Military Deployment
Periodic Occupational and Environmental Monitoring Summary (POEMS): Shorab Annex and vicinity, Afghanistan
Calendar Years: 2016-2018

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) 0017-12 (References 1-4).

PURPOSE: This POEMS documents the Department of Defense (DoD) assessment of occupational and environmental health (OEH) risk for Shorab Annex and vicinity that includes Shorab Annex, Camp Leatherneck, Camp Tombstone, Camp Bastion and Camp Antonik. This is the first POEMS for Shorab Annex. It presents a qualitative summary of OEH risks identified at this location and their potential medical implications. The report is based on information collected from 1 January 2016 through 31 December 2018 to include deployment OEH surveillance 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 where available.

This assessment assumes that environmental sampling at Shorab Annex 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 1 January 2016 through 31 December 2018.

The POEMS can be useful to inform healthcare providers and others of environmental conditions experienced by individuals deployed to Shorab Annex 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:

Shorab Annex is located in the Helmand Province. There are five camps named in the Defense Occupational and Environmental Health Readiness System (DOEHRS) that were located within the Helmand Province and were historically associated in some way with Shorab Annex. These camps are discussed in more detail below.

Camp Leatherneck: Camp Leatherneck was once occupied by multiple nations and all branches of the U.S. military and was located directly adjacent to Camp Tombstone and Camp Bastion. Camp Leatherneck housed: a vehicle maintenance area, generators, a dining facility, a fuel point, a landfill, an incinerator, a munitions storage and detonation area, and various cantonment buildings. There are no records in the DOEHRS for Camp Leatherneck after July 2014 and therefore no specific sampling information available for Camp Leatherneck during the timeframe of this POEMS.

Camp Tombstone: Camp Tombstone was adjacent to Camp Leatherneck and Camp Bastion. The camp housed a dining facility, fuel point, generators, and incinerators. The last Occupational and Environmental Health Site Assessment (OEHSA) was conducted in 2013. There were two air and one untreated water sample recorded in the DOEHRS for Camp Tombstone in 2016 but it is not clear exactly where these samples were taken and if they were actually collected at Camp Tombstone. One

of the two air samples was given a sample ID as Shorab. These samples will be considered in this assessment.

Camp Bastion: Camp Bastion was conjoined with Camp Leatherneck and located northwest of the city of Lashkar Gah in the Helmand Province. There was no OEHSA in the DOEHRS for Camp Bastion and the last sample taken at the camp was in 2010.

Camp Antonik: Camp Antonik is located in the Washer District in the Helmand Province near Camp Leatherneck. The camp was not routinely occupied and only visited on occasion. An OEHSA was begun in October 2018 but no specific information is contained in the report. There were three samples taken between 1 January 2016 and 25 December 2018. These samples will be evaluated in this POEMS.

Shorab Annex. This POEMS will focus on Shorab Annex, as it was the most active basecamp in the Helmand Province between 2016 and 2018 and the only site that had an informative OEHSA between 2016-2018. The annex was north of Camp Leatherneck and west of Camp Bastion. Shorab Annex was at an elevation of approximately 2800 feet above sea level in a paleo desert environment. Since very little rain falls in this area, dust was heavy throughout the region. Shorab Annex had a DFAC, tactical operations center, fueling point, vehicle maintenance area, generators, an airfield and a cantonment area. There was one small perimeter road that was gravel and the rest of the camp had small trails just large enough for small vehicle access. The perimeter road often kicks up heavy dust do to the dry conditions and is a concern for personnel working in the vicinity. The last OEHSA was conducted in July 2018 for Shorab Annex and approximately 26 environmental samples were collected between 1 January 2016 and 31 December 2018.

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 Shorab Annex 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 Shorab Annex and vicinity that includes Shorab Annex, Camp Leatherneck, Camp Tombstone, Camp Bastion and Camp Antonik:

Endemic diseases (malaria, rabies); and heat stress. For vector-borne endemic diseases (malaria), 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. Animal contact diseases (rabies), pose year-round risk. For heat stress, risk can be greater during months of April through October, and greater for susceptible persons including those older than 45, of low fitness level, unacclimatized, or with underlying medical conditions, and those under operational constraints (equipment, PPE, vehicles). Risks from heat stress may have been reduced with preventive medicine controls, work-rest cycles, proper hydration and nutrition, and mitigation.

