

Military Deployment
Periodic Occupational and Environmental Monitoring Summary (POEMS):
Karshi-Khanabad Airbase, Uzbekistan:
2001 to 2005

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 DoD assessment of Occupational and Environmental Health (OEH) risk for Camp Stronghold Freedom at Karshi-Khanabad (K2) Airbase, Uzbekistan. 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 October 2001 through April 2005 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 K2 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 October 2001 through April 2005.

The POEMS can be useful to inform healthcare providers and others of environmental conditions experienced by individuals deployed to K2 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 records on a Standard Form (SF) 600 (Chronological Record of Medical Care).

SITE DESCRIPTION: Karshi-Khanabad is located at on old Soviet-era airbase in the arid Qashqadaryo Province near the border with Tajikistan. K2 is one square mile of flat to rolling terrain. The elevation of K2 is 416 meters above sea level. The U.S. Air Force occupied the base between 2001 and 2005. In July 2005, the Uzbekistan government asks the U.S. to withdraw military operations from Khanabad. The U.S. vacated in November 2005. Currently, K2 Airbase is home to the 60th Separate Mixed Aviation brigade of the Uzbek Air Force.

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 K2. 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 K2, Uzbekistan:

Inhalable coarse particulate matter less than 10 micrometers in diameter (PM₁₀); food/waterborne diseases (e.g., bacterial diarrhea, Hepatitis A, Typhoid fever, Brucellosis, diarrhea-protozoal, Hepatitis E); other endemic diseases (cutaneous leishmaniasis, Crimean-Congo hemorrhagic fever, plague, Leptospirosis, Tuberculosis (TB), Rabies, Anthrax, Q fever), heat stress, and continuous noise. For food/waterborne diseases (e.g., bacterial diarrhea, hepatitis A, Typhoid fever, Brucellosis, diarrhea-protozoal, Hepatitis E), if ingesting local food and water, the health effects could have temporarily incapacitate personnel (diarrhea) or result in prolonged illness (Hepatitis A, Typhoid fever, Hepatitis E, and Brucellosis). For heat stress, risk can be greater for susceptible persons including those older than 45, of low fitness level, who are unacclimatized, or with underlying medical conditions. Risks from food/waterborne diseases and heat stress may have been reduced with preventive medicine controls and mitigation, which includes Hepatitis A and Typhoid fever vaccinations. For other vector-borne endemic diseases (cutaneous leishmaniasis, Crimean-Congo hemorrhagic fever, plague), these diseases may constitute a significant risk due to exposure to biting vectors. For water contact diseases (Leptospirosis) activities involving extensive contact with surface water increase risk. For respiratory diseases (Tuberculosis (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 continuous noise exposure, the risk is to individuals working near major noise sources. Risk may have been reduced to the majority of personnel and to individuals working near major noise sources by using proper hearing protection. For PM₁₀, exposures 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. For PM₁₀, 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 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 Karshi-Khanabad Airbase. Personnel who reported with symptoms or required treatment while at this site should have exposure/treatment noted in medical record 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 K2, Uzbekistan:

For continuous noise exposure, the long-term risk is to individuals working near major noise sources. Risk may have been reduced to the majority of personnel and to individuals working near major noise sources by using proper hearing protection. It is considered possible that some otherwise healthy personnel who were exposed for a long-term period to airborne particulate matter 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 particulate matter exposures are documented and archived, at this time there are 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, or occupational or specific personal dosimeter data) when assessing individual concerns. 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 – Karshi-Khananbad Airbase, Uzbekistan ^{1,2}

Source of Identified Health Risk ³	Unmitigated Health Risk Estimate ⁴	Control Measures Implemented	Residual Health Risk Estimate ⁴
AIR			
PM ₁₀	Short-term: 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/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: Low to none, 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/existing respiratory diseases).
	Long-term: No health guidelines		Long-term: No health guidelines
WATER			
Water for Other Purposes	Short-term: Low	Water treated in accordance with standards applicable to its intended use	Short-term: Low
	Long-term: None identified		Long-term: None identified
Military Unique			
Depleted Uranium (DU)	Short-term: Low. Inhalation of contaminated dust from activities and events (i.e., driving/resuspension dust storms) was a potential concern.		Short-term: Low. Inhalation of contaminated dust from activities and events (i.e., driving/resuspension dust storms) was a potential concern.
	Long-term: None identified.		Long-term: None identified.
ENDEMIC DISEASE			
Food borne/Waterborne (e.g., diarrhea-bacteriological)	Short-term: High, (Bacterial diarrhea, Hepatitis A, Typhoid fever) to Moderate (Diarrhea-protozoal, Brucellosis, Hepatitis E) to Low (Diarrhea-cholera, Tularemia). If ingesting local food/water, the health effects can temporarily incapacitate personnel (diarrhea) or result in prolonged illness (Hepatitis A, Typhoid fever, Brucellosis, Hepatitis E).	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: Not an identified source of health risk.		Long-term: No data available
Arthropod Vector Borne	Short-term: Moderate, (Leishmaniasis-cutaneous, Crimean-Congo hemorrhagic fever, Plague) to Low (Malaria, Lyme disease, Tick-borne encephalitis (TBE), typhus-murine, Leishmaniasis-visceral, California group viruses, Rickettsioses, Sindbis, Sandfly fever, and West Nile fever).	Preventive measures include proper wear of treated uniform, application of repellent to exposed skin and bed net use.	Short-term: Low
	Long-term: Low (Leishmaniasis-visceral infection)		Long-term: No data available

