Military Deployment
Periodic Occupational and Environmental Monitoring Summary (POEMS):
Bagram Airfield and vicinity, Afghanistan
Calendar Years: (2010 to 2013)

AUTHORITY: This periodic occupational and environmental monitoring summary (POEMS) has been developed in accordance with Department of Defense (DoD) Instructions 6490.03, 6055.05, and JCSM (MCM) 0028-07, *See REFERENCES.*

PURPOSE: This POEMS documents the Department of Defense (DoD) assessment of occupational and environmental health (OEH) risk for Bagram Airfield (BAF), its subinstallations, and surrounding installations that includes Camp Ouellette, Camp Dragon, Camp Charikar (aka OCC-Parwan), Camp Sabalu-Harrison, Combat Outpost (COP) Red Hill [aka JCOP Pushtaysark], Joint COP Pul-A-Sayad, OP Dandar (Dandar VPB), Camp Montrond, Camp Vance, and Camp Lacey. It presents a qualitative summary of health risks identified at this location and their potential medical implications. The report is based on information collected from 01 January 2010 through 31 May 2013 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. The 155th Medical Detachment – Preventive Medicine (MEDDET-PM) and 61st MEDDET-PM provided Role III preventive medicine support to the area and collected much of the information used in this POEMS. Brigade Combat Team elements provided Role II PM support at some of the outlying bases. There is a USAF bioenvironmental engineering and public health element which performs industrial hygiene and public health oversight missions near the BAF airfield and at Craig Joint Theater Hospital.

This assessment assumes that environmental health sampling at BAF and vicinity during this period was performed at representative exposure points selected to characterize health risks at the *population–level*. Due to the nature of environmental sampling, the data upon which this report is based may not be fully representative of all the fluctuations in environmental quality or capture unique occurrences. While one might expect health risks pertaining to historic or future conditions at this site to be similar to those described in this report, the health risk assessment is limited to 01 January 2010 through 31 May 2013.

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

BAF is located in the Parwan Province of northern Afghanistan approximately 11 km southwest of the city of Charikar, 47 km north of Kabul and is situated approximately 1,500 meters above sea level. The climate is semi-arid with precipitation (snow and rain) concentrated in the winter months. Weather conditions can vary widely with temperature ranging from 21 - 33 degrees Celsius (°C; 70 – 91 degrees Fahrenheit, °F) in the summer months, and minus 7 – 10 °C (19 – 50 °F) during the winter months. Strong winds (above 25 knots) can create intense dust storms, especially during the spring and summer. The airfield is approximately 38,000 acres in size and has an 11,820 foot runway serving as a hub for air freight and the movement of military personnel for eastern Afghanistan, and receives and stages larger freight transported overland from the Port of Karachi in Pakistan. The BAF has 39 large hangars along the flight line, a control tower, and numerous support buildings. The area surrounding the base is primarily rural and used for grazing and small farms with orchards. Camp Charikar, Combat Outpost (COP) Red Hill [aka JCOP Pushtaysark], and Joint COP Pul-A-Sayad were also located within

Parwan Province. Camp Ouellette, Camp Lacey, Camp Dragon, Camp Montrond, Camp Vance, and Camp Sabalu-Harrison are located within the BAF perimeter. Camp Montrond and Camp Vance are Special Operation compounds. Camp Sabalu-Harrison is a detainee holding facility on the northeastern side of BAF and based on the location of this camp and its somewhat isolation from the main part of BAF, even though it is within the perimeter of BAF, the air sampling done at this site was taken to look at a specific population exposure for personnel working at Sabalu-Harrison.

COP Pul-A-Sayad closed in Aug 2012. COP Charikar is a Korean military outpost, housing approximately 14 U.S. Special Operations personnel and over 200 Korean military and contracting personnel. It is used to share communication and intelligence operations between U.S. and Korean military elements throughout the Parwan Province. There is a full-functioning hospital used to provide medical care and health promotion to the Afghan community of Charikar. The 155 MEDDET-PM conducted an OEH site assessment (OEHSA) at COP Charikar in May 2012.

COP Red Hill (aka JCOP Pushtaysark) is located in the Parwan Province, Afghanistan. The site is situated in the Jabal us Saraj District, Parwan Province, approximately 18 km north northwest of Bagram Airfield along Route 1. The JCOP has significant grade change from north to south. The grading was done in large relatively flat areas with grade changes established by sharp slopes. The COP was located on a former Soviet heavy artillery base and had an open burn pit. The camp is no longer active and has a population of 20 Soldiers. The 155 MEDDET-PM conducted an OEHSA at COP Red Hill in January 2012.

OP Dandar was identified as a small base in Parwan Province in the U.S. Forces Afghanistan (USFOR-A) Engineering Office Environmental Database. It had an open burn pit.

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 BAF 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 may have caused acute health effects in some personnel during deployment at Bagram Airfield (BAF) and vicinity that includes Camp Ouellette, Camp Castle, Camp Dragon, Camp Charikar, Camp Sabalu-Harrison, Combat Outpost (COP) Red Hill, Joint COP Pul-A-Sayad, Camp Montrond, Camp Vance, and Camp Lacey:

Inhalable coarse particulate matter less than 10 micrometers in diameter (PM_{10}); inhalable fine particulate matter less than 2.5 micrometers in diameter ($PM_{2.5}$); food/waterborne diseases (e.g., bacterial diarrhea, hepatitis A, typhoid/paratyphoid fever, diarrhea-cholera, diarrhea-protozoal, brucellosis, hepatitis E); other endemic diseases (malaria, cutaneous leishmaniasis (acute), Crimean-Congo hemorrhagic fever, sand fly fever, typhus-miteborne, leptospirosis, Tuberculosis (TB), rabies, anthrax, Q fever); heat stress; and burn pits. For food/waterborne diseases (e.g., bacterial diarrhea, hepatitis A, typhoid/paratyphoid fever, diarrhea-cholera, diarrhea-protozoal, brucellosis, hepatitis E), if ingesting local food and water, the health effects can temporarily incapacitate personnel (diarrhea) or result in prolonged illness (hepatitis A, typhoid/paratyphoid fever, brucellosis, hepatitis E). Risks from food/waterborne diseases may have been reduced with preventive medicine controls and mitigation, which includes hepatitis A and typhoid fever vaccinations and only drinking from approved water sources in accordance with standing CENTCOM policy. For other vector-borne endemic diseases (malaria, cutaneous leishmaniasis (acute), Crimean-Congo hemorrhagic fever, sand fly fever, typhus-miteborne), these diseases may constitute a significant risk due to exposure to biting vectors; risk reduced to 'Low' by proper wear of the treated uniform, application of repellent to exposed skin, bed net use, and appropriate chemoprophylaxis, as well as minimizing areas of standing water and other vector-breeding areas. For water contact diseases (leptospirosis) activities involving extensive contact with surface water increase risk. For respiratory diseases (TB), personnel in close-quarter conditions could have been at risk for person-to-person spread. Animal contact diseases (rabies, anthrax, Q fever), pose year-round risk. For heat stress, risk can be greater during months of June through August, and greater for susceptible persons including those older than 45, of low fitness level, unacclimatized, or with underlying medical conditions. Risks from heat stress may have been reduced with preventive medicine controls, work-rest cycles, proper hydration and nutrition, and mitigation.

Air quality: For inhalable coarse particulate matter less than 10 micrometers in diameter (PM_{10}), the PM_{10} overall short-term risk was 'Low to High.' For inhalable fine particulate matter less than 2.5 micrometers in diameter ($PM_{2.5}$), the $PM_{2.5}$ overall short-term risk ranged from 'Low to Moderate.' However, exposures to PM_{10} and $PM_{2.5}$ may vary, under variable conditions, and may result in mild to more serious short-term health effects (e.g., eye, nose or throat and lung irritation) in some personnel, particularly exposures to high levels of dust 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. For burn pits, the short-term risk for PM_{10} was 'Low to High' and for $PM_{2.5}$ was 'Low to Moderate' – see Section 10.7. For burn pits, exposures may vary, and exposure to high levels of PM_{10} and to $PM_{2.5}$ in the smoke may also 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 while at this site. Although most short-term health effects from exposure to particulate matter and burn pit 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 during their time at Bagram Airfield (BAF) and vicinity. Personnel who reported with symptoms or required treatment 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 hazards associated with potential long-term health effects in some personnel during deployment at Bagram Airfield (BAF) and vicinity that includes Camp Ouellette, Camp Castle, Camp Dragon, Camp Charikar, Camp Sabalu-Harrison, Combat Outpost (COP) Red Hill, Joint COP Pul-A-Sayad, and Camp Lacey include the following: inhalable fine particulate matter less than 2.5 micrometers in diameter ($PM_{2.5}$), continuous noise, and burn pits.

Air quality: Although inhalable coarse particulate matter data less than 10 micrometers in diameter (PM_{10}) were not evaluated for long-term risk due to non-availability of established health guidelines, an analysis of inhalable

fine particulate matter less than 2.5 micrometers in diameter ($PM_{2.5}$) sampling data correlated with an overall long-term risk ranging from 'Low to Moderate.' For those personnel receiving prolonged inhalational exposure to high levels of dust, PM_{10} and $PM_{2.5}$, such as from frequent dust storms and burn pit operations, it is considered possible that some otherwise healthy personnel could develop certain chronic health conditions (e.g., reduced lung function and cardiopulmonary disease). Personnel with a history of asthma or cardiopulmonary disease are potentially more likely to develop chronic health conditions. While the exposures to dust, particulate matter, and burn pits are acknowledged, at this time there were no specific recommended, post-deployment medical surveillance evaluations or treatments for long term health risks. 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).