Air quality: For inhalable coarse particulate matter less than 10 micrometers in diameter (PM_{10}) from environmental dust (including any burn pits, burn barrels, or incinerators that might have existed), the PM_{10} overall short-term health risk was 'Low.' For inhalable fine particulate matter less than 2.5 micrometers in diameter ($PM_{2.5}$) from environmental dust (including burn pits, burn barrels, or incinerators that might have existed), the $PM_{2.5}$ overall short-term health risk was 'Low.' However, the Shorab Annex and vicinity area is a dusty semi-arid desert region and may have experienced dust-prone environmental conditions, 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. Burn pits and/or incinerators might have existed at Shorab Annex and vicinity (for example, burn pits, burn barrels, and incinerators used by the local population); however, there were no reports or sampling data available for analysis. Consequently, the PM_{10} and the $PM_{2.5}$ overall short-term health risks specifically for burn pits, burn barrels, and/or incinerators were not evaluated – see Section 10.7. Where burn pits, burn barrels, and/or incinerators may have existed, exposures may vary, and exposures to high levels of PM_{10} and $PM_{2.5}$ from smoke may result in mild to more serious short-term health effects (e.g., eye, nose or throat and lung irritation) in some personnel and certain subgroups. Although most short-term health effects from exposure to particulate matter and burn pit, burn barrel, and/or incinerator smoke 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 while at Shorab Annex and vicinity. Personnel who reported with symptoms or required treatment while at 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 Shorab Annex and vicinity that includes Shorab Annex, Camp Leatherneck, Camp Tombstone, Camp Bastion and Camp Antonik:

Air quality: For inhalable fine particulate matter less than 2.5 micrometers in diameter ($PM_{2.5}$) from environmental dust (including burn pits, burn barrels, or incinerators that might have existed), the overall long-term health risk was 'Low.' Inhalable coarse particulate matter less than 10 micrometers in diameter (PM_{10}) from environmental dust (including burn pits, burn barrels, or incinerators that might have existed) was not evaluated for long-term health risk due to no available health guidelines. However, the Shorab Annex and vicinity area is a semi-arid desert region and may have experienced dust-prone environmental conditions, also subject to vehicle traffic, and conditions may have varied. Burn pits, burn barrels, and/or incinerators might have existed at Shorab Annex and vicinity (for example, burn pits, burn barrels, and/or incinerators used by the local population); however, there are no reports and no sampling data available for analysis. Consequently, the PM_{10} and the $PM_{2.5}$ overall long-term health risks specifically for burn pits, burn barrels, or incinerators were not evaluated – see Section 10.7. However, burn pit, burn barrel, and incinerator exposures may vary, as conditions may have varied. For inhalational exposure to high levels of dust containing PM_{10} and $PM_{2.5}$, such as during high winds or dust storms, and for exposures to burn pit/barrel or incinerator smoke, it is considered possible that some otherwise healthy personnel, who were exposed for a long-term period to dust and 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 the dust and particulate matter exposures and exposures to burn pits 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. 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 – Shorab Annex and vicinity that includes Shorab Annex, Camp Leatherneck, Camp Tombstone, Camp Bastion and Camp Antonik [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: There was only one valid PM_{10} sample for Shorab Annex and vicinity. Based on this one sample, the short-term health risk was low for the day sampled. Daily levels however vary, acute health effects (e.g., upper respiratory tract irritation) are more pronounced during days with elevated PM levels. 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: There was only one valid PM_{10} sample for Shorab Annex and vicinity. Based on this one sample, the short-term health risk was low for the day sampled. Daily levels however vary, acute health effects (e.g., upper respiratory tract irritation) are more pronounced during days with elevated PM levels. 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: The short-term health risk was Low. Because Shorab Annex and vicinity was situated in a dusty semi-arid environment, a majority of the time mild acute (short-term) health effects were anticipated; certain peak or elevated levels may have produced mild eye, nose, or throat irritation in some personnel and pre-existing health conditions (e.g., asthma, or cardiopulmonary diseases) may have been exacerbated.	Limiting strenuous physical activities when air quality is especially poor; taking actions such as closing tent flaps, windows, and doors.	Short-term: The short-term health risk was Low. Because Shorab Annex and vicinity was situated in a dusty semi-arid environment, a majority of the time mild acute (short-term) health effects were anticipated; certain peak or elevated levels may have produce mild eye, nose, or throat irritation in some personnel and pre-existing health conditions (e.g., asthma, or cardiopulmonary diseases) may have been exacerbated.
	Long-term: The long-term health risk was Low for exposure to the ambient air. A Low health risk level suggests that long-term exposure to $PM_{2.5}$ was expected to have had no specific medical actions required. A small percentage of personnel may have been 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: The long-term health risk was Low for exposure to the ambient air. A Low health risk level suggests that long-term exposure to $PM_{2.5}$ was expected to have no specific medical actions required. A small percentage of personnel may have been at increased risk for developing chronic conditions, particularly those more susceptible to acute effects (e.g., those with asthma/pre-existing respiratory diseases).
Metals	Short-term: Not an identified source of health risk based on the available data. No parameters exceeded their 1-year Negligible MEGs.		Short-term: Not an identified source of health risk based on the available data. No parameters exceeded their 1-year Negligible MEGs.
	Long-term: Not an identified source of health risk based on the available data. No parameters exceeded their 1-year Negligible MEGs.		Long-term: Not an identified source of health risk based on the available data. No parameters exceeded their 1-year Negligible MEGs.
Volatile Organic Compounds (VOC)	Short-term: No data available		Short-term: No data available
	Long-term: No data available		Long-term: No data available
Water			
Non-drinking Disinfected	Short-term: None identified based on available data. All parameters were below the negligible MEGs.	Water treated in accordance with standards applicable to its intended use	Short-term: None identified based on available data. All parameters were below the negligible MEGs.
	Long-term: None identified based on available data. All parameters were below the negligible MEGs.		Long-term: None identified based on available data. All parameters were below the negligible MEGs.

