: No data available
Respiratory	Short-term: Variable; Moderate for tuberculosis (TB) to Low for meningococcal meningitis.	Providing adequate living and work space; medical screening; vaccination.	Short-term: Low
	Long-term: No data available		Long-term: No data available

Source of Identified Health Risk[3]	Unmitigated Health Risk Estimate[4]	Control Measures Implemented	Residual Health Risk Estimate[4]
Animal Contact	Short-term: Variable; Moderate for rabies, anthrax, Q-fever to Low for H5N1 avian influenza. Mitigation measures reduced the overall risk to Low.	Prohibiting contact with, adoption, or feeding of feral animals IAW U.S. Central Command (CENTCOM) General Order (GO) 1B. Risks are further reduced in the event of assessed contact by prompt post-exposure rabies prophylaxis IAW The Center for Disease Control's (CDC) Advisory Committee on Immunization Practices guidance.	Short-term: No data available
	Long-term: None identified.		Long-term: None identified.
VENOMOUS ANIMAL/ INSECTS			
Snakes, scorpions, and spiders	Short-term: Low; If encountered, effects of venom vary with species from mild localized swelling (e.g. *Scorpiops afghanus)* to potentially lethal effects (e.g. *Gloydius halys*).	Risk reduced by avoiding contact, proper wear of uniform (especially footwear), and proper and timely treatment.	Short-term: Low; If encountered, effects of venom vary with species from mild localized swelling (e.g. *Scorpiops afghanus)* to potentially lethal effects (e.g. *Gloydius halys*).
	Long-term: No data available		Long-term: No data available
HEAT/COLD STRESS			
Heat	Short-term: Variable; Risk of heat injury is High for June-September, and Low to Moderate for all other months.	Work-rest cycles, proper hydration and nutrition, and Wet Bulb Globe Temperature (WBGT) monitoring.	Short-term: Variable; Risk of heat injury in unacclimatized or susceptible personnel is Moderate for June-September and Low to Moderate for all others.
	Long-term: Low, The long-term risk was Low. However, the 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.		Long-term: Low, The long-term risk is Low. However, the 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.
Cold	Short-term: Low risk of cold stress/injury.	Risks from cold stress reduced with protective measures such as use of the buddy system, limiting exposure during cold weather, proper hydration and nutrition, and proper wear of issued protective clothing.	Short-term: Low risk of cold stress/injury.
	Long-term: Low; Long-term health implications from cold injuries are rare but can occur, especially from more serious injuries such as frost bite.		Long-term: Low; Long-term health implications from cold injuries are rare but can occur, especially from more serious injuries such as frost bite.
Unique Incidents/ Concern			
Waste Sites/Waste Disposal	Short-term: Moderate		Short-term: Moderate
	Long-term: Moderate		Long-term: Moderate
Fuel/petroleum products/ industrial chemical	Short-term: Low		Short-term: Low
	Long-term: Low		Long-term: Low

Source of Identified Health Risk[3]	Unmitigated Health Risk Estimate[4]	Control Measures Implemented	Residual Health Risk Estimate[4]
spills			
Pesticides/Pest Control	Short-term: Low	See Section 10.4	Short-term: Low
	Long-term: Low		Long-term: Low

[1]This Summary Table provides a qualitative estimate of population-based short- and long-term health risks associated with the occupational environment conditions at Kabul and vicinity. It does not represent an individual exposure profile. Actual individual exposures and health effects depend on many variables. For example, while a chemical may have been present in the environment, if a person did not inhale, ingest, or contact a specific dose of the chemical for adequate duration and frequency, then there may have been no health risk. Alternatively, a person at a specific location may have experienced a unique exposure which could result in a significant individual exposure. Any such person seeking medical care should have their specific exposure documented in an SF600.

[2] This assessment is based on specific environmental sampling data and reports obtained from 01 January 2003 through 31 December 2009. 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 Kabul and vicinity. The health risks are presented as Low, Moderate, High or Extremely High for both acute and chronic health effects. The health risk level is based on an assessment of both the potential severity of the health effects that could be caused and probability of the exposure that would produce such health effects. Details can be obtained from the USAPHC/Army Institute of Public Health (AIPH). Where applicable, "None Identified" is used when though a potential exposure is identified, and no health risks of either a specific acute or chronic health effects are determined. More detailed descriptions of OEH exposures that are evaluated but determined to pose no health risk are discussed in the following sections of this report.

[4]Health risks in this Summary Table are based on quantitative surveillance thresholds (e.g., endemic disease rates; host/vector/pathogen surveillance) or screening levels, e.g., Military Exposure Guidelines (MEGs) for chemicals. Some previous assessment reports may provide slightly inconsistent health 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 select few samples.

1 Discussion of Health Risks at Kabul, Afghanistan 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 (USAPHC) Technical Guide 230, *Environmental Health Risk Assessment and Chemical Exposure Guidelines for Deployed Military Personnel* (Reference 4). 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. 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.

2 Air

2.1 Site-Specific Sources Identified

Kabul has a semi-arid, continental climate with precipitation concentrated in the winter (sometimes falling as snow) and spring months. Airborne environmental hazards at these basecamps include, wind-blown sand, commercial industry (petro/chemical industry and storage, cement and asphalt plants), agricultural and also vehicles. Inhalational exposure to high levels of dust and particulate matter during high winds or dust storms may result in mild to more serious short-term health effects (e.g., eye, nose or throat and lung irritation) in some personnel. Additionally, certain subgroups of the deployed forces (e.g., those with pre-existing asthma/cardio pulmonary conditions) are at greatest risk of developing notable health effects.

A retrospective cohort study was conducted to investigate associations between deployment to Kabul, Afghanistan and subsequent respiratory health among United States (U.S.) military personnel (Reference 11). The study population consisted of personnel who deployed to Kabul, select Operation Enduring Freedom (OEF) locations, personnel stationed in the Republic of Korea (ROK), and U.S.-stationed personnel. Incidence rate ratios (IRRs) were estimated for respiratory symptoms, signs, and ill-defined conditions (SSIC), asthma, and chronic obstructive pulmonary disease (COPD). A significantly elevated rate of SSIC was observed among Kabul-deployed personnel compared to personnel deployed or stationed in Bagram (IRR 1.12; 95% CI, 1.05-1.19), ROK (IRR 1.20; 95% CI, 1.10-1.31), and the U.S. (IRR 1.52; 95% CI, 1.43-1.62). A statistically elevated rate of asthma was observed among personnel deployed to Kabul, relative to U.S.-stationed personnel (IRR 1.61; 95% CI, 1.22-2.12). Statistically significant rates were not observed for COPD among Kabul-deployed personnel compared to other study groups. These findings suggest that deployment to Kabul is associated with an elevated risk of post-deployment respiratory symptoms and new-onset asthma (Reference 11).