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Water-Contact (e.g. wading, swimming)	Short-term: Moderate for Leptospirosis.	Recreational swimming in surface waters not likely in this area of Iraq during this time period.	Short-term: Low to none Leptospirosis.
	Long-term: No data available		Long-term: No data available
Respiratory	Short-term: Moderate [Tuberculosis (TB)] and Low (Meningococcal meningitis).	Providing adequate work and living space; medical screening, and vaccination.	Short-term: Low to none
	Long-term: No data available		Long-term: No data available
Animal Contact	Short-term: Moderate (Rabies, Q-fever, Anthrax), Low (H5N1 Avian Influenza)	Prohibiting contact with, adoption, or feeding of feral animals IAW CENTCOM General Order 1B. Risks are further reduced in the event of assessed contact by prompt post-exposure rabies prophylaxis IAW the CDC's ACIP guidelines.	Short-term: Low to none
	Long-term: Low (Rabies)		Long-term: No data available
HEAT/COLD STRESS			
Heat	Short-term: Moderate to High; Risk of heat injury in unacclimatized personnel.	Work-rest cycles, proper hydration and nutrition, and Wet Bulb Globe Temperature (WBGT) monitoring.	Short-term: Moderate to High mitigated to Low.
	Long-term: Low, 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.		Long-term: 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	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 were rare but could occur, especially from more serious injuries such as frostbite.		Long-term: Low; Long-term health implications from cold injuries were rare but could occur, especially from more serious injuries such as frostbite.
NOISE			
Continuous (Flightline, Power Production)	Short-term: High to Low, High risk to individuals working near major noise sources without proper hearing protection.	Risks reduced by the use of hearing protection and noise barriers.	Short-term: High to Low mitigated to Low risk to the majority of personnel and to individuals working near major noise sources who use proper hearing protection.
	Long-term: High to Low, High risk to individuals working near major noise sources without proper hearing protection.		Long-term: High to Low mitigated to Low risk to the majority of personnel and to individuals working near major noise sources who use proper hearing protection.

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Unique Incidents/Concerns			
Fuel/Petroleum Products/Industrial Chemical Spills	Short-term: Low		Short-term: Low to None
	Long-term: Low		Long-term: Low to None
Asbestos	Short-term: Low		Short-term: Low to None
	Long-term: Low		Long-term: Low to None
Pesticides/Pest Control	Short-term: Low		Short-term: Low health risk from pesticide exposure.
	Long-term: Low		Long-term: Low health risk from pesticide exposure.

IAW: in accordance with
 CDC: Centers for Disease Control and Prevention
 ACIP: Advisory Committee on Immunizations Practice

¹ This Summary Table provides a qualitative estimate of population-based short- and long-term health risks associated with the general ambient and occupational environment conditions at K2. It does not represent a unique 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 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 data and reports obtained from the October 2001 through April 2005 timeframe. It is considered a current representation of general site conditions but may not reflect certain fluctuations or unique exposure incidents. Acute health risk estimates are generally consistent with field-observed health effects.

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 K2. The health risks are presented as Low, Moderate, High or Extremely High for both short- and long-term 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 APHC/AIPH. Where applicable, "None Identified" is used when though an exposure was identified, no health risk of either a specific short- or long-term health effects were determined. More detailed descriptions of OEH exposures that were 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 K2 Airbase, Uzbekistan by Source

The following sections describe the major source categories of potential health risk that were evaluated at K2, Uzbekistan. For each category, the evaluation process includes identifying what, if any, specific sub-categories/health concerns are present. This initial step results in “screening out” certain health concerns that pose no identifiable health risk (for example if all data is below screening levels). While these sections may include sub-categories that have been determined to present no identifiable health risk, the summary table on the previous page only contains those sub-categories that were determined to pose some level of potential health risk.

2 Air

2.1 Site-Specific Sources Identified

Personnel deployed to Camp Stronghold Freedom were exposed to various airborne contaminants as identified by monitoring and sampling efforts between October 2001 and April 2005. Windblown dust and sand contribute to particulate matter (PM) exposures above health-based MEGs at K2. A number of industrial activities may have contributed to air contaminants. Primarily the operation of an airport but also construction, fuel storage and distribution, water and wastewater treatment were located on and around K2. Information pertaining to off-base industries is not available. The most common complaint was of a bad smell coming from a trench. During the 2001 Environmental Site Characterization and Operational Health Risk Assessment, widespread subsurface jet fuel plumes were discovered. The plumes, most likely the results of a leaking Soviet-era underground fuel distribution system, were the cause of the odor. The jet fuel source is assessed in Section 10 (Other Unique Occupational Hazards). The summary of results follows.

There was no sampling data for 2001 and 2003.

2.2 Particulate Matter, less than 10 microns (PM₁₀)

2.2.1 Sample data/Notes:

Exposure Guidelines:

Short Term (24-hour) PM₁₀ micrograms per cubic meter (µg/m³):

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

Long-term PM₁₀ MEG (µg/m³):

- Not defined and not available.

A total of 76 valid PM₁₀ air samples were collected from January 2002-April 2005. The range of 24-hour PM₁₀ concentrations was 6 µg/m³ –791 µg/m³ with an average concentration of 125 µg/m³. For 96% of the time during this period the PM₁₀ levels indicated there was not a hazard. Other risk levels observed during this time were low (approximately 1%), and high (approximately 3%). The 2005 sampling results were eliminated during the pre-screen because PM₁₀ did not exceed the 24-hour Negligible MEG.

2.2.2 Short-term health risk:

Variable (Low to High): The short-term PM₁₀ health risk assessment estimate was low to high based on typical and peak PM₁₀ concentrations, and the likelihood of exposure at these hazard severity levels. A low short-term health risk assessment estimate for typical PM₁₀ exposure concentrations at K2 suggested the expected losses have little or no impact on accomplishing the mission. A high health risk assessment estimate for peak PM₁₀ exposure concentrations suggested a significant degradation of mission capabilities with the inability to accomplish all parts of the mission, or the inability to complete the mission to standard if hazards occur during the mission (Reference 16, Table 3-2).

The hazard severity was negligible for average PM₁₀ sample concentrations. The results suggested that a few personnel may experience notable mild eye, nose, or throat irritation; most personnel may experience only mild effects. Pre-existing health conditions (e.g., asthma, or cardiopulmonary diseases) may be exacerbated.

The hazard severity was critical for the highest observed PM₁₀ sample concentrations. During peak exposures at the critical hazard severity level, most, if not all, personnel may have experienced very notable eye, nose and throat irritation respiratory effects. Some personnel may not be able to perform assigned duties. Some lost-duty days may be expected. Those with a history of asthma or cardiopulmonary disease may experience more severe symptoms.

2.2.3 Long-term health risk:

Not evaluated because there are no available health guidelines. The EPA retracted its long-term National Ambient Air Quality Standard (NAAQS) for PM₁₀ due to an inability to link chronic health effects with chronic PM₁₀ exposure levels.

2.3 Particulate Matter, less than 2.5 microns (PM_{2.5})

2.3.1 Sample data/Notes:

PM_{2.5} samples were not collected. PM_{2.5} was not evaluated.

2.3.2 Short- and Long term health risk

Not evaluated because samples were not collected.