Source of Identified Health Risk[3]	Unmitigated Health Risk Estimate[4]	Control Measures Implemented	Residual Health Risk Estimate[4]
Military Unique			
Non-ionizing Radiation	Short-term: Shorab Annex had satellite communication dishes around the perimeter of the camp. The amount of radiation emitted by the dishes was unknown.		Short-term: Shorab Annex had satellite communication dishes around the perimeter of the camp. The amount of radiation emitted by the dishes was unknown.
	Long-term: Shorab Annex had satellite communication dishes around the perimeter of the camp according to the OEHSA. The amount of radiation emitted by the dishes was unknown.		Long-term: Shorab Annex had satellite communication dishes around the perimeter of the camp. The amount of radiation emitted by the dishes was unknown.
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 lindbergi*) 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 lindbergi*) to potentially lethal effects (e.g. *Gloydius halys*).
	Long-term: None identified		Long-term: None identified
HEAT/COLD STRESS			
Heat	Short-term: Variable; Risk of heat injury was High for April - October, and Low 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 High for April - October, and Low for all other months.
	Long-term: Low, The long-term risk was Low. However, the risk may have been 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: Low, The long-term risk was Low. However, the risk may have been greater for 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/ Concerns			
Pesticides/Pest Control	Short-term: Low	See Section 10.4	Short-term: Low
	Long-term: Low		Long-term: Low
Burn Pits	Short-term: Burn pits and/or incinerators might have existed at Shorab Annex and vicinity (for example, burn pits used by the local population); however, there are no reports or sampling data in 2016-2018 to indicate their presence or absence. Consequently, the PM_{10} and the $PM_{2.5}$ overall short-term health risks for burn pits were not evaluated – see Section 10.7. Exposure to burn pit smoke is	Risks reduced by limiting strenuous physical activities when air quality was especially poor; and action such as closing tent flaps, windows, and doors. Other control measures included locating burn pits downwind of camps, increased distance from troop populations, and	Short-term: Burn pits and/or incinerators might have existed at Shorab Annex and vicinity (for example, burn pits used by the local population); however, there are no reports or sampling data in 2016-2018 to indicate their presence or absence. Consequently, the PM_{10} and the $PM_{2.5}$ overall short-term health risks for burn pits were not evaluated – see Section 10.7. . Exposure to burn pit smoke is