Continuous Noise: For continuous noise, there is high risk of long-term effects to individuals working near major noise sources (e.g., flightline, power production) without proper hearing protection; risks may have been reduced by use of appropriate hearing protection and noise barriers.

Table 2. Population-Based Health Risk Estimates –Bagram Airfield and vicinity[1, 2]

Source of Identified Health Risk[3]	Unmitigated Health Risk Estimate[4]	Control Measures Implemented	Residual Health Risk Estimate[4]
AIR			
Particulate matter less than 10 micrometers in diameter (PM_{10})	Short-term: 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 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).
	Long-term: No health guidelines		Long-term: No health guidelines
Particulate matter less than 2.5 micrometers in diameter ($PM_{2.5}$)	Short-term: Low to Moderate, A majority of the time mild acute (short term) health effects are anticipated; certain peak levels may produce mild eye, nose, or throat irritation in some personnel and pre-existing health conditions (e.g., asthma, or cardiopulmonary diseases) may be exacerbated.	Limiting strenuous physical activities when air quality is especially poor; and actions such as closing tent flaps, windows, and doors.	Short-term: Low to Moderate, A majority of the time mild acute (short term) health effects are anticipated; certain peak levels may produce mild eye, nose, or throat irritation in some personnel and pre-existing health conditions (e.g., asthma, or cardiopulmonary diseases) may be exacerbated.
	Long-term: Low to Moderate. A small percentage of personnel may be at increased risk for developing chronic conditions. Particularly those more susceptible to acute effects (e.g., those with asthma/existing respiratory diseases).		Long-term: Low to Moderate. A small percentage of personnel may be at increased risk for developing chronic conditions. Particularly those more susceptible to acute effects (e.g., those with asthma/existing respiratory diseases).
Metals	Short-term: Low for Cadmium.		Short-term: Low for Cadmium.
	Long-term: No long term hazards identified based on the available data.		Long-term: No long term hazards identified based on the available data
Volatile Organic Compounds (VOC)	Short-term: No short term hazards identified based on the available data.		Short-term: No short term hazards identified based on the available data.
	Long-term: Low for Acrolein		Long-term: Low for Acrolein
SOIL			
Metals	Short-term: Not an identified source of health risk.		Short-term: Not an identified source of health risk.
	Long-term: No long term hazards identified based on the available data.		Long-term: No long term hazards identified based on the available data.
Organic Compounds	Short-term: Not an identified source of health risk.		Short-term: Not an identified source of health risk.
	Long-term: No long term hazards identified based on the available data.		Long-term: No long term hazards identified based on the available data.
Inorganic Compounds	Short-term: Not an identified source of health risk.		Short-term: Not an identified source of health risk.
	Long-term: No long term hazards identified based on the available data.		Long-term: No long term hazards identified based on the available data.
Water			
Consumed Water (Water Used for Drinking)	Short-term: Low. Exposures to Boron and Magnesium in ROWPU-treated drinking water were low.	U.S. Army Public Health Command (USAPHC) former U.S. Army Veterinary Command (VETCOM) approved bottled water and potable water only from designated water sources	Short-term: Low
	Long-term: No long term hazards identified based on the available data.		Long-term: No long term hazards identified based on the available data.

Water for Other Purposes	Short-term: No short or long term hazards identified based on the available data.	Water treated in accordance with standards applicable to its intended use	Short-term: No short or long term hazards identified based on the available data.
Military Unique			
Ionizing Radiation	Short-term: None based on available data		Short-term: None based on available data
	Long-term: Low		Long-term: Low
ENDEMIC DISEASE			
Food borne/Waterborne (e.g., diarrhea-bacteriological)	Short-term: Variable; High (bacterial diarrhea, hepatitis A, typhoid fever) to Moderate (diarrhea-cholera, diarrhea-protozoal, brucellosis, hepatitis E) if ingesting local food/water, the health effects can temporarily incapacitate personnel (diarrhea) or result in prolonged illness (hepatitis A, Typhoid fever, hepatitis E, brucellosis).	Preventive measures include Hepatitis A and Typhoid fever vaccination and consumption of food and water only from approved sources.	Short-term: Low to none
	Long-term: none identified		Long-term: No data available
Arthropod Vector Borne	Short-term: Variable; High for malaria, Moderate for leishmaniasis - cutaneous (acute), Crimean-Congo hemorrhagic fever, sandfly fever, typhus-miteborne; and Low for, the plague and West Nile fever.	Preventive measures include proper wear of treated uniform, application of repellent to exposed skin, bed net use, minimizing areas of standing water and appropriate chemoprophylaxis.	Short-term: Low
	Long-term: Low for Leishmaniasis-visceral infection.		Long-term: No data available
Water-Contact (e.g. wading, swimming)	Short-term: Moderate for leptospirosis	Recreational swimming in surface waters not likely in this area of Afghanistan during this time period.	Short-term: Low for leptospirosis.
	Long-term: No data available		Long-term: No data available
Respiratory	Short-term: Variable; Moderate for tuberculosis (TB) and Low for meningococcal meningitis.	Providing adequate living and work space; medical screening; vaccination.	Short-term: Low
	Long-term: No data available		Long-term: No data available
Animal Contact	Short-term: Variable; Moderate for rabies, anthrax, Q-fever and Low for H5N1 avian influenza.	Prohibiting contact with, adoption, or feeding of domestic or wild animals IAW U.S. Central Command (CENTCOM) General Order (GO) 1B. Risks are further reduced in the event of assessed contact by prompt post-exposure rabies prophylaxis IAW The Center for Disease Control's (CDC) Advisory Committee on Immunization Practices guidance.	Short-term: No data available
	Long-term: Low (Rabies)		Long-term: No data available
VENOMOUS ANIMAL/ INSECTS			
Snakes, scorpions, and spiders	Short-term: Low; If encountered, effects of venom vary with species from mild localized swelling to potentially lethal effects.	Risk reduced by avoiding contact, proper wear of uniform (especially footwear), and proper and	Short-term: Low; If encountered, effects of venom vary with species from mild localized swelling to potentially lethal effects.

	Long-term: No data available	timely treatment.	Long-term: No data available
HEAT/COLD STRESS			
Heat	Short-term: Variable; Risk of heat injury is High for July-August, Moderate for June 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 July-August, Moderate for June and Low for all others.
	Long-term: Low, The long-term risk was Low. However, the risk may be greater to certain susceptible persons– those older (i.e., greater than 45 years), in lesser physical shape, or with underlying medical/health conditions.		Long-term: Low, The long-term risk is Low. However, the risk may be greater to certain susceptible persons– those older (i.e., greater than 45 years), in lesser physical shape, or with underlying medical/health conditions.
Cold	Short-term: Low risk of cold stress/injury.	Risks from cold stress reduced with protective measures such as use of the buddy system, limiting exposure during cold weather, proper hydration and nutrition, and proper wear of issued protective clothing.	Short-term: Low risk of cold stress/injury.
	Long-term: Low; Long-term health implications from cold injuries are rare but can occur, especially from more serious injuries such as frost bite.		Long-term: Low; Long-term health implications from cold injuries are rare but can occur, especially from more serious injuries such as frost bite.
NOISE			
Continuous (Flightline, Power Production)	Short-term: Low	Hearing protection used by personnel in higher risk areas	Short-term: Low
	Long-term: Low to Moderate		Long-term: Low to Moderate
Unique Incidents/ Concerns			
Burn Pits	Airborne Substances		
Particulate matter less than 10 micrometers in diameter (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).	Control measures may have included locating burn pits downwind of personnel (based on prevailing wind direction), increased distance from living and working areas when possible, and improved waste segregation and management techniques	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).
	Long-term: No health guidelines		Long-term: No health guidelines
Particulate matter less than 2.5 micrometers in diameter ($PM_{2.5}$)	Short-term: Low to Moderate, A majority of the time mild acute (short term) health effects are anticipated; certain peak levels may produce mild eye, nose, or throat irritation in some personnel and pre-existing health conditions (e.g., asthma, or cardiopulmonary diseases) may be exacerbated.		Short-term: Low to Moderate, A majority of the time mild acute (short term) health effects are anticipated; certain peak levels may produce mild eye, nose, or throat irritation in some personnel and pre-existing health conditions (e.g., asthma, or cardiopulmonary diseases) may be exacerbated.
	Long-term: Low to Moderate. A small percentage of personnel may be at increased risk for developing chronic conditions. Particularly those more susceptible to acute effects (e.g., those with asthma/existing respiratory diseases).		Long-term: Low to Moderate. A small percentage of personnel may be at increased risk for developing chronic conditions. Particularly those more susceptible to acute effects (e.g., those with asthma/existing respiratory diseases).
Volatile Organic Compounds (VOC)	Short-term: No short term hazards identified based on the available data.		Short-term: No short term hazards identified based on the available data.