Note: It is considered possible that some otherwise healthy personnel who were exposed for a long period to PM_{2.5} could develop certain health conditions (reduced lung function, cardiopulmonary disease). However, no sampling data was collected on PM_{2.5} to prove there was no risk from it. By definition, PM_{2.5} is considered a subset of PM₁₀, which was evaluated and did rise to the level of HIGH risk at times (See previous Section 2.2). Consequently, while it is acknowledged that there was no data collected on PM_{2.5}, or on what proportion the PM_{2.5} represented of the overall PM₁₀, there is no proof that it did not comprise a major proportion (i.e., "Absence of proof is not proof of absence."). Hence, because there are no data to prove it is not a problem, it is included in the medical summary as a potential short and long-term health risk for conservative prudent public health measures. Because the actual data collected was on PM₁₀, the more general 'particulate matter' term was used in the medical summary.

2.4 Airborne Metals from PM₁₀

2.4.1 Sample data/Notes:

Degree of risk was estimated based on comparison of metals results from 57 total air samples to specified MEGs. Samples were taken from January 2002–April 2005. None of the analyzed metals in the samples were found at concentrations above a short- or long-term MEG.

2.4.2 Short and Long-term health risks:

None identified based on the available sampling data. Confidence in the risk estimate is low.

2.5 Volatile Organic Compounds (VOCs)

2.5.1 Sample data/Notes:

Between January 2002 and September 2004, 82 samples were analyzed for organic chemical pollutants [70 Volatile Organic Compounds (VOCs) and 12 Polycyclic Aromatic Hydrocarbons (PAHs)]. None of the analyzed organic chemical pollutants was found at concentrations above a short- or long-term MEG. However, MEGs are not available for all analytes detected so the risk may be underestimated. Additionally, some chemicals were not evaluated. This may also influence the uncertainty in these conclusions.

2.5.2 Short and long-term health risk:

None identified based on 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. Confidence in risk estimate is low due to unavailable health guidelines for some chemicals.

3 Soil

3.1 Site-Specific Sources Identified

Karshi-Khanabad is located in the arid Qashqadaryo Province near the border with Tajikistan. K2 is one square mile of flat to rolling terrains. Several years prior to the U.S. occupying K2, Soviet missiles were destroyed there. This event contaminated some areas of surface dirt with low-level radioactive depleted uranium and asbestos. Eight soil samples were collected at Camp Stronghold Freedom between June 2002 and September 2004. Depleted Uranium is assessed in Section 5 (Military Unique). Asbestos is assessed in Section 10 (Other Unique Occupational Hazards).

3.1.1 Sample data/Notes:

Analytical data for the eight soil samples collected at K2 was assessed for metals, inorganics and organics chemicals. Of the eight soil samples in the areas identified, no parameters exceeded the TG 230 MEGs.

3.1.2 Short and Long-term health risk:

None identified based on available sampling data. Currently, sampling data for soil is not evaluated in acute risk assessment and all detected contaminants were below applicable 1-year negligible MEG.

4 Water

In order to assess the risk to U.S. personnel from exposure to water in theater, the Army Institute of Public Health (AIPH) identified the most probable exposure pathways based on available information. The water exposures considered were the ingestion of water used for drinking and the use of water for non-drinking purposes (such as personal hygiene, or showering).

4.1 Drinking Water

4.1.1 Sample data/Notes

Samples collected from drinking water supplies were sent to PHRC-Europe (formally USACHPPM-Europe) for analysis. No drinking water samples [bottled water or Reverse Osmosis Water Purification Unit (ROWPU)-treated water] were submitted to USAPHC for analysis.

4.1.2 Short and Long-term health risk

Not evaluated because samples were not available.

4.2 Water: Used for Other Purposes (Personal Hygiene, Showering, etc.)

4.2.1 Sample data/Notes

The ROWPU-treated water supply and the raw well water supply at Camp Stronghold Freedom were used for non-drinking purposes (i.e., cooking, personal hygiene, and showering, etc.) by U.S. personnel. Five water samples used for non-drinking purposes were collected and submitted to a laboratory for analysis. Samples were received in 2002, 2003, and 2004 from ROWPU-treated water sources and in 2004 from untreated, raw well water sources. Note that gross alpha and gross beta radiological results were collected for these water samples but were not included in the health risks assessment because gross radiological MEGS were unavailable.

4.2.2 Short-term health risk:

Low. After the pre-screen the hazards identified were chloride, chromium, magnesium, and sulfate. The maximum concentrations for these chemicals did not exceed the short-term MEGs, therefore there is no short-term health risk associated with the non-drinking water samples collected from K2. Confidence in risk estimate is low.

4.2.3 Long-term health risk:

None identified based on available data. Long term MEGs are not available for chloride, chromium, magnesium, and sulfate, therefore long-term health risk associated with these chemicals could not be evaluated. Confidence in risk estimate is low.

5 Military Unique

5.1 Chemical Biological, Radiological Nuclear (CBRN) Weapons:

In June 2002, a routine inspection revealed the possible presence of nerve and chemical agents in some areas of K2. However, confirmatory samples using specialized testing equipment were negative for chemical warfare agents. The false positive results were likely due to contaminants from recent painting and other refurbishing activities.

Short and Long-term health risk: None identified based on available data. Confidence in risk estimate is medium.

5.2 Depleted Uranium (DU):

Several years prior to the U.S. occupying K2, Soviet missiles were destroyed there. This event contaminated some areas of surface/subsurface dirt with low level radioactive depleted uranium. A 2001 environmental site characterization identified low radioactivity uranium which could be potentially harmful only if inhaled. The 2002 site survey and risk assessment found very small amounts of "processed" uranium, which was later identified as depleted uranium of non-U.S. origin present at an area outside of the perimeter of Camp Stronghold Freedom. No DU or any other radioactive material was found anywhere else at the site. The contaminated area was covered with clean fill in November 2001, fenced and marked off-limits. It was determined that the uranium posed minimal health risk. The radiation hazard from this material is low.

5.2.1 Short-term health risks:

Low. Air sampling did not find radiation present at levels above background.

5.2.2 Long-term health risks:

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

5.3 Ionizing Radiation:

The 2002 site survey and risk assessment found no identifiable ionizing radiological hazards for any areas within the K2 perimeter.

Short and Long-term health risk: None identified based on available data. Confidence in risk estimate is medium.

5.4 Non-Ionizing Radiation:

No specific hazard sources were documented in DOD OEHS Portal.