Source of Identified Health Risk[3]	Unmitigated Health Risk Estimate[4]	Control Measures Implemented	Residual Health Risk Estimate[4]
	variable. Exposure to high levels of PM_{10} and $PM_{2.5}$ from smoke may result in mild to more serious short-term health effects (e.g., eye, nose or throat and lung irritation) in some personnel and certain subgroups, such as those with pre-existing health conditions (e.g., asthma, or cardiopulmonary disease, which may be exacerbated).	improved waste segregation and management techniques.	variable. Exposure to high levels of PM_{10} and $PM_{2.5}$ from smoke may result in mild to more serious short-term health effects (e.g., eye, nose or throat and lung irritation) in some personnel and certain subgroups, such as those with pre-existing health conditions (e.g., asthma, or cardiopulmonary disease, which may be exacerbated).
	Long-term: Burn pits and/or incinerators might have existed at Shorab Annex and vicinity (for example, burn pits used by the local population); however, there are no reports or sampling data for 2016-2018 to indicate their presence or absence. Consequently, the PM_{10} and the $PM_{2.5}$ overall long-term health risks specifically for burn pits were not evaluated – see Section 10.7. Exposure to burn pit smoke is variable. Exposure to high levels of PM_{10} and $PM_{2.5}$ in the smoke may be associated with some otherwise healthy personnel, who were exposed for a long-term period, possibly developing certain health conditions (e.g., reduced lung function, cardiopulmonary disease). Personnel with a history of asthma or cardiopulmonary disease could have potentially been more likely to develop such chronic health conditions.		Long-term: Burn pits and/or incinerators might have existed at Shorab Annex and vicinity (for example, burn pits used by the local population); however, there are no reports or sampling data for 2016-2018 to indicate their presence or absence. Consequently, the PM_{10} and the $PM_{2.5}$ overall long-term health risks specifically for burn pits were not evaluated – see Section 10.7. Exposure to burn pit smoke is variable. Exposure to high levels of PM_{10} and $PM_{2.5}$ in the smoke may be associated with some otherwise healthy personnel, who were exposed for a long-term period, possibly developing certain health conditions (e.g., reduced lung function, cardiopulmonary disease). Personnel with a history of asthma or cardiopulmonary disease could have potentially been more likely to develop such chronic health conditions.

[1]This Summary Table provides a qualitative estimate of population-based short- and long-term health risks associated with the occupational environment conditions at Shorab Annex and vicinity that includes: Shorab Annex, Camp Leatherneck, Camp Tombstone, Camp Bastion and Camp Antonik. 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 1 January 2016 to 31 December 2018. 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 Shorab Annex 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 Army Public Health Center (APHC). 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 Camp Shorab and vicinity, 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 Center (USAPHC) Technical Guide 230, *Environmental Health Risk Assessment and Chemical Exposure Guidelines for Deployed Military Personnel* (Reference 5). All OEH risk estimates represent residual risk after accounting for preventive controls in place. Occupational exposures and exposures to endemic diseases are greatly reduced by preventive measures. 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

Shorab Annex and vicinity was situated in a dusty semi-arid desert environment. Inhalational exposure to high levels of dust and particulate matter, such as during high winds or dust storms, may have resulted in mild to more serious short-term health effects (e.g., eye, nose or throat and lung irritation) in some personnel. Additionally, certain subgroups of the deployed forces (e.g., those with pre-existing asthma/cardio pulmonary conditions) were at greater risk of developing notable health effects.

Air pollution sources at Camp Leatherneck may have included painting, welding, refrigerant repair, vehicle maintenance, an incinerator, a munitions detonation area, fuel distribution points, unpaved roads and generators. Gravel was used in some spots throughout the basecamp for dust abatement and brine water was utilized on unpaved dirt roads throughout the day. The OEHSA conducted in 2014 indicated that local area personnel burned trash at night which occasionally produced a thick cloud like fog. There is no indication that any burning occurred in 2016-2018 as no OEHSA was conducted after 2014.

Air pollution sources at Camp Tombstone included unpaved roads, generators, a fuel point, and an incinerator.

Air pollution sources at Camp Bastion were unknown as no OEHSA exists for this camp. Likewise, an OEHSA for Camp Antonik was started in 2018 but was never filled out or completed and therefore no information on air pollution sources could be obtained for Camp Antonik.

Air pollution sources at Shorab Annex included a vehicle maintenance area, fuel point, dirt roads, generators and an airfield. Shorab Annex had a consistent dust abatement process and some gravel paths to help keep dust levels to a lower level.

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:

One valid PM_{10} air sample was collected from Camp Antonik on 14 May 2016. The 24-hour PM_{10} concentration was 75 $\mu g/m^3$. No other PM_{10} samples were collected at any of the other Camps.

2.3.3 Short-term health risks:

Low: The concentration of the sample was 75 $\mu g/m^3$ which was below the 24-hour negligible MEG (250 $\mu g/m^3$). Based on this one sample, the short-term PM_{10} health risk assessment was Low for the day sampled. A Low health risk is expected to have little or no impact on accomplishing the mission (TG 230 Table 3-2). The hazard severity based on this sample was negligible and the probability unlikely. Confidence in the short-term PM_{10} health risk assessment was low as very little confidence can be obtained from only one sample (Reference 5, Table 3-6).

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. Additionally, there were not enough PM_{10} samples collected to assess any long-term risk.

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

2.4.1 Exposure Guidelines:

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

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

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

- Negligible MEG = 15
- Marginal MEG = 65.