Volatile Organic Compounds (VOC)	Long-term: Low for Acrolein		Long-term: Low for Acrolein

[1]This Summary Table provides a qualitative estimate of population-based short- and long-term health risks associated with the occupational environment conditions at Bagram Airfield (BAF) and vicinity that includes Camp Ouellette, Camp Castle, Camp Dragon, Camp Cherry-Beasley, Camp Charikar, Camp Sabalu-Harrison, Combat Outpost (COP) Red Hill, Joint COP Pul-A-Sayad, and COP Lacey. 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 health sampling data and reports obtained from 01 January 2010 through 31 May 2013. 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 BAF and vicinity. The health risks are presented as Low, Moderate, High or Extremely High for both acute and chronic health effects. The health risk level is based on an assessment of both the potential severity of the health effects that could be caused and probability of the exposure that would produce such health effects. Details can be obtained from the USAPHC/ Army Institute of Public Health (AIPH). Where applicable, “None Identified” is used when though a potential exposure is identified, and no health risks of either a specific acute or chronic health effects are determined. More detailed descriptions of OEH exposures that are evaluated but determined to pose no health risk are discussed in the following sections of this report.

[4]Health risks in this Summary Table are based on quantitative surveillance thresholds (e.g., endemic disease rates; host/vector/pathogen surveillance) or screening levels, e.g., Military Exposure Guidelines (MEGs) for chemicals. Some previous assessment reports may provide slightly inconsistent health risk estimates because quantitative criteria such as MEGs may have changed since the samples were originally evaluated and/or because this assessment makes use of all historic site data while previous reports may have only been based on a select few samples.

1 Discussion of Health Risks at Bagram Air Field 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 Command Technical Guide 230, *Environmental Health Risk Assessment and Chemical Exposure Guidelines for Deployed Military Personnel* (USAPHC TG 230; reference 9). 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

Vehicle emissions are considered a major contributor to air pollution in the city of Charikar, which has a population of over 75,000 people. According to the Afghan National Environmental Protection Agency, most of these vehicles are over 10 years old, and generally use substandard fuels. Some of the more common industries (e.g., brick factories) burn tire rubber, plastic waste and other combustibles as cheap energy sources. Additionally, rationed power exacerbates the situation as it forces people to use more polluting fuel sources such as wood, coal and heating oil for cooking and heating.

Additional emissions from military operations included power generators, vehicular traffic, a medical waste incinerator, waste burning (burn pit and air curtain incinerators), and other local sources also contributed to the ambient environment at these locations.

Inhalational exposure to high levels of dust and particulate matter, such as during high winds or dust storms, may result in mild to more serious short-term health effects (e.g., eye, nose or throat and lung irritation) in some personnel. Additionally, certain subgroups of the deployed forces (e.g., those with pre-existing asthma/cardio pulmonary conditions) are at greatest risk of developing notable health effects. The air pollution exposure risks assessed in this POEMS focused on ambient exposures, and exposures near fuel sources (e.g., petroleum distribution points and storage) as indicated through sampling records.

Air sample data were not available from all the base camps within the Parwan Province in the vicinity of Bagram. Air sampling data were available for BAF, to include one air sample from Camp Ouellette (located on BAF), and Camp Sabalu-Harrison (located on BAF). The geographic features along with the relatively consistent land-use practices (agriculture, industrial, residential, etc.) within the province facilitate treating the province as one air shed. Therefore, the air sampling results collected from BAF are considered similar to the expected air quality at the other base camps within the province. Air samples taken at Sabalu-Harrison were evaluated separately due to the samples primarily taken to address the specific exposure concerns to the population living/working at that Camp and based on its location within the perimeter being too distant from the rest of BAF and limited movement of the populations between the camps the Sabalu-Harrison population was assessed separately.

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. The following data contains ambient air samples for particulate matter, those samples that were taken at or around the burn pit can be found in Section10.7, Burn Pits.

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:

PM_{10} samples were collected and analyzed at BAF and Camp Sabalu-Harrison; no PM_{10} air samples were collected at the other locations.
BAF: A total of 122 valid PM_{10} ambient air samples were collected and analyzed from 2010 – 2012, no sampling data from 2013 were available. The range of 24-hour PM_{10} concentrations was 23 $\mu g/m^3$ – 965 $\mu g/m^3$ with a mean concentration of 422 $\mu g/m^3$. There were 24 samples taken with values above 600 $\mu g/m^3$, the critical MEG for PM_{10}; all of these samples were taken in 2010.

Camp Sabalu-Harrison: A total of 90 valid PM_{10} air samples were collected from 01 January 2010 to 26 June 2012. No sampling data were available for 2013. The range of 24-hour PM_{10} concentrations was 28 $\mu g/m^3$ – 865 $\mu g/m^3$ with a mean concentration of 211 $\mu g/m^3$. There were five samples with values above the critical MEG, three of these were taken during July and October 2010 and one during February 2011 and one during March 2012.

2.3.3 Short-term health risks:

Low to High: The short-term PM_{10} health risk ranged from Low to High based on mean and peak PM_{10} sample concentrations, and the probability of Service Members receiving exposures at the higher hazard severity levels. Under high health risk conditions significant mission degradation would be expected which could prevent full mission completion and/or mission completion to standard. A High health risk assessment is expected to significantly degrade mission capabilities by lowering the execution standard, preventing completion of essential tasks, and jeopardizing mission completion if hazards arise during the mission. Some in-theater medical countermeasures and resources anticipated. (Reference 9, Table 3-2). Assessments derived from the PM_{10} air sampling data at BAF (excluding Camp Sabalu-Harrison) correlate to no hazard for 37%, a low health risk for 20%, a moderate health risk for 22%, and high health risk for 22% of the sampling events. In comparison, Camp Sabalu-Harrison PM_{10} air sampling data correlate with no hazard for 68%, low health risk for 30%, and moderate health risk for 2% of the sampling events. There were no Camp Sabalu-Harrison PM_{10} sampling events correlating to a high health risk assessment. Confidence in the short-term PM_{10} health risk assessments is low (Reference 9, Table 3-6).

The hazard severity for average PM_{10} concentrations in samples was negligible. The results predict a few personnel may experience notable mild eye, nose, or throat irritation; most personnel will experience only mild effects. Service members with pre-existing health conditions (e.g., asthma, or cardiopulmonary diseases) may have experienced an exacerbation of their conditions (Reference 9, Table 3-10). During 2010, the hazard severity for average PM_{10} samples was marginal. The results predict that a majority of personnel will experience notable eye, nose, or throat irritation and some respiratory effects. Some lost-duty days are expected. Significant aerobic (e.g., distance running, road marching, etc.) activity would increase risk. Those with a history of asthma or cardiopulmonary disease are predicted to suffer more dramatic symptoms.

For the highest observed PM_{10} sample concentrations, the hazard severity ranged from negligible to critical. During peak exposures at the critical hazard severity level (above 600 $\mu g/m^3$), the results predict that most, if not all, personnel would have experienced very notable eye, nose, and throat irritation and respiratory effects. Visual acuity is impaired, as is overall aerobic capacity. Some personnel will not have been able to perform their assigned duties. Some lost-duty days expected. Those with a history of asthma or cardiopulmonary disease will have experienced more severe symptoms.

2.3.4 Long-term health risk:

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

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

2.4.1 Exposure Guidelines:

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

$PM_{2.5}$ sampling data were available for BAF, including one sample from Camp Ouellette and 89 samples from Camp Sabalu-Harrison. $PM_{2.5}$ air sampling data were not collected at any of the other base camps in the vicinity of Bagram.

BAF: A total of 148 valid $PM_{2.5}$ ambient air samples were collected from 2010 – 2013. The range of 24-hour $PM_{2.5}$ concentrations was 11 $\mu g/m^3$ – 499 $\mu g/m^3$ with a mean concentration of 92 $\mu g/m^3$. All of these samples were below the Critical MEG (500 $\mu g/m^3$) for $PM_{2.5}$.

Camp Sabalu-Harrison: A total of 89 valid $PM_{2.5}$ air samples were collected from 27 March 2010 to 26 June 2012, no samples were collected in 2013. The range of 24-hour $PM_{2.5}$ concentrations was 12 $\mu g/m^3$ – 334 $\mu g/m^3$ with an average concentration of 60 $\mu g/m^3$.

2.4.3 Short-term health risks:

Low to Moderate: The short-term $PM_{2.5}$ health risk assessment ranged from low to moderate based on average and peak $PM_{2.5}$ sample concentrations, and the probability of Service Members receiving

exposures at the higher hazard severity levels. A moderate health risk assessment is expected to degrade mission capabilities by lowering the execution performance standard and diminishing mission capabilities if hazards arise during the mission. Due to limited in-theater medical countermeasures and resources, adoption of risk mitigation actions for reducing $PM_{2.5}$ health risks are difficult (Reference 9, Table 3-2). Daily average health risk levels at BAF for $PM_{2.5}$ show no hazard for 36%, low health risk for 62%, moderate health risk for 2%, and high health risk for 0% of the time. Daily average health risk levels at Sabalu-Harrison for $PM_{2.5}$ show no hazard for 68%, low health risk for 30%, moderate health risk for 2%, and high health risk for 0% of the time evaluated. Confidence in the short-term $PM_{2.5}$ health risk assessment was low (Reference 9, Table 3-6).

The hazard severity was negligible for average $PM_{2.5}$ sample concentrations at BAF and Sabalu-Harrison. The results indicate that a few personnel may experience notable mild eye, nose, or throat irritation; most personnel will experience only mild effects. Service Members with pre-existing health conditions (e.g., asthma, or cardiopulmonary diseases) may have experienced an exacerbation of their conditions. (Reference 9, Table 3-10).