Short and Long-term health risk: None identified based on available data. Confidence in risk estimate is medium.

6 Endemic Disease¹

This document lists the endemic diseases reported in the region, its specific health risks and severity and general health information about the diseases. In addition, site-specific information from the MESL database was used. The modification 11 to the CENTCOM deployment health surveillance and force health protection regulation (Reference 15) lists deployment requirements, to include immunization and chemoprophylaxis, in effect during the period covered by 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.

6.1.1 Diarrheal diseases (bacteriological)

High, unmitigated; Low, mitigated: Unmitigated health risk to U.S. personnel was high year round. Mitigation strategies in place include consumption of approved food, water, and ice; handwashing; and applied food/water safety mechanisms. Diarrheal diseases (bacteriological) could be expected to temporarily incapacitate a very high percentage of personnel (potentially over 50 percent per month) within days if local food, water, or ice was consumed. Field conditions (including lack of hand washing and primitive sanitation) may facilitate person-to-person spread and epidemics. Typically, these result in 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

High, unmitigated; Low, mitigated: Unmitigated health risk to U.S. personnel was high year round. Mitigation strategies in place include immunization, consumption of approved food, water, and ice; handwashing; and applied food/water safety mechanisms. U.S. Personnel did not drink untreated water, and vaccination for Hepatitis A is required for deployment into the CENTCOM Area of Responsibility (AOR). Hepatitis A typically occurs after consumption of fecally contaminated food or water or through direct fecal-oral transmission under conditions of poor hygiene and sanitation. Field conditions (including primitive sanitation, lack of hand washing) may facilitate outbreaks driven by

¹ NOTE: "Risk" level refers to both severity of disease (without controls, for example vaccinations) and probability of disease based on local rates/endemic status. Diseases described are those presenting greater risk when compared with U.S. conditions. Most identified disease risks can and are being mitigated with military preventive medicine measures/policies.

person-to-person spread. A typical case involves 1 to 3 weeks of debilitating symptoms, sometimes initially requiring inpatient care; recovery and return to duty may require a month or more.

6.1.3 Typhoid/paratyphoid Fever

High, unmitigated; Low, mitigated: Unmitigated health risk to U.S. personnel was high year round. Mitigation strategies in place include immunization, consumption of approved food, water, and ice; handwashing; and applied food/water safety mechanisms. U.S. Personnel did not drink untreated water, and vaccination with typhoid fever vaccination is required for deployment into the CENTCOM AOR. Risk was typically highest following spring floods. Typhoid and paratyphoid fever are acquired through the consumption of fecally contaminated food or water. The two diseases are clinically similar, and in areas where they are endemic, typhoid typically accounts for 90 percent of cases. Asymptomatic carriers are common with typhoid and contribute to sustained transmission. In countries with a mixture of primitive and modern sanitation and hygiene, outbreaks of typhoid fever can occur and may involve all age groups. A small number of cases (less than 1% per month attack rate) could occur among unvaccinated personnel consuming local food, water, or ice. With appropriate treatment, typhoid and paratyphoid fever are debilitating febrile illnesses typically requiring 1 to 7 days of supportive care, followed by return to duty.

6.1.4 Diarrhea – protozoal

Moderate, unmitigated; Low, mitigated: Unmitigated health risk to U.S. personnel was moderate year round. Risk was typically highest following spring floods. Mitigation strategies in place include consumption of approved food, water, and ice; handwashing; and applied food/water safety mechanisms. In general, *Cryptosporidium* spp., *Entamoeba histolytica*, and *Giardia lamblia* were the most common protozoal causes of diarrhea wherever sanitary conditions were significantly below U.S. standards. A small number of cases (less than 1% per month attack rate) could occur among personnel consuming local food, water, or ice. Outbreaks affecting a higher percentage of personnel were possible with *Cryptosporidium*. Symptomatic cases may vary in severity; typically mild disease demonstrating recovery and return to duty in less than 72 hours with appropriate therapy; severe cases may require 1 to 7 days of supportive care, followed by return to duty.

6.1.5 Brucellosis

Moderate, unmitigated; Low, mitigated: Unmitigated health risk to U.S. personnel was moderate year round. Mitigation strategies in place include consumption of approved food, water and ice; handwashing; universal blood/fluid-borne pathogen protection when working with animals; and applied food/water safety mechanisms. Brucellosis is a common disease in cattle, sheep, goats, swine, and some wildlife species in most developing countries. Humans contract brucellosis through consumption of contaminated dairy products (or foods made with such products) or by occupational exposures to infected animals. The health risk from direct animal contact was likely to be highest in rural areas where livestock were present. The health risk from contaminated dairy products exists countrywide, including urban areas. Rare cases (less than 0.1% per month attack rate) could occur among personnel consuming local dairy products or having direct contact with livestock. With appropriate treatment, brucellosis is a febrile illness of variable severity, potentially requiring inpatient care; convalescence is usually over 7 days even with appropriate treatment.

6.1.6 Hepatitis E

Moderate, unmitigated; Low, mitigated: Unmitigated health risk to U.S. personnel was low year round. Mitigation strategies in place include consumption of approved food, water, and ice; hand washing; and applied food/water safety mechanisms. Risk was typically highest following spring floods. Hepatitis E occurs in four major genotypes. Genotypes 1 and 2, found primarily in Africa and Asia, cause large numbers of sporadic cases, as well as large outbreaks. Fecal contamination of drinking water is the most common source of exposure for these genotypes. Large outbreaks are usually associated with particularly severe breakdowns in baseline sanitation, as often occurs during heavy rainfall which increases mixing of sewage and drinking water sources. Secondary household cases from person-to-person transmission are uncommon. Unlike hepatitis A, where local populations living in poor sanitary conditions were usually highly immune from childhood exposures, immunity levels for hepatitis E were often much lower, even in areas of extremely poor sanitation. Typically, outbreaks of hepatitis E occur primarily among adults. Although data are insufficient to assess potential disease rates, we cannot rule out rates approaching 1 percent per month among personnel consuming local food, water, or ice. Rates may exceed 1 percent per month for personnel heavily exposed during outbreaks in the local population. Typical case involves 1 to 3 weeks of debilitating symptoms, sometimes initially requiring inpatient care; recovery and return to duty may require a month or more.