Vehicle emissions are a major contributor to air pollution in the city of Kabul, which has a population of over 4 million people. Most vehicles are over 10 years old, and generally use substandard fuels. Some of the more common industries, such as brick factories, burn tire rubber, plastic waste, and other combustibles as cheap energy sources. Additionally, rationed power exacerbates the situation as it forces people to use more polluting sources such as wood, coal, and heating oil for cooking and heating.

Typical military operations, including vehicular traffic, generators and other local sources (including burning of waste) will also contribute to the ambient environment at these locations.
Limited environmental surveillance occurred between 2003 and 2009. The summary of results follows.

2.2 Particulate matter

Particulate matter (PM) is a complex mixture of extremely small particles suspended in the air. The PM includes solid particles and liquid droplets emitted directly into the air by sources such as: power plants, motor vehicles, aircraft, generators, construction activities, fires, and natural windblown dust. The PM can include sand, soil, metals, volatile organic compounds (VOC), allergens, and other compounds such as nitrates or sulfates that are formed by condensation or transformation of combustion exhaust. The PM composition and particle size vary considerably depending on the source. Generally, PM of health concern is divided into two fractions: PM_{10}, which includes coarse particles with a diameter of 10 micrometers or less, and fine particles less than 2.5 micrometers ($PM_{2.5}$), 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 than10 micrometers (PM_{10})

2.3.1 Exposure Guidelines:

Short Term (24-hour) PM_{10} (micrograms per cubic meter, $\mu g/m^3$):

- Negligible MEG = 250
- Marginal MEG = 420
- Critical MEG = 600

Long-term PM_{10} MEG ($\mu g/m^3$):

- Not defined and not available.

2.3.2 Sample data/Notes:

A total of 141 valid PM_{10} air samples were collected at Camp Eggers and Camp Phoenix from 15 July 2003 – 28 April 2009. The range of 24-hour PM_{10} concentrations was 7 $\mu g/m^3$–765 $\mu g/m^3$ with an average concentration of 201 $\mu g/m^3$. No PM_{10} air samples were collected at Camp Kabul - ISAF, Camp Julian, KMTC, KAIA, Camp Morehead, Camp Policharki, Camp New Sarobi, National Military Hospital, and Camp Dubbs.

Camp Eggers: A total of 81 valid PM_{10} air samples were collected from 16 September 2008 to 28 April 2009. The range of 24-hour PM_{10} concentrations was 18 $\mu g/m$ –735 $\mu g/m^3$ with an average concentration of 211 $\mu g/m^3$.

Camp Phoenix: A total of 60 valid PM_{10} air samples were collected from 15 July 2003 to 17 December 2008. The range of 24-hour PM_{10} concentrations was 1 $\mu g/m^3$–765 $\mu g/m^3$ with an average concentration of 187 $\mu g/m^3$.

2.3.3 *Short-term health risks:*

Variable (Low to High): The short-term PM_{10} health risk assessment is variable based on average and peak PM_{10} sample concentrations, and the likelihood of exposure at these hazard severity levels. The variable risk is due to significant fluctuations in daily concentrations.

Camp Eggers: Daily average health risk levels for PM_{10} show no hazard for 74%, low health risk for 21%, moderate health risk for 2%, and high health risk for 2% of the time. Confidence in the short-term PM_{10} health risk assessment is high (Reference 4, Table 3-6).

Camp Phoenix: Daily average health risk levels for PM_{10} show no hazard for 75%, low health risk for 18%, moderate health risk for 5%, and high health risk for 2% of the time. Confidence in the short-term PM_{10} health risk assessment is high (Reference 4, Table 3-6).

The hazard severity for average PM_{10} concentrations in samples was negligible. The results indicate that a few personnel may experience notable mild eye, nose, or throat irritation. Most personnel will only experience mild effects. Pre-existing health conditions (e.g., asthma or cardiopulmonary diseases) may be exacerbated (Reference 4, Table 3-11).

For the highest observed PM_{10} sample concentration, the hazard severity was critical. During peak exposures at the critical hazard severity level, most if not all personnel will experience very notable eye, nose, and throat irritation and respiratory effects. Visual acuity is impaired, as is overall aerobic capacity. Some personnel will not be able to perform assigned duties and some lost duty days are expected. Those with a history of asthma or cardiopulmonary disease will experience more severe symptoms (Reference 4, Table 3-11).

2.3.4 *Long-term health risk:*

Not Evaluated-no available health guidelines. The U.S. Environmental Protection Agency (EPA) has retracted its long-term standard (national ambient air quality standards, NAAQS) for PM_{10} due to an inability to clearly link chronic health effects with chronic PM_{10} exposure levels.

2.4 Particulate Matter, less than 2.5 *micrometers* ($PM_{2.5}$)

2.4.1 Exposure Guidelines:

Short Term (24-hour) $PM_{2.5}$ (µg/m^3):

- Negligible MEG = 65
- Marginal MEG = 250
- Critical MEG = 500

Long-term (1year) $PM_{2.5}$ MEGs (µg/m^3):

- Negligible MEG = 15
- Marginal MEG = 65

2.4.2 Sample data/Notes:

A total of 137 valid $PM_{2.5}$ air samples were collected at Camp Eggers and Camp Phoenix from 04 September 2006 to 30 December 2009. The range of 24-hour $PM_{2.5}$ concentrations was 15 µg/m^3–274 µg/m^3 with an average concentration of 93 µg/m^3. No $PM_{2.5}$ air samples were collected at Camp Kabul - ISAF, Camp Julian, KMTC, KAIA, Camp Morehead, Camp Policharki, Camp New Sarobi, National Military Hospital, and Camp Dubbs.

Camp Eggers: A total of 49 valid $PM_{2.5}$ air samples were collected from 04 September 2006 to 02 April 2009. The range of 24-hour $PM_{2.5}$ concentrations was 25 µg/m^3–211 µg/m^3 with an average concentration of 84 µg/m^3.

Camp Phoenix: A total of 88 valid $PM_{2.5}$ air samples were collected from 30 December 2006 to 30 December 2009. The range of 24-hour $PM_{2.5}$ concentrations was 15 µg/m^3–274 µg/m^3 with an average concentration of 97 µg/m^3.