For the highest observed $PM_{2.5}$ exposure, the hazard severity ranged from negligible to marginal. During peak exposures at the marginal hazard severity level (above 250 $\mu g/m^3$), a majority of personnel will experience notable eye, nose, and throat irritation and some respiratory effects. Some lost-duty days are expected. Significant aerobic activity will increase risk. Those with a history of asthma or cardiopulmonary disease are expected to experience increased symptoms.

2.4.4 Long-term health risks:

Low to Moderate: The long-term health risk assessment ranges from Low to Moderate based on average $PM_{2.5}$ concentration, and the likelihood of exposure at this hazard severity level. A Moderate risk level suggests that long-term exposure to $PM_{2.5}$ is expected to have some future medical surveillance activities and related resources such as documentation of environmental data in the designated DoD archive is anticipated. Consider documenting exposed groups or personnel of surveillance interest. (Reference 9, Table 3-3). Confidence in the long-term $PM_{2.5}$ health risk assessment is low (Reference 9, Table 3-6).

The average measured $PM_{2.5}$ sample concentration value corresponded with a negligible hazard severity. Under repeated exposures to $PM_{2.5}$ concentrations at these levels, a small percentage of personnel may have increased risk for developing chronic conditions, such as reduced lung function or exacerbated chronic bronchitis, COPD, asthma, atherosclerosis, or other cardiopulmonary diseases. Personnel with history of asthma or cardiopulmonary disease are considered to be at a higher risk of developing chronic conditions. Exposures below this are not expected to result in development of chronic health conditions in generally healthy troops (Reference 9, Table 3-11).

2.5 Airborne Metals

2.5.1 Sample data/Notes:

A total of 88 valid PM_{10} airborne metal samples were collected at BAF and 90 valid PM_{10} airborne metal samples were collected at Camp Sabalu-Harrison from 01 January 2010 to 31 May 2013. Cadmium was the only airborne metal for PM_{10} samples with a population exposure point concentration (PEPC) greater than its 1 year negligible MEG for ambient conditions at BAF. No samples from Sabalu-Harrison had airborne metal concentrations exceeding negligible MEGs.

Cadmium was detected in three out 88 samples, with a peak PEPC of 0.04 ug/m^3 which is 5 times above its corresponding 1 year negligible MEG of 0.007ug/m^3.

A total of 111 valid $PM_{2.5}$ airborne metal samples were collected at BAF from 01 January 2010 to 31 May 2013. No samples were above their corresponding 1 year negligible MEGs.

2.5.2 Short-term health risks:

Low: Cadmium had an average (0.0005 ug/m^3) and peak (0.04 ug/m^3) sample concentration that exceeded the short-term 14 day negligible MEG (0.021 ug/m^3). The short-term health risk assessment for PM_{10} airborne cadmium sample concentrations is Low. Confidence in the health risk assessment is medium (Reference 9, Table 3-6).

2.5.3 Long-term health risks:

None identified based on the available sampling data. Long-term exposure to lower levels of cadmium in air leads to a buildup of cadmium in the kidneys and possible kidney disease. Other long-term effects are lung damage and fragile bones (Reference 17).

2.6 Volatile Organic Compounds (VOC)

2.6.1 Sample data/Notes:

The health risk assessment was based on average and peak concentration of 7 valid ambient volatile organic compounds (VOC) air samples collected using the EPA sampling method TO-14 and 8 valid ambient VOC air samples collected using the sampling method TO-17 from 01 January 2010 to 31 May 2013, and the likelihood of exposure. Acrolein was the only reported VOC pollutant found at concentrations above short or long-term MEGs .

Acrolein was detected in 7 out of 7 valid TO-14 samples with a peak PEPC of 1.8ug/m^3, which exceeded its negligible 1 year MEG of 0.14 ug/m^3.

2.6.2 Short-term health risks:

None identified based on available sample data. No parameters exceeded the short term MEGs.

2.6.3 Long-term health risks:

Low: Acrolein had an average (1.1 ug/m^3) and peak (1.8 ug/m^3) sample concentration that exceeded the long term 1 year negligible MEG (0.14 ug/m^3). The long-term health risk assessment for acrolein sample concentrations is Low, based on a negligible hazard severity and an occasional hazard probability rank. Animal studies show that breathing acrolein causes irritation to the nasal cavity, lowered breathing rate, and damage to the lining of the lungs (Reference 18). Confidence in the health risk assessment is low (Reference 9, Table 3-6).

3 Soil

3.1 Site-Specific Sources Identified

3.2 Sample data/Notes:

A total of 12 valid surface soil samples were collected from 01 January 2010 to 31 May 2013, to assess OEH risk to deployed personnel. The primary soil contamination exposure pathways are dermal contact and dust inhalation. Typical parameters analyzed for included semi-volatile organic compounds

(SVOCs), heavy metals, polychlorinated biphenyls (PCBs), pesticides, and herbicides. If the contaminant was known or suspected, other parameters may have been analyzed for (i.e., total petroleum hydrocarbons (TPH) and polycyclic aromatic hydrocarbons (PAH) near fuel spills). For the risk assessment, personnel are assumed to remain at this location for 6 months to 1 year.

3.3 Short-term health risk:

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

3.4 Long-term health risk:

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

4 Water

In order to assess the health risk to U.S. personnel from exposure to water in theater, the USAPHC identified the most probable exposure pathways. These are based on the administrative information provided on the field data sheets submitted with the samples taken over the time period being evaluated. It is assumed that 100% of all U.S. personnel at Bagram Airfield and vicinity will be directly exposed to reverse osmosis water purification unit (ROWPU) treated and disinfected fresh bulk water, since this classification of water is primarily used for personal hygiene, showering, cooking, and for use at vehicle wash racks. Field data sheets indicate that bottled water and ROWPU treated water were being used for drinking water.

4.1 Drinking Water: Bottled or Packaged Water

4.1.1 Site-Specific Sources Identified

There were multiple bottled water brands used at Bagram Airfield. These included Cristal, Kinley, and Aria brands of bottled water. Bottled water could not be evaluated in this assessment because no bottled water sampling results were available for review.

4.1.2 Sample data/Notes:

To assess the potential for adverse health effects to troops, the following assumptions were made about dose and duration: A conservative (protective) assumption was that personnel routinely ingested 15 L/day of bottled water for up to 365 days (1-year). It was further assumed that control measures were not used. A total of 13 valid drinking water samples were collected from ROWPUs between 01January 2010 to 31 May 2013 on BAF. Only the ROWPU at the west well on BAF treats water used for potable purposes. Water from the remaining wells is used for disinfected non-potable purposes.

Boron was detected in twelve out of thirteen drinking water samples with an average concentration of 0.63 milligrams per liter (mg/L) and a peak concentration was 1.7 mg/L. The peak concentration was slightly above the short-term 14-day negligible MEG of 0.93 mg/L, thus the short-term health risk from drinking water at Bagram Airfield from short-term exposure to boron was low.

A treated water sample was collected at Camp Charikar on 27 October 2011. The camp employed a filtration system but did not use a ROWPU. The treated water was used for cooking and personal hygiene purposes. No chemicals were detected at levels exceeding the short-term or long-term MEGs.

A treated water sample was collected at JCOP Pul-A-Sayad on 1 January 2012 from a well on the camp. This water was treated and occasionally used for cooking and kitchen sanitation purposes. No chemicals were detected at levels exceeding the short-term or long-term MEGs.

Magnesium was detected in ten out of thirteen drinking water samples with an average concentration of 11.7 mg/L and a peak concentration of 39 mg/L. The peak concentration was slightly above the short-term 14-day negligible MEG of 30 mg/L, thus the short-term health risk from drinking water at Bagram Airfield from short-term exposure to magnesium was low.

4.1.3 Short-term and long-term health risk:

The short term health risk from drinking water at Bagram Airfield from short term exposure to magnesium and boron is low. Confidence in the risk assessment is low because of limited sample data.

There is no long-term health risk from boron in drinking water because the average PEPC for boron, (0.63 mg/L) was below the 1 year negligible MEG of 0.93mg/L. There is not a long term MEG for magnesium, thus long-term health risks could not be evaluated.

4.2 Non-Drinking Water: Disinfected

4.2.1 Site-Specific Sources Identified

Although the primary route of exposure for most microorganisms is ingestion of contaminated water, dermal exposure to some microorganisms, chemicals, and biological contaminants 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 the base camps were expected to remain at the camp for approximately 1 year. A conservative (protective) assumption is that personnel routinely consumed less than 5 L/day of non-drinking water for up to 365 days (1-year). It is further assumed that control measures and/or personal protective equipment were not used. A total of 29 disinfected bulk water (Non-Drinking) samples from 1 January 2010 to 31 May 2013 on BAF were evaluated for this health risk assessment. No chemicals were detected at levels above the short or long-term MEGs.

4.2.3 Short and long-term health risks:

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

5 Military Unique

5.1 Chemical Biological, Radiological Nuclear (CBRN) Weapons

No specific hazard sources were documented in the Defense Occupational and Environmental Health Readiness System (DOEHRS), or the Military Exposure Surveillance Library (MESL) from 1 January 2010 to 31 May 2013 timeframe.

5.2 Depleted Uranium (DU)

No specific hazard sources were documented in the DOEHRS or MESL from 1 January 2010 to 31 May 2013 timeframe.

5.3 Ionizing Radiation

Medical and dental radiography are utilized at Craig Joint Theater Hospital (CJTH). Radiology personnel are enrolled in the thermoluminescent dosimetry (TLD) program. Permitted radioactive materials and generally licensed devices are used in chemical, biological, radiological, nuclear and high-yield explosives (CBRNE) detection equipment, moisture density gauges and targeting pods.