6.1.7 Tularemia

Low: Unmitigated health risk to U.S. personnel was low year round. Mitigation strategies in place include consumption of approved food, water, and ice; handwashing; and applied food/water safety mechanisms. The disease can be transmitted in multiple ways, including by eating infected meat, drinking water contaminated by infected animals, direct animal contact, animal bites, inhalation of contaminated dust, and arthropod vectors (including ticks, deer flies, and mosquitoes). Disease symptoms reflect the mode of transmission, with ulceroglandular forms associated with direct animal contact or vectors, pharyngeal and gastrointestinal forms associated with food- or waterborne outbreaks, and pneumonic or typhoidal forms associated with inhalation of contaminated dust. Rare cases (less than 0.1% per month) cannot be ruled out among personnel consuming local food, water, or ice. Potentially severe disease may require hospitalization and convalescence for over 7 days.

6.1.8 Diarrhea – cholera

Low: Unmitigated health risk to U.S. personnel was low year round. Mitigation strategies in place include consumption of approved food, water, and ice; handwashing; and applied food/water safety mechanisms. Development of symptomatic cholera requires exposure to large inoculums and typically is associated with ingestion of heavily contaminated food or water. Person-to-person spread of cholera occurs very infrequently, if at all. The majority of infections (75 percent or more, depending on biotype) among healthy adults are very mild or asymptomatic. Only a small percentage of infections are severe. Because cholera frequently causes serious public health impact, cholera cases are more likely to be reported under the International Health Regulations than other types of diarrhea. Rare cases (less than 0.1% per month attack rate) could occur among personnel consuming local food, water, or ice. Most symptomatic cases are mild, with recovery and return to duty in less than 72 hours on appropriate outpatient treatment; severe cases may require 1-7 days of supportive or inpatient care, followed by return to duty.

6.1.9 Short-term health risks:

High to Low, unmitigated; Low to None, mitigated: The overall short-term unmitigated health risk associated with other foodborne and waterborne diseases at K2 was considered high (for bacterial

diarrhea, hepatitis A, typhoid fever), moderate (for diarrhea-protozoal, brucellosis, hepatitis E), and low (tularemia, diarrhea-cholera) if local food or water was consumed. Preventive Medicine measures such as vaccinations, consumption of approved food, water, and ice; and handwashing reduced the health risk to low to none. Confidence in the risk estimate was medium.

6.1.10 Long-term health risks:

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

6.2 Arthropod Vector-Borne Diseases

During warmer months (typically from April through November), ecological conditions support populations of arthropod vectors, including mosquitoes, ticks, and sandflies, with variable rates of disease transmission. A variety of vector-borne diseases occur at low or unknown levels; as a group, these diseases may constitute a significant risk in the absence of mitigation measures. Personnel exposed to mosquitoes, ticks, sandflies, or other biting vectors were at risk during day or night.

6.2.1 Crimean-Congo hemorrhagic fever

Moderate, unmitigated; Low, mitigated: Unmitigated health risk to U.S. personnel was moderate year round with peak transmission from April-October. Crimean-Congo hemorrhagic fever (CCHF) infections can occur as sporadic cases or clusters of cases, and are associated with tick bites or occupational contact with blood or secretions from infected animals. Outbreaks of CCHF occur infrequently. It is a very severe illness typically requiring intensive care with fatality rates from 5% to 50%. Mitigation strategies in place include Individual Protective Measures (IPM) practices, proper wear of permethrin treated uniforms, application of repellent to exposed skin, use of bed nets (when applicable), reduction of pest/breeding habitats, and engineering controls.

6.2.2 Plague

Moderate, unmitigated; Low, mitigated: Unmitigated health risk to U.S. personnel was moderate year round. The risk was greatest during the summer (June through August) and autumn (September through November). It is reservoirized by rats and transmitted by their flea populations. Rare cases (less than 0.1% per month attack rate) could occur among personnel exposed to rodents and flea bites. Epidemic transmission is unlikely, but may occur under conditions of crowding, with heavy flea exposure and respiratory transmission. Potentially severe illnesses may require more than 7 days of hospitalization and convalescence. Mitigation strategies in place include IPM practices, proper wear of permethrin treated uniforms, application of repellent to exposed skin, use of bed nets (when applicable), reduction of pest/breeding habitats, and engineering controls.

6.2.3 Leishmaniasis-cutaneous

Moderate, unmitigated; Low, mitigated: Unmitigated health risk to U.S. personnel was moderate with seasonal transmission (April-October). Leishmaniasis-cutaneous (acute form) is transmitted by sandflies. A small number of cases (less than 1% per month attack rate) could occur among personnel exposed to sandfly bites in areas with infected people, rodents, dogs, or other reservoir animals. In groups of personnel exposed to heavily infected sandflies in focal areas, attack rates can be very high (over 50%). Mitigation strategies in place include IPM practices, proper wear of permethrin treated uniforms, application of repellent to exposed skin, use of bed nets (when applicable), reduction of pest/breeding habitats, and engineering controls. Cutaneous infection is

unlikely to be debilitating, though lesions can be disfiguring.

6.2.4 Malaria

Low: Unmitigated health risk to U.S. personnel was low with seasonal transmission (April-October). Malaria incidents are often determined based on the presence of agriculture activity, including irrigation systems, which provide breeding habitats for vectors. In the Uzbekistan region, a small number of cases (less than 0.1 percent per month attack rate) could occur among personnel exposed to mosquito bites, primarily at night. Malaria incidents can 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, and fatalities can occur. Mitigation strategies in place include IPM practices, proper wear of permethrin treated uniforms, application of repellent to exposed skin, use of bed nets (when applicable), reduction of pest/breeding habitats, and engineering controls.

6.2.5 Lyme disease

Low: Unmitigated health risk to U.S. personnel was low with seasonal transmission (April-October). Lyme disease, transmitted by tick bites, is present in the region. Rare cases are possible. Incidents can result in debilitating febrile illness typically requiring 1-7 days of inpatient care followed by return to duty. Severe cases may require prolonged convalescence. Mitigation strategies in place include IPM practices, proper wear of permethrin treated uniforms, application of repellent to exposed skin, use of bed nets (when applicable), reduction of pest/breeding habitats, and engineering controls.