2.4.3 *Short-term health risks:*

Low to Moderate: The short-term $PM_{2.5}$ health risk assessment is Low based on average $PM_{2.5}$ sample concentrations and Moderate based on peak $PM_{2.5}$ sample concentrations and the likelihood of exposure at these hazard severity levels.

Camp Eggers: Daily average health risk levels for $PM_{2.5}$ show no hazard for 33% and low health risk for 67% of the time. Confidence in the short-term $PM_{2.5}$ health risk assessment was low to medium (Reference 4, Table 3-6).

Camp Phoenix: Daily average health risk levels for PM_{10} show no hazard for 39%, low health risk for 58%, and moderate health risk for 3% of the time. Confidence in the short-term PM_{10} health risk assessment is high (Reference 4, Table 3-6).

The hazard severity for average $PM_{2.5}$ concentrations in samples was negligible. The results indicate that a few personnel may experience notable mild eye, nose, or throat irritation. Most personnel will only experience mild effects. Pre-existing health conditions (e.g., asthma or cardiopulmonary diseases) may be exacerbated (Reference 4, Table 3-11).

For the highest observed $PM_{2.5}$ exposure, the hazard severity was marginal. During peak exposures above the marginal hazard severity level, a majority of personnel will experience notable mild eye, nose, and throat irritation and some respiratory effects. Some lost duty days are expected. Significant aerobic activity will increase risk. Those with a history of asthma or cardiopulmonary disease are expected to experience increased symptoms (Reference 4, Table 3-11).

2.4.4 *Long-term health risks:*

Moderate: The long-term health risk assessment was Moderate based on average $PM_{2.5}$ concentration, and the likelihood of exposure at this hazard severity level. Confidence in the long-term $PM_{2.5}$ health risk assessment is low to medium (Reference 4, Table 3-6).

The hazard severity was marginal for average $PM_{2.5}$ sample concentrations. The results suggest that with repeated exposures above the marginal hazard severity threshold, it is plausible that development of chronic health conditions such as reduced lung function or exacerbated chronic bronchitis, COPD, asthma, atherosclerosis, or other cardiopulmonary diseases could occur in generally healthy troops. Those with a history of asthma or cardiopulmonary disease are considered to be at particular risk. (Reference 4, Table 3-12).

2.5 Airborne Metals

2.5.1 Exposure Guidelines:

2.5.2 Sample data/Notes:

A total of 141 valid PM_{10} airborne metal samples were collected at Camp Phoenix and Camp Eggers from 15 July 2003 to 28 April 2009, and a total of 137 valid $PM_{2.5}$ airborne metal samples were collected at Camp Phoenix and Camp Eggers from 04 September 2006 to 30 December 2009. No PM_{10} or $PM_{2.5}$ airborne metal samples were collected at Camp Kabul - ISAF, Camp Julian, KMTC, KAIA, Camp Morehead, Camp Policharki, Camp New Sarobi, National Military Hospital, and Camp Dubbs.

2.5.3 *Short and long-term health risks:*

None identified based on the available sampling data. None of the PM_{10} or $PM_{2.5}$ airborne metal samples were found at concentrations above short or long-term MEGs.

2.6 Volatile Organic Compounds (VOC)

2.6.1 Exposure Guidelines:

2.6.2 Sample data/Notes:

The health risk assessment is based on average and peak concentration of 21 valid volatile organic chemical (VOC) air samples collected at Camp Phoenix and Camp Eggers from 16 September 2008 to 28 April 2009, and the likelihood of exposure. No VOC samples were collected at Camp Kabul - ISAF, Camp Julian, KMTC, KAIA, Camp Morehead, Camp Policharki, Camp New Sarobi, National Military Hospital, and Camp Dubbs.

2.6.3 *Short and long-term health risks:*

None identified based on the available sampling data. For some analytes, the analytical limit of quantitation (LOQ) was above the military exposure guidelines, which may cause inaccurate population exposure point concentrations, and as a result, the risk may be underestimated.

3 Soil

3.1 Site-Specific Sources Identified

3.2 Sample data/Notes:

A total of 23 valid surface soil samples were collected at Camp Eggers, Camp Phoenix, and Camp Policharki from June 2003 to May 2008, to assess OEH health risk to deployed personnel. The primary soil contamination exposure pathways are dermal contact and dust inhalation. Typical parameters analyzed for include semi volatile organic compounds (SVOCs), heavy metals, polychlorinated biphenyls (PCBs), pesticides, herbicides, and radionuclides. For the risk assessment, personnel are assumed to remain at this location for 6 months to 1 year.

3.3 *Short-term health risk:*

Not an identified source of health risk. Currently, sampling data for soil are not evaluated for short term (acute) health risks**.**

3.4 *Long-term health risk:*

None identified based on available sample data. No parameters exceeded 1-year Negligible MEGs.

4 Water

In order to assess the health risk to U.S. personnel from exposure to water in theater, the USAPHC identified the most probable exposure pathways. These are based on the administrative information provided on the field data sheets submitted with the samples taken over the time period being evaluated. The primary ingestion sources are a mix of bottled and treated water. Non-drinking specific exposures sources (such as personal hygiene or food preparation sources) where much less that 5-15

Liters of water are ingested per day (assumed range of military ingestion rates. Personnel were directly exposed to reverse osmosis water purification unit (ROWPU) treated and disinfected fresh bulk water.

4.1 Drinking Water: Bottled or Packaged Water

4.1.1 Site-Specific Sources Identified

There were multiple bottled water brands sampled at Kabul, Camp Eggers, Camp Phoenix, and Camp Policharki. Various bottled water brands include: Obi Zulo ®, Oasis ®, Kinley ®, Cristal ®, Emirates ®, Riwa ®, Jeema ®, and Tabiyat ®.

4.1.2 Sample data/Notes:

To assess the potential for adverse health effects to troops, the following assumptions were made about dose and duration: A conservative (protective) assumption was that personnel routinely ingested 5 liters per day (L/day) of bottled water for up to 365 days (1-year). It was further assumed that control measures were not used. A total of 21 valid bottled and treated water samples were collected from 28 April 2003 to 10 July 2009.

Camp Eggers: Eight samples represented drinking water exposures at Camp Eggers. Four samples were taken in 2006; two bottled water sources (one Obi Zulo ® and one Oasis ®) and two secondary sources taken from dining facilities. Two water bottle samples (one each of Kinley ® and Cristal ®) were taken from the Qalaa House in 2008. In 2009, one bottled water sample (location/brand unknown) and one water buffalo sample were collected. Although this is a small sample set, risk analysis indicated that none of these samples demonstrated any potential health risks to U.S. personnel. There is no specific data available for bottled water at these locations because all monitoring is done at the Class I distribution center at Bagram Airbase. As a result, these conclusions should be tempered by the limited data.