Backscatter x-ray systems and mobile vehicle and cargo systems (MVACIS) are used for screening personnel and/or vehicles at the installation Entry Control Points (ECPs). Two separate systems are in use, one for pedestrians and one for vehicles. The MVACIS use a Cobalt 60 source which emit a gamma beam to scan vehicles passing through ECPs.

Rapiscan Secure 1000 is a walk-up system used for screening personnel (pedestrians) entering the base. All non-U.S. personnel entering the installation are screened using the Rapiscan. The AS&E Z-Backscatter systems are mounted in two unmarked, nondescript passenger vans operated at ECP 1. The vans are unoccupied and unattended during operations; SFS personnel review the images from an observation post located approximately 50 yards away. Important note: The Rapiscan operation at ECP 1 has been repositioned as of February 2011, and is no longer considered a health risk hazard (TF44-MED 2011). MVACIS are believed to be in use at the other ECPs on BAF to include the entry way into Sabalu-Harrison.

5.3.1 Short -term health risks:

None identified based on the available data.

5.3.1 Long-term health risks:

Low: As currently configured, radiation exposure is insignificant for Z-Backscatter van operators as well as the Rapiscan operators at entry control point (ECP) 3. At ECP 1, Rapiscan operations may potentially expose personnel to radiation levels that approach the general public dose limit over the course of a 6-month deployment. Although no exposure limits were exceeded, the As Low As Reasonably Achievable (ALARA) principle applies. Long-term health risk is considered low. Confidence for risk assessments was low (Reference 9, Table 3-6).

5.4 Non-Ionizing Radiation

The 2012 Bagram Airfield OEHSA listed typical communication antennas being on site. These communication antennas are radio frequency radiating (RFR) sources, which only emit RFR when transmitting. Ground-based radio frequency emitters have administrative processes in place to reduce the potential for exposures and ensure personnel are not within the uncontrolled environment hazard distance. No other specific hazard sources were documented in the DOEHRS or MESL from 1 January 2010 to 31 May 2013 timeframe.

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) 11 (Reference 11)

lists deployment requirements, to include immunizations and chemoprophylaxis, in effect during the timeframe of this POEMS.

6.1 Foodborne and Waterborne Diseases

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

During the August 2012 time period, AAFES food service facilities on BAF had a seven day public health improvement stand-down. These facilities had been failing inspections for the prior several months with the failures attributed to inadequate training, improper food holding temperatures, and stocking issues. Following the stand down, marked sanitation improvement was observed at these facilities. Mitigation strategies were in place and included consuming food and water from approved sources, vaccinations (when available), frequent hand washing and general sanitation practices.

6.1.1 Diarrheal diseases (bacteriological)

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

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

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

6.1.3 Short-term Health Risks:

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

6.1.4 Long-term Health Risks:

None identified based on available data.

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. In addition, other vector-borne diseases are transmitted at low or unknown levels and may constitute a significant risk. 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

Moderate, mitigated to Low: Potential unmitigated risk to U.S. personnel is moderate during warmer months (typically March through November) but reduced to low with mitigation measures. Malaria outbreaks 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 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. The last case of malaria reported at BAF was in 2008.

6.2.2 Leishmaniasis

Moderate, mitigated to Low: The disease risk is Moderate during the warmer months when sandflies are most prevalent, but reduced to low with mitigation measures. Leishmaniasis is transmitted by sand flies. There are two forms of the disease; cutaneous (acute form) and visceral (a more latent form of the disease). Cutaneous infection is unlikely to be debilitating, though lesions may be disfiguring. Visceral leishmaniasis is uncommon with attack rate less than 0.1% per month. The parasites of visceral leishmaniasis may survive for years in infected individuals. The infection may go unrecognized by physicians in the U.S. after infections become symptomatic years later. When symptomatic, visceral leishmaniasis causes a severe febrile illness which typically requires hospitalization with convalescence over 7 days.

6.2.3 Crimean-Congo hemorrhagic fever

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

6.2.4 Sandfly fever

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

6.2.5 Plague

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

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

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

6.2.7 West Nile fever

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

6.2.9 Short -term health risks:

Low: The unmitigated health risk estimate is moderate for malaria (infection rate of less than 1% per month), Moderate for leishmaniasis-cutaneous (acute), Crimean-Congo hemorrhagic fever, sandfly fever, typhus-miteborne; and Low for, the plague and West Nile fever. Health risk is reduced to low by proper wear of the uniform, application of repellent to exposed skin, and appropriate chemoprophylaxis. Confidence in health risk estimate was high.

6.2.10 Long-term health risks:

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

6.3 Water Contact Diseases

Operations or activities that involve extensive water contact may result in personnel being temporarily debilitated with leptospirosis in some locations. Leptospirosis health risk typically increases during

flooding. In addition, although not specifically assessed in this document, bodies of surface water are likely to be contaminated with human and animal waste. Activities such as wading or swimming may result in exposures to enteric diseases such as diarrhea and hepatitis via incidental ingestion of water. Prolonged water contact also may lead to the development of a variety of potentially debilitating skin conditions such as bacterial or fungal dermatitis. Mitigation strategies were in place and included avoiding water contact and recreational water activities, proper wear of uniform (especially footwear), and protective coverings for cuts/abraded skin.

6.3.1 Leptospirosis

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

6.3.2 Short-term health risks:

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

6.3.3 Long-term health risks:

None identified based on available data.

6.4 Respiratory Diseases

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

6.4.1 Tuberculosis (TB)

Moderate, mitigated to Low: Potential health risk to U.S. personnel is Moderate, mitigated to Low, year round. Transmission typically requires close and prolonged contact with an active case of

pulmonary or laryngeal TB, although it also can occur with more incidental contact. The Army Surgeon General has defined increased risk in deployed Soldiers as indoor exposure to locals or third country nationals of greater than one hour per week in a highly endemic active TB region. Additional mitigation included active case isolation in negative pressure rooms, where available.

6.4.2 Meningococcal meningitis

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

6.4.3 Short-term health risks:

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

6.4.4 Long-term health risks:

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

6.5 Animal-Contact Diseases

6.5.1 Rabies

Moderate, mitigated to Low: Rabies posed a year-round moderate risk. Occurrence in local animals was well above U.S. levels due to the lack of organized control programs. Dogs are the primary reservoir of rabies in Afghanistan, and a frequent source of human exposure. Rabies is transmitted by exposure to the virus-laden saliva of an infected animal, typically through bites, but could occur from scratches contaminated with the saliva. A U.S. Army Soldier bitten on the hand by a feral dog in January 2011 while deployed in Afghanistan died of rabies on 31 August 2011 (Reference 12). Laboratory results indicated the Soldier was infected from contact with a dog while deployed. Although the vast majority (>99%) of persons who develop rabies disease will do so within a year after a risk exposure, there have been rare reports of individuals presenting with rabies disease up to six years or more after their last known risk exposure. Mitigation strategies included command emphasis of CENTCOM GO 1B, reduction of animal habitats, active pest management programs, and timely treatment of feral animal scratches/bites.

6.5.2 Anthrax

Low: Anthrax cases are rare in indigenous personnel, and pose a Low risk to U.S. personnel. Anthrax is a naturally occurring infection; cutaneous anthrax is transmitted by direct contact with infected animals or carcasses, including hides. Eating undercooked infected meat may result in contracting gastrointestinal anthrax. Pulmonary anthrax is contracted through inhalation of spores and is extremely rare. Mitigation measures included consuming approved food sources, proper food preparation and cooking temperatures, avoidance of animals and farms, dust abatement when working in these areas, vaccinations, and proper PPE for personnel working with animals.

6.5.3 Q-Fever

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

6.5.4 H5N1 avian influenza

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

6.5.5 Short-term health risks:

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

6.5.6 Long-term health risks:

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

7 Venomous Animal/Insects

All information was taken directly from the Clinical Toxinology Resources web site from the University of Adelaide, Australia (Reference 2). The species listed below have home ranges that overlap the location of Bagram Airfield 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 afghanus* ,*Androctonus amoreuxi,* and *Androctonus baluchicus*: Severe envenoming possible, potentially lethal. Severe envenoming may produce direct or indirect cardio toxicity, with cardiac arrhythmias, cardiac failure. Hypovolemic hypotension possible in severe cases due to fluid loss through vomiting and sweating.

- *Afghanobuthus nuamanni*: Stings by these scorpions are likely to cause only short lived local effects, such as pain, without systemic effects.

- *Compsobuthus rugosulus, Compsobuthus tofti*: Severe envenoming possible, potential lethality and systemic effects unknown.

- *Mesobuthus caucasicus, Mesobuthus eupeus, Mesobuthus macmahoni*: Stings by these scorpions are likely to cause only short lived local effects, such as pain, without systemic effects.

- *Orthochirus afghanus, Orthochirus bicolor, Orthochirus. Jalalabadensis, Orthochirus pallidus, Orthochirus samrchelsis*, *Orthochirus scrobiculosus*: Severe envenoming possible, potential lethality and systemic effects unknown.

- *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

- *Boiga trigonata* (Common Cat Snake), and *Telescopus rhinopoma* (leopard viper)**:** Unlikely to cause significant envenoming; Bites by these rear fanged Colubrid snakes are rarely reported. They are likely to cause minimal to moderate local effects and no systemic effects.