6.2.6 Sandfly fever

Low: Unmitigated health risk to U.S. personnel was low with seasonal transmission (April-October). The disease is transmitted by sandflies, which typically bite at night and breed in dark places rich in organic matter, particularly in rodent or other animal burrows. Rare cases are possible. Abandoned dwellings, sometimes used by troops as temporary quarters, also can harbor significant numbers of sandflies. Although data are insufficient to assess potential disease rates, 1 to 10 percent of personnel could be affected per month under worst-case conditions with no mitigation measures in place. In small groups exposed to heavily infected sandfly populations in focal areas, attack rates can be very high (over 50 percent). Incidents can result in debilitating febrile illness typically requiring 1 to 7 days of supportive care followed by return to duty. Mitigation strategies in place include IPM practices, proper wear of permethrin treated uniforms, application of repellent to exposed skin, use of bed nets (when applicable), reduction of pest/breeding habitats, and engineering controls.

6.2.7 California group viruses

Low: Unmitigated health risk to U.S. personnel was low with seasonal transmission (April-October). California group viruses are maintained in an enzootic cycle involving mosquitoes and a variety of vertebrate reservoirs. The great majority of infections in adults are asymptomatic. Most symptomatic and severe cases occur in children. Rare cases (less than 0.1% per month) cannot be ruled out among personnel exposed to mosquito bites. Incidents can result in a mild to moderate febrile illness typically requiring 1 to 7 days of inpatient care followed by return to duty. Mitigation strategies in place include IPM practices, proper wear of permethrin treated uniforms, application of repellent to exposed skin, use of bed nets (when applicable), reduction of pest/breeding habitats, and engineering controls.

6.2.8 Tick-borne encephalitis (TBE)

Low: Unmitigated health risk to U.S. personnel was low with seasonal transmission (April-October). TBE infections occur as sporadic cases or outbreaks and are associated with tick bites. Rare cases (less than 0.1% per month) of TBE disease are possible among personnel exposed to tick bites. TBE is a potentially very severe disease sometimes requiring intensive care. Fatalities may occur in 1-5% of Central European encephalitis cases. Mitigation strategies in place include IPM practices, proper wear of permethrin treated uniforms, application of repellent to exposed skin, use of bed nets (when applicable), reduction of pest/breeding habitats, and engineering controls.

6.2.9 Rickettsioses, tickborne

Low: Unmitigated health risk to U.S. personnel was low with seasonal transmission (April-October). Rare cases (less than 0.1% per month) of rickettsioses disease are possible among personnel exposed to tick bites. Rickettsioses are transmitted by multiple species of hard ticks, including *Rhipicephalus* spp., which are associated with dogs. Other species of ticks, including *Ixodes* are also capable of transmitting rickettsial pathogens in this group. In addition to dogs, various rodents and other animals also may serve as reservoirs. Ticks are most prevalent from April through November. Incidents can result in debilitating febrile illness, which may require 1 to 7 days of supportive care followed by return to duty. Mitigation strategies in place include IPM practices, proper wear of permethrin treated uniforms, application of repellent to exposed skin, use of bed nets (when applicable), reduction of pest/breeding habitats, and engineering controls.

6.2.10 Sindbis

Low: Unmitigated health risk to U.S. personnel was low with seasonal transmission (April-October). Sindbis and sindbis-like viruses are maintained in a bird-mosquito cycle in rural areas and occasionally caused limited outbreaks among humans. The viruses are transmitted by a variety of *Culex* mosquito species found primarily in rural areas. A variety of bird species may serve as reservoir or amplifying hosts. Extremely rare cases (less than 0.01% per month attack rate) could have occurred seasonally (April - November). Debilitating febrile illness often accompanied by rash, typically requires 1 to 7 days of supportive care; significant arthralgias may persist for several weeks or more in some cases. Mitigation strategies in place include IPM practices, proper wear of permethrin treated uniforms, application of repellent to exposed skin, use of bed nets (when applicable), reduction of pest/breeding habitats, and engineering controls.

6.2.11 Typhus-murine (fleaborne)

Low: Unmitigated health risk to U.S. personnel was with seasonal transmission (April-October). Typhus-murine is assessed as present, but at unknown levels. Rare cases are possible among personnel exposed to rodents (particularly rats) and fleabites. Incidents may result in debilitating febrile illness typically requiring 1 to 7 days of supportive care followed by return to duty. Mitigation strategies in place include IPM practices, proper wear of permethrin treated uniforms, application of repellent to exposed skin, use of bed nets (when applicable), reduction of pest/breeding habitats, and engineering controls.

6.2.12 West Nile fever

Low: Unmitigated health risk to U.S. personnel was low with seasonal transmission (April-October). West Nile fever was present and maintained by the bird population and mosquitoes that help to

transfer the diseases from birds to humans. The majority of infections in young, healthy adults are asymptomatic although it can result in fever, headache, tiredness, and body aches, occasionally with a skin rash (on the trunk of the body) and swollen lymph glands. West Nile fever is a febrile illness typically requiring 1-7 days of inpatient care followed by return to duty; convalescence may be prolonged. Mitigation strategies in place include IPM practices, proper wear of permethrin treated uniforms, application of repellent to exposed skin, use of bed nets (when applicable), reduction of pest/breeding habitats, and engineering controls.

6.2.13 Leishmaniasis – visceral

Low: Unmitigated health risk to U.S. personnel was moderate with seasonal transmission (April-October). Leishmaniasis-visceral is transmitted by sandflies. Rare cases are possible among personnel exposed to sandfly bites in areas with infected humans, dogs, or other reservoir animals. Asymptomatic chronic infections may occur and may become symptomatic years later. When symptomatic, visceral leishmaniasis causes a severe febrile illness, which typically requires hospitalization with convalescence over 7 days. Mitigation strategies in place include IPM practices, proper wear of permethrin treated uniforms, application of repellent to exposed skin, use of bed nets (when applicable), reduction of pest/breeding habitats, and engineering controls.

6.2.14 Short-term health risks:

Moderate to Low, unmitigated; Low to None, mitigated: The overall short-term unmitigated health risk associated with arthropod vector-borne diseases at K2 was considered Moderate (for Crimean-Congo hemorrhagic fever, plague, and leishmaniasis-cutaneous) and Low (for malaria, tick-borne encephalitis (TBE), leishmaniasis-visceral, California group viruses, lyme disease, rickettsioses, sandfly fever, typhus-murine (fleaborne), West Nile fever, and sindbis). Preventive measures such as IPM practices, proper wear of treated uniforms and application of repellent to exposed skin reduced the health risk to low to none for arthropod vector-vector borne diseases. Confidence in the risk estimate was medium.