Camp Phoenix: Four samples were received from Camp Phoenix. One drinking water sample was taken from a ROWPU in 2003. One bottled (Emirates ®), one water blivet, and one tap water sample taken from an unknown dining facility were sampled in 2006. No samples were available for 2004-2005, or 2007-2009 that would reflect basecamp wide drinking water exposures. This small sample set indicated that none of these samples demonstrated any potential health risks to U.S. personnel. However, these conclusions should be tempered by the limited data.

Camp Policharki: A single bottled water sample (Tabiyat ® brand) was taken in 2008. Although this bottled water was discontinued for primary drinking because of complaints of poor taste, the sample did not demonstrate a potential health risk to U.S. personnel.

Camp Dubbs: A single drinking water sample was taken from a ROWPU in 2009. Although this is a small sample set, risk analysis indicated that the sample did not demonstrate a potential health risks to U.S. personnel.

Camp Morehead: A single drinking water sample was taken from a ROWPU in 2007. Although this is a small sample set, risk analysis indicated that the sample did not demonstrate a potential health risk to U.S. personnel.

4.1.3 *Short-term and long-term health risk:*

None identified based on available sample data. All collected samples were below the short and long-term Negligible MEGs.

4.2 Non-Drinking Water: Disinfected

4.2.1 Site-Specific Sources Identified

Although the primary route of exposure for most microorganisms is ingestion of contaminated water, dermal exposure to some microorganisms, chemicals, and biologicals may also cause adverse health effects. Complete exposure pathways would include 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.

4.2.2 Sample data/Notes:

To assess the potential for adverse health effects to troops the following assumptions were made about dose and duration: All U.S. personnel at this location were expected to remain at this site for approximately 1 year. A conservative (protective) assumption is that personnel routinely consumed less than 5 L/day of non-drinking water for up to 365 days (1-year). It is further assumed that control measures and/or personal protective equipment were not used. Disinfected bulk water and ROWPU samples from 10 February 2002 to 21 December 2009 were evaluated for this health risk assessment.

Camp Eggers: Based on available data, 11 samples representing non-drinking water exposures (personal hygiene, etc.) were found for this timeframe. These were from 2006 (1 sample), 2007 (2 samples), 2008 (6 samples) and 2009 (2 samples). This small sample set indicated that none of these samples demonstrated any potential health risks to U.S. personnel. No samples of this type were collected in 2003-2005. As a result, these conclusions should be tempered by the limited data.

Camp Phoenix: Based on available data, 15 samples representing non-drinking water exposures (personal hygiene, etc.) were found for this timeframe. These were from 2002 (1 sample), 2004 (1 samples), 2006 (2 samples), 2007 (4 samples), 2008 (6 samples) and 2009 (1 sample). This small sample set indicated that none of these samples demonstrated any potential health risks to U.S. personnel. No samples of this type were collected in 2003 or 2005. As a result, these conclusions should be tempered by the limited data.

Camp Kabul - ISAF (one sample), Camp Julian (three samples), KMTC (eight samples), KAIA (four samples), Camp Morehead (7 samples), Camp Policharki (one sample), Camp New Sarobi (one sample), National Military Hospital (one sample), and Camp Dubbs (one sample): No samples collected demonstrated any potential health risks to U.S. personnel.

4.2.3 *Short and long-term health risks:*

None identified based on available sample data. All collected samples were below the short and long-term Negligible MEGs.

5 Military Unique

5.1 Chemical Biological, Radiological Nuclear (CBRN) Weapons

No specific hazard sources were documented in the Defense Occupational and Environmental Health Readiness System (DOEHRS), or the Military Exposure Surveillance Library (MESL) from 01 January 2003 to 31 December 2009 (References 1 and 5).

5.2 Depleted Uranium (DU)

No specific hazard sources were documented in the DOEHRS or MESL from 01 January 2003 to 31 December 2009 (References 1 and 5).

5.3 Ionizing Radiation

No specific hazard sources were documented in the DOEHRS or MESL from 01 January 2003 to 31 December 2009 (References 1 and 5).

5.4 Non-Ionizing Radiation

No specific hazard sources were documented in the DOEHRS or MESL from 01 January 2003 to 31 December 2009 (References 1 and 5).

6 Endemic Diseases

This document lists the endemic diseases reported in the region, its specific health risks and severity and general health information about the diseases. USCENTCOM Modification (MOD) 12 (Reference 6) lists deployment requirements, to include immunizations and chemoprophylaxis, in effect during the timeframe of this POEMS.

6.1 Foodborne and Waterborne Diseases

Food borne and waterborne diseases in the area are transmitted through the consumption of local food and water. Local unapproved food and water sources (including ice) are heavily contaminated with pathogenic bacteria, parasites, and viruses to which most U.S. Service Members have little or no natural immunity. Effective host nation disease surveillance does not exist within the country. Only a small fraction of diseases are identified or reported in host nation personnel. Diarrheal diseases are expected to temporarily incapacitate a very high percentage of U.S. personnel within days if local food, water, or ice is consumed. Hepatitis A and typhoid fever infections typically cause prolonged illness in a smaller percentage of unvaccinated personnel. Vaccinations are required for DoD personnel and contractors. In addition, although not specifically assessed in this document, significant outbreaks of viral gastroenteritis (e.g., norovirus) and food poisoning (e.g., *Bacillus cereus*, *Clostridium perfringens*, *Staphylococcus*) may occur. Key disease risks are summarized below:

Mitigation strategies were in place and included consuming food and water from approved sources, vaccinations (when available), frequent hand washing, and general sanitation practices.

6.1.1 *Diarrheal diseases (bacteriological)*

High, mitigated to Low: Diarrheal diseases are expected to temporarily incapacitate a very high percentage of personnel (potentially over 50% per month) within days if local food, water, or ice is consumed. Field conditions (including lack of hand washing and primitive sanitation) may facilitate person-to-person spread and epidemics. Typically mild disease treated in outpatient setting; recovery and return to duty in less than 72 hours with appropriate therapy. A small proportion of infections may require greater than 72 hours limited duty, or hospitalization.