- *Echis multisquamatus* (central Asian saw-scaled viper), *Echis 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.

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

- *Macrovipera lebetina turanica* (Levantine Viper): Severe envenoming possible, potentially lethal. Bites may cause mild to severe local effects, shock & coagulopathy.

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

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 9, Table 3-6).

7.5 Long-term health risk:

None identified.

8 Heat/Cold Stress

The Bagram airfield is located at 1,500 m above sea level. Precipitation is concentrated in the winter (snow) and spring months. Summers are long and hot (temperatures range from 70 – 91 degrees Fahrenheit (°F)) but have very low humidity. Fall (October and November) is warm and dry. Winters are cold but short, lasting from December to March (temperature range: 19 - 50 °F). Spring in Bagram starts in late March and is the wettest time of the year.

8.1 Heat

Summer (June - September) average monthly temperatures range from 74 °F to 84 °F with an average temperature of 80 °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 monthly average temperatures alone is Low (< 78 °F) from September – May, Moderate (78-81.9°F) from June, high (82-87.9°F) from July to August. However, work intensity and clothing/equipment worn pose greater health risk of heat stress/injury than environmental factors alone (Reference 6). Managing risk of hot weather operations included monitoring work/rest periods, proper hydration, and taking individual risk factors (e.g. acclimation, weight, and physical conditioning) into consideration. Risk of heat stress/injury was reduced with preventive measures

8.1.1 Short-term health risk:

Low to High, mitigated to Low: Risk of heat injury in unacclimatized or susceptible populations (older, previous history of heat injury, poor physical condition, underlying medical/health conditions), and those under operational constraints (equipment, PPE, vehicles) is High from July -September, Moderate in June, and Low from October - May. The risk of heat injury is reducible to low through preventive measures such as work/rest cycles, proper hydration and nutrition, and monitoring WBGT. Confidence in the health risk estimate is low (Reference 9, Table 3-6).

8.1.2 Long-term health risk:

Low: The long-term risk is Low. However, the risk may be greater for certain susceptible persons– those older (i.e., greater than 45 years), in lesser physical shape, or with underlying medical/health conditions. Long-term health implications from heat injuries are rare but may occur, especially from more serious injuries such as heat stroke. It is possible that high heat in conjunction with various chemical exposures may increase long-term health risks, though specific scientific evidence is not conclusive. Confidence in these risk estimates is medium (Reference 9, Table 3-6).

8.2 Cold

8.2.1 Short-term health risks:

Winter (December - March) average monthly temperatures range from 34 °F to 53°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 December – March. The risk assessment for Non-Freezing Cold Injuries (NFCI), such as chilblain, trench foot, and hypothermia, is Low based on historical temperature and precipitation data. Frostbite is unlikely to occur because temperatures rarely drop below freezing. However, personnel may encounter significantly lower temperatures during field operations at higher altitudes. As with heat stress/injuries, cold stress/injuries are largely dependent on operational and individual factors instead of environmental factors alone.

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

8.1.2 Long-term health risk:

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

9 Noise

9.1 Continuous

Aircraft operations have the potential to cause significant noise hazard to flight line support personnel. Especially during intermediate and full power runs of fixed wing aircraft (e.g., F-15 and F-16 engine tests). Because of the potential noise hazard inherent in flight line operations, personnel are required to wear dual hearing protection when working on the flight line and are enrolled in the Hearing Conservation Program. Personal noise dosimetry was performed on 3 November 2010 to measure ground technician exposure during engine run-ups. Most sustained engine run events were identified below 110 A weighted decibels (dBA), which do not present a significant hazard when double hearing protection is worn. For example, the effective noise reduction rate (NRR) of 22 dBA, when double hearing protection is worn, will reduce 110 dBA to 88 dBA which has a 4 hour exposure limit per day). Extreme noise events during engine runs (intermediate and full-power runs) produced sustained dBA of 123.6 (14 minute exposure) and 135.1 dBA (32 minute exposure) and may have exceeded the dosimeter upper measurement limit of 140 dBA. Existing control (double hearing protection) is inadequate to fully protect personnel against noise hazard during these extreme events (Reference 1).

Personnel residing in close proximity to generators will routinely be exposed to noise levels as high as 82.0 dBA. Although this is below the 85 dB threshold requiring hearing protection, it still presents a concern for hearing conservation.

9.1.1 Short and long-term health risks:

Low: The short-term risk of noise injury with appropriate hearing protection use is low. Few exposed personnel (if any) are expected to have noticeable health effects during mission. Confidence in risk assessment is low (Reference 9).

9.1.2 Long-term health risk:

Low to moderate: The long-term risk of noise injury with appropriate hearing protection use is low with few exposed personnel (if any) are expected to develop delayed onset, irreversible effects. If protective measures are not used, the risk is elevated to moderate and many exposed personnel are plausibly expected to develop delayed onset, irreversible effects. Confidence in risk assessment is low (Reference 9).

9.2 Impulse

No specific hazard sources were documented in the DOEHRS or MESL from 01 January 2010 to 31 May 2013 timeframe.

9.2.1 Short-term and Long-term health risks:

Not evaluated.

10 Unique Incidents/Concerns

10.1 Potential environmental contamination sources

DoD personnel are exposed to various chemical, physical, ergonomic, and biological hazards in the

course of performing their mission. These types of hazards depend on the mission of the unit and the operations and tasks which the personnel are required to perform to complete their mission. The health risk associated with these hazards depends on a number of elements including what materials are used, how long the exposure last, what is done to the material, the environment where the task or operation is performed, and what controls are used. The hazards can include exposures to heavy metal particulates (e.g. lead, cadmium, manganese, chromium, and iron oxide), solvents, fuels, oils, and gases (e.g. carbon monoxide, carbon dioxide, oxides of nitrogen, and oxides of sulfur). Most of these exposures occur when performing maintenance task such as painting, grinding, welding, engine repair, or movement through contaminated areas. Exposures to these occupational hazards can occur through inhalation (air), skin contact, or ingestion; however exposures through air are generally associated with the highest health risk.

10.2 Waste Sites/Waste Disposal

Hazardous materials such as used oil, diesel fuel, JP-8, antifreeze, and filter oil are stored in 55-gallon drums at the Hazmat Yard. The storage containers for the Hazmat Yard have secondary containment. The water that is collected in the POL storage secondary containment is disposes as hazardous waste unless the fuels and liquids can be separated from the water. BAF has a “regulated” waste disposal facility which mostly relies on chemical neutralization to treat hazardous types of chemical wastes [Note: Several kinds of hazardous waste streams comprise regulated waste.] This facility became fully operational around October 2013. Shipment of regulated waste to Denmark was discontinued in 2011. During the interim period, battery acid and ROWPU chemicals were chemically neutralized on BAF. Most of the other hazardous chemical wastes were stored on the base until the “regulated” waste disposal facility came on-line.

Solid waste was managed by three separate technologies: open burning, air curtain incinerators, and industrial solid waste incinerators. Through August 2012, there was a burn pit in operation along with two air curtain incinerators and solid waste incinerators on the northern perimeter of BAF. Each of these were operated by the base operating contractor. On 1 September 2012 the burn pit was closed and a new burn pit was opened adjacent to Camp Sabalu-Harrison. The burn pit was operated by a local Afghan contractor. There were also two 16-ton incinerators, totaling 32- ton/per day operated by contractors at the new burn pit site. Construction began on a MILCON project for an additional 200-ton capacity. In 2012, BAF reportedly disposed of 60-70% of their solid waste by open burning, 25-30% by incineration, and 15-20% through recycling. Regulated medical waste was disposed of by two medical waste incinerators located on the installation.

10.3 Fuel/petroleum products/industrial chemical spills

There are multiple fuel points on BAF; however, a comprehensive list of their locations, storage volumes, and fuel types was not available. In 2011, the North Fuel Point (NFP) stored diesel fuel in two types of storage containers. The NFP had two bunker tanks storing 4.2 million liters and 18 bladders storing 800,000 liters of diesel fuel. In 2012, a site visit by PM personnel was only documented for retail fuel point. The retail fuel point had secondary containment, spill kits, eye wash and shower stations and was stocked with PPE. The retail fuel point was comprised of three-20,000 gallon bladders with one bladder each for storing JP-8, gasoline or mogas, and diesel fuel. According to a report received by the PM detachment in 2012, total JP-8 fuel storage, mogas/gasoline, and diesel storage exceeded 15 million gallons, 303,000 gallons, and 474,000 gallons; respectively. The base reportedly had multiple fuel spill events but no specific information concerning these events was available.

10.4 Pesticides/Pest Control:

The health risk of exposure to pesticide residues is considered within the framework of typical residential exposure scenarios, based on the types of equipment, techniques, and pesticide products that have been employed, such as enclosed bait stations for rodenticides, various handheld equipment for spot treatments of insecticides and herbicides, and a number of ready-to-use (RTU) methods such as aerosol cans and baits. The control of rodents required the majority of pest management inputs, with the acutely toxic rodenticides staged as solid formulation lethal baits placed in tamper-resistant bait stations indoors and outdoors throughout cantonment areas. Nuisance insects, including biting and stinging insects such as bees, wasps, and ants, also required significant pest management inputs. Use of pesticides targeting against these pests generally involved selection of compounds with low mammalian toxicity and short-term residual using pinpoint rather than broadcast application techniques. For each pesticide product applied during this period, the EPA approved label has been archived, providing a framework how each pesticide handled and applied (see below). This list below is not a complete list of insecticides and rodenticides used at the site. A comprehensive listing of pesticide applications (date, time, type of pesticide, etc.) may be obtained by contacting the Armed Forces Pest Management Board which archive the DD Form 1532-1 "Pest Management Maintenance Record" completed by applicators in the Combined Joint Operations Area-Afghanistan (CJOA-A).