6.2.15 Long-term health risks:

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

6.3 Water Contact Diseases

Tactical operations or recreational activities that involve extensive contact with surface water such as lakes, streams, rivers, or flooded fields may result in significant exposure to leptospirosis. Arid portions of Iraq without permanent or persistent bodies of surface water do not support transmission of leptospirosis. Risk was restricted primarily to areas along rivers and lakes. These diseases can debilitate personnel for up to a week or more. Leptospirosis 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 exposure to enteric diseases including 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 including bacterial or fungal dermatitis.

6.3.1 Leptospirosis

Moderate, unmitigated; Low, mitigated: Unmitigated health risk to U.S. personnel was moderate with seasonal transmission (April--October). Leptospirosis is present in Uzbekistan but at unknown levels. Human infection occurs through exposure to water or soil contaminated by infected animals and has been 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 pass directly into surface waters. Leptospirosis can enter the body through cut or abraded skin, mucous membranes, and conjunctivae. Ingestion of contaminated water can also lead to infection. The acute generalized illness associated with infection can 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.

6.3.2 Short-term health risks:

Moderate, unmitigated; Low to None, mitigated: The overall short-term unmitigated health risk associated with water contact disease at K2 was considered moderate (for leptospirosis). Preventive measures such as avoiding water contact and recreational water activities; and protective coverings for cuts/abraded skin reduced the health risk to low to none. Confidence in the risk estimate was medium.

6.3.3 Long-term health risks:

None identified based on available data. Confidence in the risk estimate was 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.

6.4.1 Tuberculosis (TB)

Moderate, unmitigated; Low, mitigated: Unmitigated health risk to U.S. personnel was moderate year round. Tuberculosis (TB) is usually transmitted through close and prolonged exposure to an active case of pulmonary or laryngeal TB, but can also occur with incidental contact. The risk of TB in U.S. forces varies with individual exposure. TB was evaluated as part of the Post Deployment Health Assessment (PDHA). Mitigation strategies include routine medical screenings; 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 (treating active case, detainee operations); and active case isolation in negative pressure rooms, where available.

6.4.2 Meningococcal meningitis

Low: Unmitigated health risk to U.S. personnel was low year round. Meningococcal meningitis is transmitted from person to person through droplets of respiratory or throat secretions. Risk is comparable to the U.S. among unvaccinated personnel who have close contact with the local population. Close and prolonged contact facilitates the spread of this disease. Meningococcal meningitis is a potentially very severe disease typically requiring intensive care; fatalities may occur in 5-15% of cases. Mitigation strategies include routine medical screenings; enforcing minimum space allocation in housing units; implementing head-to-toe sleeping in crowded housing units; implementation of proper PPE, when necessary (treating active case, detainee operations); and active case isolation in negative pressure rooms, where available. Additional measures include vaccination and frequent sanitation of common use items (phones, door handles) and areas.

6.4.3 Short-term health risks:

Moderate to Low, unmitigated; Low to None, mitigated: The overall short-term unmitigated health risk associated with respiratory diseases at K2 was considered moderate (for tuberculosis) to low (for meningococcal meningitis). Preventive measures such as vaccination; routine medical screenings; and active case isolation in negative pressure rooms reduced the health risk to low to none. Confidence in the risk estimate was medium.

6.4.4 Long-term health risks:

None identified based on available data. TB was evaluated as part of the Post Deployment Health Assessment (PDHA). A TB skin test was required post-deployment if potentially exposed and was based upon individual service policies.

6.5 Animal-Contact Diseases

6.5.1 Rabies

Moderate, unmitigated; Low, mitigated: Unmitigated health risk to U.S. personnel was moderate year round. Occurrence is well above U.S. levels due to the lack of organized control programs. Dogs are the primary sources of human exposure to rabies in Uzbekistan, and canine rabies is the most common rabies strain. 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. 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 Q-Fever

Moderate, unmitigated; Low, mitigated: Unmitigated health risk to U.S. personnel was moderate year round. Rare cases were possible among personnel exposed to aerosols from infected animals, with clusters of cases possible in some situations. Significant outbreaks (affecting 1-50 percent) could 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. Q-Fever is a debilitating febrile illness, sometimes presenting as pneumonia, typically requiring 1 to 7 days of inpatient care followed by return to duty. Mitigation strategies include consuming approved food sources, avoidance of animals and farms, dust abatement when working in these areas (wet mop, water sprayed on high volume traffic areas, etc.), and proper PPE for personnel working with animals, and immunization.

6.5.3 Anthrax

Moderate, unmitigated; Low, mitigated: Unmitigated health risk to U.S. personnel was moderate year round. Cutaneous and gastrointestinal anthrax are the most common forms of naturally occurring infection; cutaneous anthrax is transmitted by direct contact with infected animals or carcasses, including hides. Eating undercooked infected meat can result in contracting gastrointestinal anthrax. Pulmonary anthrax is contracted through inhalation of spores and is extremely rare. Cutaneous anthrax typically requires 1 to 7 days of supportive care with subsequent return to duty; gastrointestinal anthrax typically requires hospitalization, and has a high fatality rate if untreated. Mitigation strategies include consuming approved food sources, avoidance of animals and farms, dust abatement when working in these areas (wet mop, water sprayed on high volume traffic areas, etc.), and proper PPE for personnel working with animals, and immunization.

6.5.4 H5N1 avian influenza

Low: Unmitigated health risk to U.S. personnel was low year round. Extremely rare cases could occur in U.S. personnel who have close contact with birds or poultry infected with H5N1. H5N1 is a very severe illness. The fatality rate is higher than 50 percent in symptomatic cases. Mitigation strategies include avoidance with birds/poultry and proper cooking temperatures for poultry products.

6.5.5 Short-term health risks:

Moderate to Low, unmitigated; Low to None, mitigated: The overall short-term unmitigated health risk associated with animal contact diseases at K2 was considered moderate (for rabies, Q-fever, and anthrax) to Low (for H5N1 avian influenza). Preventive measures such as consuming approved food sources; immunization; and avoidance of animals and farms reduced the health risk to low to none. Confidence in risk estimate was medium.

6.5.6 Long-term health risks:

Low: The long-term risk for rabies is low because the incubation period for rabies can be several years in rare cases.

7 Venomous Animal/Insect

The DOD Occupational and Environmental Health Surveillance (OEHS) Data Portal did not have a base camp assessment for any venomous animal/insects. Routine pest control measures are conducted at K2.