2.4.2 Sample data/Notes:

$PM_{2.5}$ samples were only collected at Shorab Annex and Tombstone. Since Shorab Annex and Tombstone are located in close proximity to each other all samples were assessed as general ambient air to which the entire population may have been exposed. Additional samples were also collected in the vicinity of the helicopter landing zone (HLZ) due to concerns regarding additional risk from inhalation of particulates to personnel working within close proximately to this area. There were four samples that were collected near the HLZ.

For the ambient air a total of 16 valid $PM_{2.5}$ air samples were collected from 26 April 2016 to 10 December 2018 but two were not analyzed for $PM_{2.5}$ due to a laboratory error. The range of 24-hour $PM_{2.5}$ concentrations was 12 µg/m^3 – 83 µg/m^3 with an average concentration of 43 µg/m^3.

There were four samples collected between 18 August 2017 and 8 May 2018 near the HLZ but one was not analyzed for $PM_{2.5}$ due to laboratory error. The range of 24-hour $PM_{2.5}$ concentrations was 16 µg/m^3 - 59 µg/m^3 with an average concentration of 39 µg/m^3.

2.4.3 Short-term health risks:

Low: The short-term $PM_{2.5}$ health risk assessment was Low for the ambient air and for samples taken in the vicinity of the HLZ based on average and peak $PM_{2.5}$ sample concentrations, and the likelihood of exposure at these hazard severity levels. A Low health risk assessment is expected to have little to no impact on accomplishing the mission (Reference 5, Table 3-2). Confidence in the short-term $PM_{2.5}$ health risk assessment was low due to the limited number of samples taken throughout the three years (Reference 5, Table 3-6). Additionally, there was no indication from the available data that there was a significant increase in $PM_{2.5}$ exposure for special populations working near the HLZ. Concentrations for samples taken near the roads were similar to those taken for the ambient air.

For the highest observed $PM_{2.5}$ exposure for the ambient air pathway (83 µg/m^3) the hazard severity was negligible. Based on the highest observed $PM_{2.5}$ concentration taken near the HLZ (59 µg/m^3), the hazard severity was also negligible. During peak exposures above the negligible hazard severity level, a few personnel may have experienced notable eye, nose, and throat irritation and most personnel experienced only mild effect. Pre-existing health conditions (e.g., asthma, or cardiopulmonary diseases) may have been exacerbated. The hazard probability for both pathways was unlikely (Reference 5, Table 3-11).

2.4.4 Long-term health risks:

Low: The long-term health risk assessment was Low for exposure to the ambient air based on the average $PM_{2.5}$ concentration (43 µg/m^3), and the likelihood of exposure at this hazard severity level. A Low health risk level suggests that long-term exposure to $PM_{2.5}$ is expected to have had no specific medical actions required (Reference 5, Table 3-3). Confidence in the long-term $PM_{2.5}$ health risk assessment was low based on the limited amount of data for each year. There was not enough data available to assess the long-term health risk for special populations working in the vicinity of the HLZ (Reference 5, Table 3-6).

The hazard severity was negligible for the average $PM_{2.5}$ sample concentrations for the ambient air. The results suggest that with repeated exposures above the negligible threshold, a small percentage of personnel may have had increased risk for developing chronic conditions, such as reduced lung function or exacerbated chronic bronchitis, chronic obstructive pulmonary disease (COPD), asthma, atherosclerosis, or other cardiopulmonary diseases. Those with a history of asthma or cardiopulmonary disease are considered to be at particular risk. This guideline is an uncertain screening value - it is not a known health effect concentration. The hazard probability for the ambient air was seldom (Reference 5, Table 3-12).

2.5 Airborne Metals

2.5.1 Sample data/Notes:

A total of 17 valid airborne metal samples were collected at Shorab Annex and vicinity from 26 April 2016 to 10 December 2018.

2.5.2 Short and Long-term health risks:

None identified based on the available sampling data. No parameters exceeded their 1-year Negligible MEGs

2.6 Volatile Organic Compounds (VOC)

2.6.1 Sample data/Notes:

No VOC air samples were available for Shorab Annex and vicinity from 1 January 2016 to 31 December 2018.

2.6.2 Short and long-term health risks:

Data was not available to evaluate health risks.

3 Soil

3.1 Site-Specific Sources Identified

3.2 Sample data/Notes:

No soil samples were available for Shorab Annex and vicinity for 2016-2018.

3.3 Short and long-term health risk:

Data was not available to evaluate health risk.