6.1.2 *Hepatitis A, typhoid/paratyphoid fever, and diarrhea-protozoal*

High, mitigated to Low: Unmitigated health risk to U.S. personnel is high year round for hepatitis A and typhoid/paratyphoid fever, and Moderate for diarrhea-protozoal. Mitigation was in place to reduce the risks to low. Hepatitis A, typhoid/paratyphoid fever, and diarrhea-protozoal disease may cause prolonged illness in a small percentage of personnel (less than 1% per month). Although much rarer,

other potential diseases in this area that are also considered a Moderate risk include: hepatitis E, diarrhea-cholera, and brucellosis.

6.1.3 *Short-term health risks:*

Low: The overall unmitigated short-term risk associated with food borne and waterborne diseases are considered High (bacterial diarrhea, hepatitis A, typhoid/paratyphoid fever) to Moderate (diarrhea-cholera, diarrhea-protozoal, brucellosis, hepatitis E) if local food or water is consumed. Preventive Medicine measures reduced the risk to Low. Confidence in the health risk estimate is medium.

6.1.4 *Long-term health risks:*

None identified based on available data. Confidence in the health risk estimate is medium.

6.2 Arthropod Vector-Borne Diseases

During the warmer months, the climate and ecological habitat support populations of arthropod vectors, including mosquitoes, ticks, mites, and sandflies. Significant disease transmission is sustained countrywide, including urban areas. Malaria, the major vector-borne health risk in Afghanistan, is capable of debilitating a high percentage of personnel for up to a week or more. Mitigation strategies were in place and included proper wear of treated uniforms, application of repellent to exposed skin, and use of bed nets and chemoprophylaxis (when applicable). Additional methods included the use of pesticides, reduction of pest/breeding habitats, and engineering controls.

6.2.1 *Malaria*

High, mitigated to Low. Potential unmitigated risk to U.S. personnel is High during warmer months (typically April through November) but reduced to low with mitigation measures. Malaria incidents are often associated with the presence of agriculture activity, including irrigation systems and standing water, which provide breeding habitats for vectors. A small number of cases may occur among personnel exposed to mosquito (Anopheles spp.) bites. Malaria incidents may cause debilitating febrile illness typically requiring 1 to 7 days of inpatient care, followed by return to duty. Severe cases may require intensive care or prolonged convalescence.

6.2.2 *Leishmaniasis*

Moderate, mitigated to Low: The disease risk is Moderate during the warmer months when sandflies are most prevalent, but reduced to low with mitigation measures. Leishmaniasis is transmitted by sand flies. There are two forms of the disease; cutaneous (acute form) and visceral (a more latent form of the disease). The leishmaniasis parasites may survive for years in infected individuals and this infection may go unrecognized by physicians in the U.S. when infections become symptomatic years later. Cutaneous infection is unlikely to be debilitating, though lesions may be disfiguring. Visceral leishmaniasis disease can cause severe febrile illness which typically requires hospitalization with convalescence over 7 days.

6.2.3 *Crimean-Congo hemorrhagic fever*

Moderate, mitigated to Low: Unmitigated risk is moderate, but reduced to low with mitigation measures. Crimean-Congo hemorrhagic fever occurs in rare cases (less than 0.1% per month attack rate in indigenous personnel) and is transmitted by tick bites or occupational contact with blood or secretions from infected animals. The disease typically requires intensive care with fatality rates from 5% to 50%.

6.2.4 *Sandfly fever*

Moderate, mitigated to Low: Sandfly fever has a Moderate risk with potential disease rates from 1% to 10% per month under worst case conditions. Mitigation measures reduced the risk to low. The disease is transmitted by sandflies and occurs more commonly in children though adults are still at risk. Sandfly fever disease typically resulted in debilitating febrile illness requiring 1 to 7 days of supportive care followed by return to duty.

6.2.5 *Plague*

Low: Potential health risk to U.S. personnel is Low year round. Bubonic plague typically occurred as sporadic cases among people who come in contact with wild rodents and their fleas during work, hunting, or camping activities. Outbreaks of human plague are rare and typically occur in crowded urban settings associated with large increases in infected commensal rats (*Rattus rattus*) and their flea populations. Some untreated cases of bubonic plague may develop into secondary pneumonic plague. Respiratory transmission of pneumonic plague is rare but has the potential to cause significant outbreaks. Close contact is usually required for transmission. In situations where respiratory transmission of plague is suspected, weaponized agent must be considered. Extremely rare cases (less than 0.01% per month attack rate) could occur. Incidence could result in potentially severe illness which may require more than 7 days of hospitalization and convalescence.

6.2.6 *Typhus-miteborne (scrub typhus**)***

Moderate, mitigated to Low: Potential health risk to U.S. personnel is Moderate during warmer months (typically March through November) when vector activity is highest. Mitigation measures reduced the risk to low. Mite-borne typhus is a significant cause of febrile illness in local populations with rural exposures in areas where the disease is endemic. Large outbreaks have occurred when non-indigenous personnel such as military forces enter areas with established local transmission. The disease is transmitted by the larval stage of trombiculid mites (chiggers), which are typically found in areas of grassy or scrubby vegetation, often in areas which have undergone clearing and regrowth. Habitats may include sandy beaches, mountain deserts, cultivated rice fields, and rain forests. Although data are insufficient to assess potential disease rates, attack rates can be very high (over 50%) in groups of personnel exposed to heavily infected "mite islands" in focal areas. The disease can cause debilitating febrile illness typically requiring 1 to 7 days of inpatient care, followed by return to duty.

6.2.7 *West Nile fever*

Low: West Nile fever is present. The disease is maintained by the bird population and transmitted to humans via mosquito vector. Typically, infections in young, healthy adults were asymptomatic although fever, headache, tiredness, body aches (occasionally with a skin rash on trunk of body), and swollen lymph glands can occurred. This disease is associated with a low risk estimate.

6.2.8 *Short -term health risks:*

Low to Moderate: Low for, the plague, malaria, and West Nile fever and Moderate for leishmaniasis-cutaneous (acute), Crimean-Congo hemorrhagic fever, sandfly fever, typhus-miteborne. Health risk is reduced to low by proper wear of the uniform, application of repellent to exposed skin, and appropriate chemoprophylaxis. Confidence in health risk estimate was medium.

6.2.9 *Long-term health risks:*

Low: Low for leishmaniasis-visceral (chronic). Risk is reduced to Low by proper wear of the uniform and application of repellent to exposed skin. Confidence in the risk estimate is medium.

6.3 Water Contact Diseases

Operations or activities that involve extensive water contact may result in personnel being temporarily debilitated with leptospirosis in some locations. Leptospirosis health risk typically increases during flooding. In addition, although not specifically assessed in this document, bodies of surface water are likely to be contaminated with human and animal waste. Activities such as wading or swimming 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 potentially debilitating skin conditions such as bacterial or fungal dermatitis. Mitigation strategies were in place and included avoiding water contact and recreational water activities, proper wear of uniform (especially footwear), and protective coverings for cuts/abraded skin.