10.4.1 Rodenticides

Bromadialone, brodifacoum were used to control rodents.

10.4.2 Insecticides

Insecticides used to control ants, bees, bed bugs, crickets, fleas, flies, lice, mosquitoes, spiders, termites, and wasps include:

Hydramethylnon, fipronil, imidacloprid, Z-9-Tricosene, beta-cyfluthrin, and permethrin were used from spring through fall to control ants, wasps, hornets, bees and filth flies.

Hydramethylnon, pyrethrins, piperonyl butoxide, beta-cyfluthrin, and fipronil were used 3-4 times/year to control mosquitoes, spiders, cockroaches.

Pyrethrins, beta-cyfluthrin, piperonyl butoxide, hydramethylnon, and fipronil were used to control camel spiders, termites, scorpions, bed bugs, mites, crickets, ticks, fleas, and silverfish.

10.4.3 Short-term and Long-term health risks

Low: Long term health risk is Low. Confidence in the health risk assessment is medium (Reference 9, Table 3-6).

10.5 Asbestos

There were 118 samples taken during an industrial hygiene field services building assessment at BAF conducted during 24July-12 August 2011 (References 19-23). Seven samples at five different buildings came back positive for asbestos containing materials (ACMs). The ACM samples were found at Building 14895-Warehouse Psy Ops, Building 15804-Motel 6, Building 15805-Motel 8, Building 24002-JAC and Building 25059. The majority of the ACM samples were found in attics, either as attic residue or as thermal system insulation on the attic piping, other ACM samples were found in boiler room insulation and a couple fire doors. The ACMS were found in locations not likely to be entered or disturbed by military personnel. Recommendations were made in the building assessment report to remove all ACM materials before beginning any renovation or demolition projects and to post warning notices at the entrances to rooms with ACMs and require individuals entering these areas to wear

proper personal protective equipment. As of 25 April 2014, two of the four BLDGs have asbestos hazard warning signs posted.

10.6 Lead Based Paint

A total of 406 paint chip samples were taken as part of the industrial hygiene field services building assessment report for BAF conducted during 24July- 12 August 2012 to test for lead based paint (LBP). Fourteen samples from 11 different buildings contained concentration levels of lead above the regulatory level and were classified as LBP. The LBP was found in Building 23176-Russian Hangar, Building 23075-CIF, Building 23166- Maintenance Building, Building 25112-Russian Tower, Building 13955-WWLR, Building 13974-Coalition Village, Building 13982-Sustainment BDE HQ, Building 14843A –PX, Building 14895-Warehouse PsyOps, Building 15906- JDOC, and Building 23194 – JOC. Recommendations were made to remove and manage the LBP according to the U.S. Housing and Urban Development Guidelines and ensure that proper protection is worn during any demolition/renovation activities

10.7 Burn Pit

On 1 September 2012, the previously used burn pit was closed and a new burn pit was opened adjacent to Camp Sabalu-Harrison. The new burn pit was operated by an Afghan contractor and located approximately 200 yards east of Camp Sabalu-Harrision. The prevailing winds in the area were in a SW direction and originated from the northeast based on the documents provided.

While not specific to BAF 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 7). The committee's review of the literature and the data suggests that service in Iraq or Afghanistan (i.e., a broader consideration of air pollution than exposure only to burn pit emissions) may be associated with long-term health effects, particularly in susceptible (e.g., those who have asthma) or highly exposed subpopulations, such as those who worked at the burn pit. Such health effects would be due mainly to high ambient concentrations of PM from both natural and anthropogenic sources, including military sources. If that broader exposure to air pollution turns out to be relevant, potentially related health effects of concern are respiratory and cardiovascular effects and cancer. Susceptibility to the PM health effects could be exacerbated by other exposures, such as stress, smoking, local climatic conditions, and co-exposures to other chemicals that affect the same biologic or chemical processes. Individually, the chemicals measured at burn pit sites in the study were generally below concentrations of health concern for general populations in the U.S. However, the possibility of exposure to mixtures of the chemicals raises the potential for health outcomes associated with cumulative exposure to combinations of the constituents of burn pit emissions and emissions from other sources.

10.7.1 Particulate matter, less than10 micrometers (PM_{10})

10.7.2 Exposure Guidelines:

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

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

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

- Not defined and not available.

10.7.2.1 Sample data/Notes:

A total of 70 valid PM_{10} air samples were collected at BAF near the burn pit from 2010-2012, no sampling data for 2013 was available. The range of 24-hour PM_{10} concentrations was 3µg/m^3 – 865 µg/m^3 with an average concentration of 225 µg/m^3.

A total of 12 valid PM_{10} air samples were collected at Camp Sabalu-Harrison near the BAF burn pit from 2010-2012, no samples were available for 2013. The range of 24-hour PM_{10} concentrations was 11µg/m^3 – 248 µg/m^3 with an average concentration of 106 µg/m^3.

10.7.2.2 Short-term health risks:

Low to High: The short-term PM_{10} health risk assessment was Low to High based on average and peak PM_{10} concentrations at both BAF and Camp Sabalu-Harrison, and the likelihood of exposure at these hazard severity levels. A High health risk assessment for typical and peak exposure concentrations suggests that short-term exposure to PM_{10} at BAF and Camp Sabalu-Harrison was expected to have significant degradation of mission capabilities in terms of the required mission standard, inability to accomplish all parts of the mission, or inability to complete the mission standard if hazards occur during the mission. Some in theater medical countermeasures and resources are anticipated (Reference 9, Table 3-2). Daily average health risk levels for PM_{10} show no hazard for 63%, low health risk for 29%, moderate health risk for 4%, and high health risk for 4% of the time evaluated. Confidence in the short-term PM10 health risk assessment was low (Reference 9, Table 3-6).

The hazard severity was negligible for average PM_{10} exposures. The results indicate that above these, a few personnel may experience notable mild eye, nose, or throat irritation: most personnel will experience only mild effects. Pre-existing health conditions may be exacerbated (Reference 9, Table 3-6).

For the highest observed PM_{10} exposures, the hazard severity was critical. There were four instances out of the 70 samples evaluated that the PM_{10} samples were above the critical MEG (600 µg/m^3). During peak exposures at the critical hazard severity level, most if not all personnel will experience very notable eye, nose, and throat irritation and respiratory effects. Visual acuity is impaired, as is overall aerobic capacity. Some personnel will not be able to perform assigned duties. Some lost-duty days are expected. Those with a history of asthma or cardiopulmonary disease will experience more severe symptoms. Conditions may have also resulted in adverse, non-heath related materiel/logistical impacts (Reference 9, Table 3-10).

10.7.2.3 Long-term health risk:

Not Evaluated-no available health guidelines. The EPA has retracted its long-term NAAQS for PM_{10} due to an inability to clearly link chronic health effects with chronic PM_{10} exposure levels.

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

10.7.4 Exposure Guidelines:

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

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

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

- Negligible MEG = 15
- Marginal MEG = 65.

10.7.4.1 Sample data/Notes:

A total of 68 valid $PM_{2.5}$ air samples were collected at BAF from 2010–2012, no samples were available in 2013. The range of 24-hour $PM_{2.5}$ concentrations was 14 $\mu g/m^3$–350$\mu g/m^3$ with an average concentration of 78.5 $\mu g/m^3$.

A total of 9 valid $PM_{2.5}$ air samples were collected at Camp Sabalu-Harrison during 2012, no other samples were available during 2010, 2011 or 2013. The range of 24-hour $PM_{2.5}$ concentrations was 45 $\mu g/m^3$–148 $\mu g/m^3$ with an average concentration of 75 $\mu g/m^3$.

10.7.4.2 Short-term health risks:

Low to Moderate: The short-term $PM_{2.5}$ health risk assessment is low to moderate based on average and peak $PM_{2.5}$ sample concentrations, and the likelihood of exposure at these hazard severity levels. A moderate health risk assessment is expected to have degraded mission capabilities in terms of the required mission standard and will have resulting in reduced mission capability if hazards occurred during the mission. Limited in-theater medical countermeasures and resources are anticipated (Reference 9, Table 3-2). Daily average health risk levels for $PM_{2.5}$ show no hazard for 49%, low health risk for 49%, moderate health risk for 2%, and high health risk for 0% of the time evaluated. Confidence in the short-term PM10 health risk assessment was low (Reference 9, Table 3-6).

The hazard severity was negligible for average $PM_{2.5}$ sample concentrations at BAF and Sabalu-Harrison. The results indicate that a few personnel may experience notable mild eye, nose, or throat irritation; most personnel will experience only mild effects. Pre-existing health conditions (e.g., asthma, or cardiopulmonary diseases) may have been exacerbated. (Reference 9, Table 3-10).

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

10.7.4.3 Long-term health risks:

Low to Moderate: The long-term health risk assessment is Low to Moderate based on average $PM_{2.5}$ concentration, and the likelihood of exposure at this hazard severity level. A Moderate risk level suggests that long-term exposure to $PM_{2.5}$ is expected to have limited future medical surveillance activities and related resources anticipated. Consider documenting exposed groups or personnel of surveillance interest. (Reference 9, Table 3-3). Confidence in the long-term $PM_{2.5}$ health risk assessment is low (Reference 9, Table 3-6).