8 Heat/Cold Stress

Uzbekistan has long, hot summers and short, mild winters. Extreme maximum and low temperatures are 104 degrees Fahrenheit (°F) and 28.4 °F.

8.1 Heat

8.1.1 Short-term health risk:

High, unmitigated; Low, mitigated: The short-term health risk of heat injury was high in unacclimated personnel. Preventive measures such as work-rest cycles; and proper hydration reduced the health risk to low.

8.1.2 Long-term health risks:

Low: The long-term 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. Long-term health implications from heat injuries were rare but could occur—especially from more serious heat injuries such as heat stroke. It was possible that high heat in conjunction with various chemical exposures could increase long-term health risks, though specific scientific evidence was not conclusive. Confidence in these risk estimates was medium.

8.2 Cold

Short-term and Long-term health risks: The risk of cold injury was low. Confidence in this risk estimate was medium.

9 Noise

9.1 Continuous:

Noise evaluation from the Environmental Site Survey and Operational Health Risk Assessment (2002) and SF600 (September 2002-May 2003) indicated combined noise sources at the site generate noise levels that are equivalent to a large city or industrial facility. Major noise sources were the prime power generation station, Subsistence/Storage refrigeration trailer area, the refrigeration trailers located next to the base camp's dining facility and flight operations. Noise levels are not appreciably lower during the overnight hours. The noise levels indicated that personnel could be exposed to hazardous levels of noise that may lead to hearing loss. Hearing protection is required by personnel working in sources of major noise.

Short-term and Long-term risks: **High, unmitigated; Low, mitigated.** The unmitigated health risk was high for individuals working near major noise sources without proper hearing protection. Risk was reduced to low through use of proper hearing protection. Confidence in risk estimate was medium.

9.2 Impulse:

No impulse noise evaluations conducted, not evaluated.

Short-term and Long-term risks: Not evaluated because there is no available impulse noise evaluation/data. No identified health risks.

10 Other Unique Occupational Hazards

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 exposures 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 Fuel/Petroleum Products/Industrial Chemical Spills

The Environmental Site Characterization and Operational Health Risk Assessment conducted in November 2001 by PHRC-Europe (formally USACHPPM-Europe) found widespread jet fuel plumes, usually 1-3 meters underground, most likely from a leaking Soviet-era underground fuel distribution system. The fuel vapors from the plumes were the cause of the bad smell and pooling of "black goo" while digging.

Short-term and Long-term risks: **Low**. In November 2001, the trench was filled with clean soil to create a cap to hold the vapors underground. In addition, areas of known fuel contamination were delineated as "no dig" areas. These measures reduced Personnel exposure to chemicals. Confidence in this risk estimate is medium.

10.3 Waste Sites/Waste Disposal

During the closure of K2, a 20-foot long shipping container accumulating regulated medical waste was discovered. A local contractor was found that could properly handle and incinerate the container's contents.

Short-term and Long-term health risks: None identified based on available data. Confidence in this risk estimate is medium.

10.4 Pesticides/Pest Control

The Baseline Infectious Disease Risk Assessment for Uzbekistan identifies mosquitoes, ticks, and sandflies as present in the country. The DOD OEHS Data Portal database was searched for any information on this topic along with the 2002 and 2004 site assessments. The databases and reports did not contain data on pesticides/pest control.

Short-term and Long-term risks: **Low**. Confidence in this risk estimate is low to medium.

10.5 Lead- based Paint

The base camp's One-Stop In-processing Center was the only structure with lead based paint. Information pertaining to the condition of the lead based paint is not available. The Center was relocated (relocation date not available) into Corimec-type containers and the old facility was not occupied by US personnel. No paint chip sampling was required.

Short-term and Long-term risks: None identified based on available data. Confidence in this risk estimate is medium.

10.6 Asbestos

The Environmental Site Characterization and Operational Health Risk Assessment conducted in November 2001, found asbestos was present in localized areas of surface dirt. Several years prior to the U.S. occupying K2, Soviet missiles were destroyed there. This event contaminated some areas of surface dirt with asbestos. Also, the 2004 Final Deployment Occupational and Environmental Health Site Assessment stated previous operational health risk assessments identified several structures (i.e., 416th AEG Vehicle maintenance Facility, CI/FP/JAG Building and its gazebo, and Military Police Headquarters Building) with friable asbestos containing material (ACM) tiled roofs. However, the 2004 site assessment identified only one structure with ACM tiled roofs, the CI/FP/JAG Building's gazebo. The site assessment concluded airborne friable asbestos does not pose a health threat.

Short-term and Long-term risks: **Low**. Air samples did not detect the presence of any airborne asbestos fibers. Facility personnel were not exposed to inhalable asbestos fibers. Confidence in this risk estimate is medium.

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11. Global Security: Karshi-Khanabad (K2) Air Base, Camp Stronghold Freedom, Khanabad, Uzbekistan at <http://www.globalsecurity.org/military/world/centralasia/khanabad.htm>. The website was accessed on 19 October 2010.
12. Klaassen, Curtis D. *Casarett and Doull's Toxicology: the Basic Science of Poisons*, Chapter 2- Principles of Toxicology; Fifth Edition, McGraw-Hill, New York.

² NOTE. The data are currently assessed using the TG230 Final. The general method involves an initial review of the data which eliminates all chemical substances not detected above 1-yr 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 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 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 non-drinking 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 to conservatively assess non-drinking uses of water.

13. USACHPPM, Field Final Report, Environmental Site Survey and Operational Health Risk Assessment Stronghold Freedom, Karshi-Khanabad Airfield, Uzbekistan, 31 May-14 June 2002.
14. USACHPPM, Particulate Matter Factsheet No. 64-009-0708, 2008.
15. U.S. Central Command (CENTCOM) Regulation 220-1, Deployment Health Surveillance and Force Health Protection, 2010.
16. USAPHC TG230, June 2010 Revision, Final Environmental Health Risk Assessment and Chemical Exposure Guidelines for Deployed Military Personnel TG230.
17. World Health Organization (WHO) Fact Sheet No. 141, *Meningococcal meningitis*, 2010.

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).

U.S. Army Public Health Command (USAPHC) [(formerly the US Army Center for Health Promotion and Preventive Medicine (USACHPPM)]
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/afri/711hpw/usafsam.asp>

DOD Force Health Protection and Readiness (FHP & R)
Phone: (800) 497-6261. <http://fhp.osd.mil>