6.3.1 *Leptospirosis*

Moderate, mitigated to Low: Human infections occur seasonally (typically April through November) through exposure to water or soil contaminated by infected animals and is associated with wading, and swimming in contaminated, untreated open water. The occurrence of flooding after heavy rainfall facilitates the spread of the organism because as water saturates the environment leptospirosis present in the soil passes directly into surface waters. Leptospirosis can enter the body through cut or abraded skin, mucous membranes, and conjunctivae. Infection may also occur from ingestion of contaminated water. The acute, generalized illness associated with infection may mimic other tropical diseases (for example, dengue fever, malaria, and typhus), and common symptoms include fever, chills, myalgia, nausea, diarrhea, cough, and conjunctival suffusion. Manifestations of severe disease can include jaundice, renal failure, hemorrhage, pneumonitis, and hemodynamic collapse. Recreational activities involving extensive water contact may result in personnel being temporarily debilitated with leptospirosis. Incidence could result in debilitating febrile illness typically requiring 1 to 7 days of inpatient care, followed by return to duty; some cases may require prolonged convalescence. This disease is associated with a Moderate health risk estimate.

6.3.2 *Short-term health risks:*

Low: Unmitigated Health risk of leptospirosis is Moderate during warmer months. Mitigation measures reduce the risk to Low. Confidence in the health risk estimate is medium.

6.3.3 *Long-term health risks:*

None identified based on available data. Confidence in the health risk estimate is medium.

6.4 Respiratory Diseases

Although not specifically assessed in this document, deployed U.S. forces may be exposed to a wide variety of common respiratory infections in the local population. These include influenza, pertussis, viral upper respiratory infections, viral and bacterial pneumonia, and others. The U.S. military populations living in close-quarter conditions are at risk for substantial person-to-person spread of respiratory pathogens. Influenza is of particular concern because of its ability to debilitate large numbers of unvaccinated personnel for several days. Mitigation strategies were in place and included routine medical screenings, vaccination, enforcing minimum space allocation in housing units,

implementing head-to-toe sleeping in crowded housing units, implementation of proper personal protective equipment (PPE) when necessary for healthcare providers and detention facility personnel.

6.4.1 *Tuberculosis (TB)*

Moderate, mitigated to Low: Potential health risk to U.S. personnel is Moderate, mitigated to Low, year round. Transmission typically requires close and prolonged contact with an active case of pulmonary or laryngeal TB, although it also can occur with more incidental contact. The Army Surgeon General has defined increased risk in deployed Soldiers as indoor exposure to locals or third country nationals of greater than one hour per week in a highly endemic active TB region. Additional mitigation included active case isolation in negative pressure rooms, where available.

6.4.2 *Meningococcal meningitis*

Low: Meningococcal meningitis poses a Low risk and is transmitted from person to person through droplets of respiratory or throat secretions. Close and prolonged contact facilitates the spread of this disease. Meningococcal meningitis is potentially a very severe disease typically requiring intensive care; fatalities may occur in 5-15% of cases.

6.4.3 *Short-term health risks:*

Low: Moderate (TB) to Low (for meningococcal meningitis). Overall risk was reduced to Low with mitigation measures. Confidence in the health risk estimate is medium.

6.4.4 *Long-term health risks:*

None identified based on available data. Tuberculosis is evaluated as part of the post deployment health assessment (PDHA). A TB skin test is required post-deployment if potentially exposed and is based upon individual service policies.

6.5 Animal-Contact Diseases

6.5.1 *Rabies*

Moderate, mitigated to Low: Rabies posed a year-round moderate risk. Occurrence in local animals was well above U.S. levels due to the lack of organized control programs. Dogs are the primary reservoir of rabies in Afghanistan, and a frequent source of human exposure. Rabies is transmitted by exposure to the virus-laden saliva of an infected animal, typically through bites, but could occur from scratches contaminated with the saliva. A U.S. Army Soldier stationed in Afghanistan died of rabies on 31 August 2011 (Reference 7). Laboratory results indicated the Soldier was infected from contact with a dog while deployed. Although the vast majority (>99%) of persons who develop rabies disease will do so within a year after a risk exposure, there have been rare reports of individuals presenting with rabies disease up to six years or more after their last known risk exposure. Mitigation strategies included command emphasis of CENTCOM GO 1B, reduction of animal habitats, active pest management programs, and timely treatment of feral animal scratches/bites.

6.5.2 *Anthrax*

Moderate, mitigated to Low: Anthrax cases are rare in indigenous personnel, and pose a Low risk to U.S. personnel. Anthrax is a naturally occurring infection; cutaneous anthrax is transmitted by direct contact with infected animals or carcasses, including hides. Eating undercooked infected meat may result in contracting gastrointestinal anthrax. Pulmonary anthrax is contracted through inhalation of

spores and is extremely rare. Mitigation measures included consuming approved food sources, proper food preparation and cooking temperatures, avoidance of animals and farms, dust abatement when working in these areas, vaccinations, and proper PPE for personnel working with animals.

6.5.3 *Q-Fever*

Moderate, mitigated to Low: Potential health risk to U.S. personnel is Moderate, but mitigated to Low, year round. Rare cases are possible among personnel exposed to aerosols from infected animals, with clusters of cases possible in some situations. Significant outbreaks (affecting 1-50%) can occur in personnel with heavy exposure to barnyards or other areas where animals are kept. Unpasteurized milk may also transmit infection. The primary route of exposure is respiratory, with an infectious dose as low as a single organism. Incidence could result in debilitating febrile illness, sometimes presenting as pneumonia, typically requiring 1 to 7 days of inpatient care followed by return to duty. Mitigation strategies in place as listed in paragraph 6.5.2 except for vaccinations.

6.5.4 *H5N1 avian influenza*

Low: Potential health risk to U.S. personnel is Low. Although H5N1 avian influenza (AI) is easily transmitted among birds, bird-to-human transmission is extremely inefficient. Human-to-human transmission appears to be exceedingly rare, even with relatively close contact. Extremely rare cases (less than 0.01% per month attack rate) could occur. Incidence could result in very severe illness with fatality rate higher than 50 percent in symptomatic cases. Mitigation strategies included avoidance of birds/poultry and proper cooking temperatures for poultry products.

6.5.5 *Short-term health risks:*

Low: The short-term unmitigated risk is Moderate for rabies, anthrax, and Q-fever to Low for H5N1 avian influenza. Mitigation measures reduced the overall risk to Low. Confidence in risk estimate is medium.