The hazard severity was marginal for average $PM_{2.5}$ sample concentrations. The results suggest that with repeated exposures above the marginal hazard severity threshold, it is plausible that development chronic health conditions, such as reduced lung function or exacerbated chronic bronchitis, COPD, asthma, atherosclerosis, or other cardiopulmonary diseases could occur in generally healthy troops. Personnel 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 effects concentration (Reference 9, Table 3-11).

10.7.5 Airborne Metals

10.7.5.1 Sample data/Notes:

A total of 70 valid PM_{10} airborne metal samples were collected at BAF and 12 valid PM_{10} airborne metal samples were collected at Camp Sabalu-Harrison from 2010 to 2012, no samples were available for 2013. No samples from BAF or Sabalu-Harrison had airborne metal concentrations above their corresponding MEGS.

A total of 67 valid $PM_{2.5}$ airborne metal samples were collected at BAF and 9 valid $PM_{2.5}$ airborne metal samples were collected at Camp Sabalu-Harrison from 2010 to 2012, no samples were available for 2013. No samples were above their corresponding short-term MEGs.

10.7.5.2 Short and long-term health risks:

None identified based on the available sampling data.

10.7.6 Volatile Organic Compounds (VOC)

10.7.6.1 Sample data/Notes:

The health risk assessment was based on average and peak concentration of 23 valid volatile organic chemical (VOC) air samples collected for ambient conditions using the EPA sampling method TO-14 method and 64 valid VOC air samples collected for ambient conditions using the TO-17 method from 01 January 2010 to 31 May 2013, and the likelihood of exposure. The TO-17 samples were collected between 2010 and 2011. TO-14 samples were taken during 2010-2012. No samples were available during 2013. Acrolein was the only analyzed VOC pollutant found at concentrations above short or long-term MEGs.

Acrolein was detected in 23 out of 23 valid TO-14 samples with a peak PEPC of 4 ug/m^3, which exceeded its negligible 1 year MEG of 0.14 ug/m^3.

10.7.6.2 Short-term health risks:

None identified based on available sample data. No parameters exceeded the short term MEGs

10.7.6.3 Long-term health risks:

Low: Acrolein had an average (2.3 ug/m^3) and peak (4 ug/m^3) sample concentration that exceeded the short-term 14 day negligible MEG (0.14 ug/m^3). The long-term health risk assessment for Acrolein sample concentrations is Low. Confidence in the health risk assessment is low (Reference 9, Table 3-6).

10.8 Special sampling – 12hr burn pit emissions study

In an attempt to assess the difference between day and night time exposure to smoke from burning at burn pits on BAF a limited amount of 12 hour particulate matter samples were taken near the landfill collocated with the old burn pit, burn boxes and incinerator on BAF and the new burn pit site near Sabalu-Harrison. There were a total of 44 PM_{10} samples and 49 $PM_{2.5}$ samples taken at BAF between 29 October 2010 and 23 June 2011. Of these samples there were seven that were invalid, five PM_{10} and two $PM_{2.5}$ samples. There were a total of 10 PM_{10} samples and 10 $PM_{2.5}$ samples taken at Sabalu-Harrison from 29 October 2012 through 3 November 2012, with one or two samples of PM_{10} and $PM_{2.5}$ sizes taken each day. There was not a written report associated with this sampling to provide any

additional information other than the data results. Based on a review of the limited data, there does not seem to be a great deal of variation between the morning or evening/night PM concentrations.

For the PM_{10} samples, 11 samples were collected at BAF in the morning (sample start times varied between 0600hrs and 0800hrs) ranging from a maximum concentration of 983 ug/m^3 to a minimum of 231 ug/m^3 and an average of 455 ug/m^3. There were 28 evening/night (sample start times varied between1800hrs and 2000hrs) PM_{10} samples at BAF ranging from a max concentration of 787 ug/m^3 to minimum concentration of 38 ug/m^3 and an average of 416 ug/m^3.

There were five PM_{10} samples collected at Sabalu-Harrison in the morning (sample start times took place between 0805hrs and 0930hrs) ranging from a maximum concentration of 252 ug/m^3 to a minimum of 138 ug/m^3 and an average of 219 ug/m^3. Five evening/night (sample start times took place between 2034 hrs and 2131 hrs) PM_{10} samples were taken at Sabalu-Harrison ranging from a max concentration of 764 ug/m^3 to minimum concentration of 136 ug/m^3 and an average of 281 ug/m^3.

For the $PM_{2.5}$ samples, there were 19 samples taken at BAF in the morning (sample start times varied between 0600hrs and 1142hrs) ranging from 599 ug/m^3 to 25 ug/m^3 with an average of 214 ug/m^3. There were 28 evening/night samples that had a range of 615 ug/m3 to 11 ug/m3 with an average of 180 ug/m3.

At Sabalu-Harrison, there were five samples taken in the morning (sample start times took place between 0805hrs and 0930hrs) ranging from 231 ug/m^3 to 81 ug/m^3 with an average of 136 ug/m^3. Five evening/night samples (sample start times took place between 2034hrs and 2131hrs) were taken at Sabalu-Harrison that had a range of 360ug/m3 to 47 ug/m3 with an average of 124 ug/m3.

Another study focusing on 12 hour air sampling by the burn pit was conducted by the Air Force Bioenvironmental Engineering Team examining occupational exposures among security forces personnel working near combined burn pit and incinerator operations at BAF from November 2011 – March 2012. This study entailed collecting both occupational (personal) and environmental (ambient) air samples for security forces stationed at the BAF solid waste disposal area that includes a burn pit, two air curtain incinerators and seven solid waste and medical waste incinerators. Occupational air sample analytes included total particulates not otherwise specified (PNOS), respirable PNOS, acrolein, and polyaromatic hydrocarbons (PAH). Exposures were measured for four security forces (SF) positions (Entry control point SF, Tower SF, Gunner SF, and Area Supervisor SF). Thirty 12-hour shifts were monitored from November 2011 through March 2012. The results of the study found that the geometric mean for all analytes and for all job specialties were below the12 hour adjusted American Conference of Governmental Industrial Hygienists (ACGIH) threshold limit value time weighted averages (TWA) for respirable particulate matter, acrolein, and naphthalene (Reference 16). The data from this study were not available for review; only the report write up was available.

11 References[1]

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[1] NOTE. The data are currently assessed using the 2010 TG230. The general method involves an initial review of the data which eliminates all chemical substances not detected above 1-yr negligible MEGs. Those substances screened out are not considered acute or chronic health hazards so are not assessed further. For remaining substances, acute and chronic health effects are evaluated separately for air water (soil is only evaluated for long term risk). This is performed by deriving separate short-term and long term population exposure level and estimates (referred to as population exposure point concentrations (PEPC)) that are compared to MEGs derived for similar exposure durations. If less than or equal to negligible MEG the risk is Low. If levels are higher than negligible then there is a chemical-specific toxicity and exposure evaluation by appropriate SMEs, which includes comparison to any available marginal, critical or catastrophic MEGs. For drinking water 15 L/day MEGs are used for the screening while site specific 5-15 L/day are used for more detailed assessment. For nondrinking water (such as that used for personal hygiene or cooking) the 'consumption rate' is limited to 2 L/day (similar to the EPA) which is derived by multiplying the 5 L/day MEG by a factor of 2.5. This value is used to conservatively assess non drinking uses of water.

15. Occupational and Environmental Health Site Assessment Base camp Bagram, 23 July 2012.

16. Occupational and Environmental Health Site Assessment Base camp Bagram, 20 December 2012.

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19. USAPHC Industrial Hygiene Field Services Report No. 55-ML-0EUC-11 Building 14895 Assessment, Bagram, Afghanistan. 3-4 August 2011.

20. USAPHC Industrial Hygiene Field Services Report No. 55-ML-0EUC-11 Building 15804 Assessment, Bagram, Afghanistan. 2 August 2011.

21. USAPHC Industrial Hygiene Field Services Report No. 55-ML-0EUC-11 Building 15805 Assessment, Bagram, Afghanistan. 3 August 2011.

22. USAPHC Industrial Hygiene Field Services Report No. 55-ML-0EUC-11 Building 24002 Assessment, Bagram, Afghanistan. 6 August 2011.

23. USAPHC Industrial Hygiene Field Services Report No. 55-ML-0EUC-11 Building 25059 Assessment, Bagram, Afghanistan. 7 August 2011.

12 Where Do I Get More Information?

If a provider feels that the Service member's or Veteran's current medical condition may be attributed to specific OEH exposures at this deployment location, he/she can contact the Service-specific organization below. Organizations external to DoD should contact DoD Force Health Protection and Readiness (FHP & R).
Army Institute of Public Health Phone: (800) 222-9698. http://phc.amedd.army.mil/
Navy and Marine Corps Public Health Center (NMCPHC) (formerly NEHC) Phone: (757) 953-0700. www.nmcphc.med.navy.mil
U.S. Air Force School of Aerospace Medicine (USAFSAM) (formerly AFIOH) Phone: (888) 232-3764. http://www.wpafb.af.mil/afrl/711hpw/usafsam.asp
DoD Force Health Protection and Readiness (FHP & R) Phone: (800) 497-6261. http://fhp.osd.mil