4 Water

In order to assess the health risk to U.S. personnel from exposure to water in theater, the APHC identified the most probable exposure pathways. These are based on the administrative information provided on the field data sheets (FDS) submitted with the samples taken over the time period being evaluated. There were two untreated water samples taken for Camp Antonik, one for Camp Tombstone and four for Shorab Annex. Based on the FDSs all samples for untreated water were associated with source water for treatment purposes and not consumption. Therefore, untreated samples are not assessed as potential ingestion health hazards. Some of the water was used for personnel hygiene but not for brushing teeth. None of the samples had concentrations above the non-drinking water MEGs.

4.1 Drinking Water: Bottled or Packaged Water

4.1.1 Site-Specific Sources Identified

The OEHSAs for Shorab Annex indicated that there were three bottled water brands; Aria®, Cristal® and Kinley® used at Shorab Annex. No other information was available in the DOEHRS for the other basecamps during the timeframe covered by this POEMS. There were no bottled water samples

available to evaluate for any of the basecamps (Reference 1). Identification of a trademarked product does not imply endorsement by the Army.

4.1.2 Short-term and long-term health risk:

No available sample data to determine a health risk.

4.2 Non-Drinking Water: Disinfected/Treated

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 although OEHSA information indicates a shorter deployment than 1 year. A conservative (protective) assumption is that personnel routinely consumed less than 5L/day of non-drinking water for up to 365 days (1-year). It is further assumed that control measures were not used. Three non-drinking treated water samples were available for Shorab Annex. No other non-drinking treated water samples were available for any of the other Camps. The samples were collected from the tap at the Reverse Osmosis Water Purification Unit (ROWPU). The water was used for cooking, washing food, and personnel hygiene.

4.2.3 Short and long-term health risks:

None identified based on available sample data. All parameters were below Negligible MEGs, however only three samples were available for analysis.

5 Military Unique

5.1 Chemical Biological, Radiological Nuclear (CBRN) Weapons

No specific hazard sources were documented in the DOEHRS from 1 January 2016 to 31 December 2018 (Reference 1).

5.2 Depleted Uranium (DU)

No specific hazard sources were documented in the DOEHRS from 1 January 2016 to 31 December 2018 (Reference 1).

5.3 Ionizing Radiation

No specific hazard sources were documented in the DOEHRS from 1 January 2016 to 31 December 2018 (Reference 1).

5.4 Non-Ionizing Radiation

Shorab Annex had satellite communication dishes around the perimeter of the camp. The amount of radiation emitted by the dishes were unknown (Reference 1).

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. CENTCOM Modification (MOD) 12 (Reference 6) lists deployment requirements, to include immunizations and chemoprophylaxis, in effect during the timeframe of this POEMS. Additionally, some information was found under the disease threats section in the OEHSAs for Shorab Annex. Information from the OEHSA is summarized in Table 3 below. It was not specified in the OEHSA how the risk estimate was obtained (Reference 1).

Table 3. Disease Threat Assessment in Shorab Annex OEHSA

Disease Threat	Hazard Severity	Hazard Probability	Risk Estimate
Malaria	Marginal	Occasional	Moderate
Encephalitis (Japanese)	Critical	Unlikely	Low
Rabies	Marginal	Likely	Moderate
Leishmaniasis (Other or Unspecified)	Negligible	Unlikely	Low
Leptospirosis	Critical	Unlikely	Low
Typhus (Murine)	Critical	Unlikely	Low

6.1 Foodborne and Waterborne Diseases

Foodborne 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 disease surveillance has been improved to cover the majority of the country since 2009. There is still underreporting of specific disease incidence.

6.1.1 Diarrheal diseases (bacteriological)

Diarrheal diseases are expected to temporarily incapacitate a very high percentage of personnel 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

Hepatitis A, typhoid/paratyphoid fever, and diarrhea-protozoal disease may cause prolonged illness in a small percentage of unvaccinated personnel. Vaccinations are required for DoD personnel and contractors.

6.1.3 Polio

Despite a concerted global eradication campaign, the poliovirus continues to affect children and adults in Afghanistan. Polio is a highly infectious disease that invades the nervous system. The virus is transmitted by person-to-person, typically by hands, food or water contaminated with fecal matter or through direct contact with the infected person's saliva. An infected person may spread the virus to

others immediately before and about 1 to 2 weeks after symptoms appear. The virus can live in an infected person's feces for many weeks. About 90% of people infected have no symptoms, and about 1% have a very severe illness leading to muscle weakness, difficulty breathing, paralysis, and sometimes death. People who do not have symptoms can still pass the virus to others and make them sick.

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

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

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

Crimean-Congo hemorrhagic fever 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

Sandfly fever 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

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**)**

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

West Nile fever 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 occur.

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.

6.4 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, measles, 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)

Tuberculosis 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 can include active case isolation in negative pressure rooms, where available.