6.5.6 *Long-term health risks:*

Low: A Low long term risk exists for rabies because, in rare cases, the incubation period for rabies can be several years.

7 Venomous Animal/Insect

All information was taken directly the Armed Forces Pest Management Board (Reference 8) and the Clinical Toxinology Resources web site from the University of Adelaide, Australia (Reference 9). The species listed below have home ranges that overlap the location of Kabul and vicinity, and may present a health risk if they are encountered by personnel. See Section 9 for more information about pesticides and pest control measures.

7.1 Spiders

- *Latrodectus dahlia* (widow spider): Severe envenoming possible, potentially lethal. However, venom effects are mostly minor and even significant envenoming is unlikely to be lethal.

7.2 Scorpions

- *Mesobuthus caucasicus, Mesobuthus eupeus, Mesobuthus macmahoni, Orthochirus afghanus,*

Orthochirus. Jalalabadensis, Orthochirus pallidus, Orthochirus samrchelsis: There are a number of dangerous Buthid scorpions, but there are also some known to cause minimal effects only. Without clinical data it is unclear where these species fit within that spectrum.

- *Hottentotta alticola*, and *Hottentotta saulcyi*: Moderate envenoming possible but unlikely to prove lethal. Stings by these scorpions are likely to cause only short lived local effects, such as pain, without systemic effects.

- *Scorpiops afghanus*: Mild envenoming only, not likely to prove lethal. Stings by these scorpions are likely to cause only short lived local effects, such as pain, without systemic effects.

7.3 Snakes

- *Gloydius halys* (Haly's pit viper): Severe envenoming possible, potentially lethal. Bites may cause moderate to severe coagulopathy and haemorrhagins causing extensive bleeding.

- *Hemorrhis ravergieri* (mountain racer): Unlikely to cause significant envenoming. Bites require symptomatic treatment only.

- *Macrovipera lebetina obtusa* (Lebetine viper), *and Macrovipera lebetina turanica* (*Turan blunt-nosed viper*): Severe envenoming possible, potentially lethal. Bites may cause mild to severe local effects, shock & coagulopathy.

- *Naja oxiana* (Oxus cobra): Severe envenoming possible, potentially lethal. Bites can cause systemic effects, principally flaccid paralysis.

- *Platyceps rhodorachis* (Jan's desert racer): Mild envenoming only, not likely to prove lethal. Requires symptomatic treatment only.

7.4 *Short-term health risk:*

Low: If encountered, effects of venom vary with species from mild localized swelling (e.g. widow spider) to potentially lethal effects (e.g., Haly's Pit Viper). See effects of venom above. Mitigation strategies included avoiding contact, proper wear of uniform (especially footwear), and timely medical treatment. Confidence in the health risk estimate is low (Reference 4, Table 3-6).

7.5 *Long-term health risk:*

None identified.

8 Heat/Cold Stress

8.1 Heat

Precipitation is concentrated in the winter (snow) and spring months. Summers are long and hot (temperatures range from 58 degrees Fahrenheit (°F) to 90 °F) but have very low humidity. Fall (October and November) is warm and dry. Winters are cold but short, lasting from December to March (temperature range: 19 °F to 40 °F). Spring in Kabul starts in late March and is the wettest time of the year (average rainfall for March is 3 inches). Work intensity and clothing/equipment worn pose greater health risk of heat stress/injury than environmental factors alone (Reference 9). Managing risk of hot weather operations included monitoring work/rest periods, proper hydration, and taking individual risk

factors (e.g., acclimation, weight, and physical conditioning) into consideration. Risk of heat stress/injury was reduced with preventive measures

8.1.1 *Short-term health risk:*

Low to High, mitigated to Low: The risk of heat injury was reduced to low through preventive measures such as work/rest cycles, proper hydration and nutrition, and monitoring Wet Bulb Globe Temperature (WBGT). Risk of heat injury in unacclimatized or susceptible populations (older, previous history of heat injury, poor physical condition, underlying medical/health conditions), and those under operational constraints (equipment, PPE, vehicles) is High from June - September, Moderate from April – May and October – November, and Low from December – March. Confidence in the health risk estimate is low (Reference 4, Table 3-6).

8.1.2 *Long-term health risk:*

Low: The long-term risk is Low. However, the risk may be greater for certain susceptible persons– those older (i.e., greater than 45 years), in lesser physical shape, or with underlying medical/health conditions. Long-term health implications from heat injuries are rare but may occur, especially from more serious injuries such as heat stroke. It is possible that high heat in conjunction with various chemical exposures may increase long-term health risks, though specific scientific evidence is not conclusive. Confidence in these risk estimates is medium (Reference 4, Table 3-6).

8.2 Cold

8.2.1 *Short-term and health risks:*

Winter (December - March) mean daily minimum temperatures range from 19 °F to 40 °F. Because even on warm days a significant drop in temperature after sunset by as much as 40 °F can occur, there is a risk of cold stress/injury from December – March. The risk assessment for Non-Freezing Cold Injuries (NFCI), such as 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 (Reference 10).

Low: The health risk of cold injury is Low. Confidence in the health risk estimate is medium.

8.2.2 *Long-term health risk:*

Low: The health risk of cold injury is Low. Confidence in the health risk estimate is high.

9 Noise

9.1 Continuous

No continuous noise evaluations were conducted.

9.1.1 *Short and long-term health risks:*

Not evaluated

9.2 Impulse

No impulse noise evaluations were conducted.

9.2.1 *Short-term and long-term health risks:*

Not evaluated.

10 Unique Incidents/Concerns

10.1 Potential environmental contamination sources

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 exposure last, what is done to the material, the environment where the task or operation is performed, and what controls are used. The hazards can include exposures to heavy metal particulates (e.g., lead, cadmium, manganese, chromium, and iron oxide), solvents, fuels, oils, and gases (e.g., carbon monoxide, carbon dioxide, oxides of nitrogen, and oxides of sulfur). Most of these exposures occur when performing maintenance task such as painting, grinding, welding, engine repair, or movement through contaminated areas. Exposures to these occupational hazards can occur through inhalation (air), skin contact, or ingestion; however exposures through air are generally associated with the highest health risk.

10.2 Waste Sites/Waste Disposal

There was very limited information about solid waste management in U.S. portions of the joint camps. The prevailing solid waste management issues included a lack of lids for trash cans in food preparation areas, and dumpsters being left open and/or not cleaned regularly. The dumpsters had no plugged drains to allow cleaning. There was no information about how wastes were disposed of at either camp, such as by landfilling or burning.