6.4.2 Meningococcal meningitis

Meningococcal meningitis is potentially a very severe disease typically requiring intensive care; fatalities may occur in 5-15% of cases.

6.5 Animal-Contact Diseases

6.5.1 Rabies

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 reduction of animal habitats, active pest management programs, and timely treatment of feral animal scratches/bites.

6.5.2 Anthrax

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

Q-fever is 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.

6.5.4 Avian influenza

Although 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.

6.6 Soil-transmitted helminths (hookworm, strongyloidiasis, cutaneous larva migrans)

Soil-transmitted helminths (hookworm, strongyloidiasis, cutaneous larva migrans) can occur in a small number of cases (less than 1% per month attack rate) could occur among personnel with direct skin exposure to soil contaminated with human or animal feces (including sleeping on bare ground, walking barefoot). Initial skin symptoms typically are mild and are not debilitating. However, systemic

symptoms of fever, cough, abdominal pain, nausea, and diarrhea may develop weeks to months after initial infection with hookworm or *Strongyloides* spp. More severe infections with high worm burden may be debilitating in some cases. Rates of infection in U.S. personnel will be highly variable, depending on specific local environmental conditions. Rates of infection in U.S. personnel are expected to be less than 1 percent per month in most locations. However, rates in some focal areas with heavily contaminated soil could exceed 1 percent per month.

7 Venomous Animals

All information was taken directly from the Armed Forces Pest Management Board (Reference 7) and the Clinical Toxinology Resources web site from the University of Adelaide, Australia (Reference 8). The species listed below have home ranges that overlap the location of Shorab Annex 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

- *Androctonus amoreuxi,* and *Androctonus baluchicus*: Severe envenoming possible, potentially lethal. Severe envenoming may produce direct or indirect cardio toxicity, with cardiac arrhythmias, cardiac failure. Hypovolaemic hypotension possible in severe cases due to fluid loss through vomiting and sweating.

- *Buthacus striffleri*, *Compsobuthus afghanus, Orthochirus bicolor, Orthochirus danielleae*, *Orthochirus erardi, Orthochirus heratensis, Orthochirus jalalabadensis, Orthochirus monodi*, *Orthochirus scrobiculosus,* and *Sassanidotus gracilis*: 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.

7.3 Snakes

- *Echis carinatus multisquamatus* (central Asian saw-scaled viper), *Echis carinatus sochureki* (Sochurek's saw-scaled viper), *Gloydius halys* (Haly's pit viper): Severe envenoming possible, potentially lethal. Bites may cause moderate to severe coagulopathy and haemorrhagins causing extensive bleeding.

- *Eristocophis mcmahoni* (McMahon's viper): Severe envenoming possible, potentially lethal. Venom shows strong hemorrhagic activity. Mild to Moderate neurotoxic effects may occur.

- *Pseudocerastes persicus* (Persian horned viper): Unlikely to cause significant envenoming; limited clinical data suggest bites result in local effects 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 5, Table 3-6).

7.5 Long-term health risk:

None identified.

8 Heat/Cold Stress

8.1 Heat

Summer (June - September) monthly mean daily maximum temperatures range from 96 degrees Fahrenheit (°F) to 107 °F with an average temperature of 103 °F based on historical climatological data from the U.S. Air Force Combat Climatology Center, 14th Weather Squadron. The health risk of heat stress/injury based on temperatures alone was Low (< 78 °F) from November – March, high (82-87.9°F) in October and April, and extremely high (≥ 88°F) from May – September. However, 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 likely 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: Based on standard Army policy the risk of heat injury should have been reduced 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) was High from April - October, and Low from November - March. Confidence in the health risk estimate is low (Reference 5, Table 3-6).

8.1.2 Long-term health risk:

Low: The long-term risk was Low. However, the risk may have been 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 5, Table 3-6).

8.2 Cold

Winter (November - March) mean daily minimum temperatures ranged from 33 °F to 51 °F with an average temperature of 41 °F based on historical climatological data from the U.S. Air Force Combat Climatology Center, 14th Weather Squadron. 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 November – March. The risk assessment for Non-Freezing Cold Injuries (NFCI), such as chilblain, trench foot, and hypothermia, was Low based on historical temperature and precipitation data.

Frostbite was unlikely to occur because temperatures rarely dropped below freezing. However, personnel may have 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 9).

8.2.1 Short-term health risks:

Low: The short-term health risk of cold injury was Low. Confidence in the health risk estimate is medium (Reference 5, Table 3-6).