10.2.1 *Short-term and long-term risks:*

Moderate: Confidence in the health risk assessment is medium (Reference 4, Table 3-6).

10.3 Fuel/petroleum products/industrial chemical spills

There are aboveground storage tanks on Camp Phoenix, 35 thousand (K) Liter mogas and 25 K Liter diesel. No fuel/petroleum products or chemical spills were noted in the environmental Baseline survey.

10.3.1 *Short-term and long-term risks:*

Low: Confidence in the health risk assessment is low (Reference 4, Table 3-6).

10.4 Pesticides/Pest Control:

The health risk of exposure to pesticide residues is considered within the framework of typical residential exposure scenarios, based on the types of equipment, techniques, and pesticide products that have been employed, such as enclosed bait stations for rodenticides, various handheld equipment for spot treatments of insecticides and herbicides, and a number of ready-to-use (RTU) methods such as aerosol cans and baits. The control of rodents required the majority of pest management inputs, with the acutely toxic rodenticides staged as solid formulation lethal baits placed in tamper-resistant bait

stations indoors and outdoors throughout cantonment areas. Nuisance insects, including biting and stinging insects such as bees, wasps, and ants, also required significant pest management inputs. Use of pesticides targeting against these pests generally involved selection of compounds with low mammalian toxicity and short-term residual using pinpoint rather than broadcast application techniques. There are historical reports of mosquitoes, ticks, and sandflies on site which are controlled for through the application of pesticides. Several monthly Pesticide Application Reports in the MESL data portal for Kabul January 2003-December 2009 list the usage of pesticides on the site. There were no reports that indicated accidents, misuse, misapplication or other hazards associated with pesticide use.

10.4.1 Rodenticides

Bromadialone, brodifacoum, bromethalin, diphacinone, and zinc phosphide were used to control rodents.

10.4.2 Insecticides

Insecticides used to control ants, bees, crickets, fleas, flies, lice, mosquitoes, spiders, termites, and wasps include: hydramethylnon, nithiazine, fipronil, imidacloprid, d-trans allethrin, phenothrin, methomyl, beta-cyfluthrin, deltamethrin, permethrin, hydramethylnon, pyrethrins, piperonyl butoxide, MGK-264, deltamethrin, (S)-methoprene, Bacillus thuringiensis var. israelensis, beta-cyfluthrin, fipronil deltamethrin, pyrethrins, beta-cyfluthrin, lambda-cyhalothrin, piperonyl butoxide, MGK-264 , hydramethylnon, fipronil, (S)-hydroprene, bifenthrin.

10.4.3 Herbicides

Glyphosate was used to control weeds.

10.4.4 *Short-term and long-term health risks:*

Low: Confidence in the health risk assessment is low to medium (Reference 4, Table 3-6).

10.5 Asbestos

There is no specific information available to assess this hazard. However, Camp Phoenix was originally a huge junkyard and an abandoned tractor trailer park. Asbestos resulting from third world sources including vehicles would reasonably be expected.

10.5.1 *Short-term and long-term risks:*

Unknown.

10.6 Lead Based Paint

There is no specific information available to assess this hazard. However, Camp Phoenix was originally a huge junkyard and an abandoned tractor trailer park in a third world country. Lead based paint would reasonably be expected.

10.6.1 *Short-term and long-term risks:*

Unknown.

10.7 Burn Pits

There were no known burn pits located at Kabul and vicinity during this time period.

10.7.1 *Short-term and long-term health risks:*

None.

11 References[1]

1. Defense Occupational and Environmental Health Readiness System (referred to as the DOEHRS-EH database) at https://doehrs-ih.csd.disa.mil/Doehrs/. Department of Defense (DoD) Instruction 6490.03, *Deployment Health*, 2006.

2. DoDI 6055.05, Occupational and Environmental Health, 2008.

3. Joint Staff Memorandum (MCM) 0017-12, Procedures for Deployment Health Surveillance, 2012.

4. USAPHC TG230, June 2013 Revision.

5. DoD MESL Data Portal: https://mesl.apgea.army.mil/mesl/.Some of the data and reports used may be classified or otherwise have some restricted distribution.

6. Modification 12 to United States Central Command Individual Protection and Individual Unit Deployment Policy, 2 December 2013.

7. CDC. 2012. Morbidity and Mortality Weekly Report. Imported Human Rabies in a U.S. Army Soldier. May 4, 2012. 61(17); 302-305.

8. Armed Forces Pest Management Board: http://www.afpmb.org/content/venomous-animals-country#Afghanistan. U.S. Army Garrison - Forest Glen, Silver Spring, MD.

9. Clinical Toxinology Resources: http://www.toxinology.com/. University of Adelaide, Australia.

10. Goldman RF. 2001. Introduction to heat-related problems in military operations. *In*: Textbook of military medicine: medical aspects of harsh environments Vol. 1, Pandolf KB, and Burr RE (Eds.), Office of the Surgeon General, Department of the Army, Washington DC.

11. Sharkey JM, Abraham JH, Clark LL, Rohrbeck P, Ludwig SL, Hu Z, Baird CP. 2015. Post-deployment Respiratory Healthcare Encounters following Deployment to Kabul, Afghanistan: A Retrospective Cohort Study. Mil Med. Accepted for Publication. Abstract: Inhalational hazards are numerous in operational environments.

[1] NOTE. The data are currently assessed using the 2013 TG230 version. The general method involves an initial review of the data which eliminates all chemical substances not detected above 1-yr negligible MEGs. 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 water (soil is only evaluated for long term risk). This is performed by deriving separate short-term and long term population exposure level and 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 SMEs, which includes comparison to any available marginal, critical or catastrophic MEGs. For drinking water 15 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 2 L/day (similar to the EPA) which is derived by multiplying the 5 L/day MEG by a factor of 2.5. This value is used to conservatively assess non drinking 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 DoD Force Health Protection and Readiness (FHP & R).
Army Institute of Public Health Phone: (800) 222-9698. http://phc.amedd.army.mil/
Navy and Marine Corps Public Health Center (NMCPHC) (formerly NEHC) Phone: (757) 953-0700. www.nmcphc.med.navy.mil
U.S. Air Force School of Aerospace Medicine (USAFSAM) (formerly AFIOH) Phone: (888) 232-3764. http://www.wpafb.af.mil/afrl/711hpw/usafsam.asp
DoD Force Health Protection and Readiness (FHP & R) Phone: (800) 497-6261. http://fhp.osd.mil