8.1.2 Long-term health risk:

Low: The long-term health risk of cold injury was Low. Confidence in the health risk estimate is medium (Reference 5, Table 3-6).

9 Noise

9.1 Continuous

Shorab Annex: Generators and aircraft were identified in the Shorab Annex OEHSA as a source of noise to personnel working in the vicinity. The use of PPE was mandatory on flight line and when working close to the generators.

9.1.1 Short and long-term health risks:

Not evaluated

9.2 Impulse

No specific hazard sources were documented in the DOEHRS from 1 January 2016 to 31 December 2018.

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 lasts, 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 tasks 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

According to the Shorab Annex OEHSA, all hazardous materials were disposed of by a local contractor. Commercial and residential waste was also handled by a contractor and transferred for disposal to an off-site location.

10.3 Fuel/petroleum products/industrial chemical spills

No known product/industrial spills were reported in 2016-2018 for any of the facilities.

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, nuisance insects, including biting and stinging insects such as bees, wasps, and ants, required pest management. Use of pesticides generally involved selection of compounds with low mammalian toxicity and short-term residual using pinpoint rather than broadcast application techniques. According to the OEHSA, pesticide management on Shorab Annex was handled by contract. Monthly pesticide application reports were not available in DOEHRS for Shorab Annex and vicinity but there were some maintenance records for Shorab Annex which gave some information on the types of pesticides used during the 2016-2018 timeframe. This information is summarized below.

10.4.1 Rodenticides

Brodifacoum was used to control rodents.

10.4.2 Insecticides

Insecticides used to control ants, bees, crickets, fleas, flies, lice, mosquitoes, spiders, termites, and wasps included: Fipronil, hydramethylnon, and 9-tricosene.

10.4.2 Herbicides

No information was available on the herbicides used to control weeds.

10.4.3 Short-term and Long-term health risks

Low: Short and Long term health risk is Low. Confidence in the health risk assessment is low as there was not much information or application records in the DOEHRS (Reference 5, Table 3-6).

10.5 Asbestos

No specific hazard sources were documented in the DOEHRS from 1 January 2016 through 31 December 2018 for asbestos.

10.6 Lead Based Paint

No specific hazard sources were documented in the DOEHRS from 1 January 2016 through 31 December 2018 for lead based paint.

10.7 Burn Pit

While not specific to Shorab Annex and vicinity, the consolidated epidemiological and environmental sampling and studies on burn pits that have been conducted as of the date of this publication have been unable to determine whether an association does or does not exist between exposures to emissions from the burn pits and long-term health effects (Reference 10). The Institute of Medicine committee's (Reference 10) review of the literature and the data suggests that service in Iraq or Afghanistan (i.e., a broader consideration of air pollution than exposure only to burn pit emissions) may be associated with long-term health effects, particularly in susceptible (e.g., those who have asthma) or highly exposed subpopulations, such as those who worked at the burn pit. Such health effects would be due mainly to high ambient concentrations of PM from both natural and anthropogenic sources, including military sources. If that broader exposure to air pollution turns out to be relevant, potentially related health effects of concern are respiratory and cardiovascular effects and cancer. Susceptibility to the PM health effects could be exacerbated by other exposures, such as stress, smoking, local climatic conditions, and co-exposures to other chemicals that affect the same biologic or chemical processes. Individually, the chemicals measured at burn pit sites in the study were generally below concentrations of health concern for general populations in the United States. However, the possibility of exposure to mixtures of the chemicals raises the potential for health outcomes associated with cumulative exposure to combinations of the constituents of burn pit emissions and emissions from other sources. The Camp Leatherneck OEHSA from 2014 mentions the occasional burning of unserviceable ammunitions in the northwest corner of Camp Leatherneck as well as the burning of trash by local personnel off post near Camp Leatherneck but no additional information was available on burn pits for the timeframe of this POEMS. Additionally, there is no mention of any operational burn pits for Shorab Annex and vicinity in DOEHRS during the time frame of this POEMS.

11 References

1. Defense Occupational and Environmental Health Readiness System (referred to as the DOEHRS-EH database) at https://doehrs-ih.csd.disa.mil/Doehrs/.

2. Department of Defense (DoD) Instruction 6490.03, *Deployment Health*, 2006.

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

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

5. USAPHC TG230, June 2013 Revision.

6. Modification 12 to United States Central Command Individual Protection and Individual Unit Deployment Policy, 02 December 2013.

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

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

9. 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.

10. IOM (Institute of Medicine). 2011. Long-term health consequences of exposure to burn pits in Iraq and Afghanistan. Washington, DC: The National Academies Press.

12 Where Do I Get More Information?

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