Military Deployment
Periodic Occupational and Environmental Monitoring Summary (POEMS):
Kandahar Airfield and vicinity, Afghanistan
Calendar Years: (2009 to 2014)

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 Kandahar Airfield (KAF) and vicinity that includes Combat Outpost (COP) Ahmad Khan (also known as [aka] COP Admadkhan), Afghan National Civil Order Police Headquarters (ANCOP HQ), Alizi, Afghan National Police (ANP) Hill, Ainsworth (aka Emarat), Area Control Station (ACS) 14-2, ACS 4, ACS 5, COP Ashoque, COP Azim Jan Kariz (AJK), Forward Operation Base (FOB) Aziz Ullah, Babaghday, Bagh E Pol (aka Bagh E Pul), Camp Baker, Camp Belambay (aka Camp Belambai), FOB Belanday, Camp Brown, Burmohommad, Busha (aka Panjsher), Cabacoy (aka Zalakhan), COP Caron (aka COP Caran), Checkpoint One, Checkpoint Two, Checkpoint 72, Checkpoint 7-2, Chineh, Deh Qobad, Demaiwand, Diwar, Strong Point Edgerton (aka Dand District), Ezabad (aka Maiwand), Fathollah, Folad, Checkpoint Gerandai, Strong Point Gharibon, Camp Ghecko, COP Ghundy Ghar, Strong Point Gorgon, Strong Point Haji Ramuden, Strong Point Haji Ramuddin II, Camp Hero, FOB Howz-E-Madad (aka Panjawa Howze Madad), COP Hutal (aka COP Rath), Jawkari, COP Johnston, Joint Regional Afghan National Police Center (JRAC), COP Jelawur, Kandahar Airfield, COP Kandalay, COP Khenjakak, COP Kolk, COP Lakhokhel, Camp/FOB Lindsey, Loy Kariz, COP Luke, COP Macthab (aka COP Ballpeen, aka Area Control Point 15), COP Makuan, FOB Masum Ghar, Millet (aka Deh Kuchay), Checkpoint Mullah Mahdi, COP Mushan, COP Nalgham, Camp Nathan Smith, COP Nejat, COP Neshin (aka COP Neshan), New Provincial Headquarters (PHQ), COP Now Ruzi, Operations Coordination Center Province (OCCP) Kandahar, Operations Coordination Center District-Panjawi (OCCD-P), Old Corps, Old PHQ (aka Old ANP), Outpost (OP)-971, Pa'in Kelay, Palace, Panjawi (aka Pajwai), COP Pashmul South, Checkpoint Perozi, Police Substation 1, Police Substation 2, Police Substation 3, Police Substation 7, Police Substation 8, Police Substation 9, Police Substation 10, Police Substation 12, Police Substation 16, Provincial Reserve Kandahar, Pul, Rostum, COP Sablaghay, FOB Sakari Karez (aka FOB Ramrod), Salim Aka, COP Sangsar, FOB Scorpion, Shobat (aka Sohbat), FOB Shoja, Shurandam, FOB Siah Choy, Camp Simmons 2, COP Sperwan Ghar, COP Talukan, COP Tarnak (aka COP Marianne), COP Terminator (aka COP Atta Mohammed Khan), Strong Point Theinhart (aka Strong Point Theinert), Walakan, FOB Walton, COP Ware (aka Charbaugh), Camp Wilson (aka Pasab), FOB Zangabad (aka FOB Saidon), Zhari Dosht (aka Zhari Dasht), and COP Zharif Kel (aka COP Zarifkhel). It presents a qualitative summary of health risks identified at these locations and their potential medical implications. The report is based on information collected from 1 October 2009 through 30 September 2014 to include deployment OEHS sampling and monitoring data (e.g. air, water, and soil), field investigation and health assessment reports, as well as country and area-specific information on endemic diseases.

This assessment assumes that environmental sampling at KAF 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, health risk assessments are limited to 1 October 2009 through 30 September 2014.

The POEMS can be useful to inform healthcare providers and others of environmental conditions experienced by individuals deployed to KAF 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: KAF is located in Kandahar province at the northern end of the Southwestern Plateau of Afghanistan, near the southern slopes of the Hindu Kush Mountains (the western most range of the Himalayan Chain). The elevation of KAF is about 1,000 meters above sea level. KAF houses the Regional Command-South (RC-S) headquarters and is the largest base in terms of population and land area within RC-S. The locations included in this POEMS are located in RC-S near to Kandahar City.

Samples collected from the following locations were aggregated and risk was assessed collectively because the locations were in proximity of each other: [KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey], [FOB Belanday, Strong Point Gorgon, and FOB Shoja], [FOB Masum Ghar, COP Pashmul South, Panjawi (aka Pajwai), and Salim Aka], [FOB Howz-E-Madad (aka Panjawa Howze Madad), and COP Sangsar], [Aziz Ullah and COP Hutal (aka COP Rath)], [OCCP Kandahar, COP Ahmad Khan (aka COP Admadkhan), Old PHQ (aka Old ANP), FOB Walton, Kandahar PHQ, and Police Substations 1, 9, 10, 12, and 16], [Bagh E Pol (Bagh E Pul) and Police Substations 2 and 7], [Strong Point Edgerton (aka Dand District), ACS 4, and Provincial Reserve Kandahar], [ANCOP HQ, Police Substation 8, COP Ware (aka Charbaugh), and Millet (aka Deh Kuchay)], [COP Luke and Shurandam], [COP Ghundy Ghar, and COP Sperwan Ghar], [Strong Point Haji Ramuddin II and COP Nalgham], and [Checkpoint Perozi, Checkpoint Mullah Mahdi, FOB Zangabad (aka FOB Saidon), COP Mushan, and COP Talukan].

Samples collected from the following locations were assessed for risk individually because the locations were not in proximity of other sampling locations: ACS 14-2, Deh Qobad, COP Neshin (aka COP Neshan), FOB Scorpion, COP Kandalay, Chineh, Ezabad (aka Maiwand), Pa'in Kelay, COP AJK, COP Makuan, Zhari Dosht (aka Zhari Dasht), COP Kolk, Strong Point Gharibon, FOB Siah Choy, COP Now Ruzi, Camp Belambay (aka Camp Belambai), COP Khenjakak, Police Substation 3, Checkpoint 1, Checkpoint 2, Checkpoint Gerandai, COP Terminator (aka COP Atta Mohammed Khan), Camp Nathan Smith, Camp Wilson (aka Pasab). All other locations had no sample data.

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 KAF and vicinity. As indicated in the detailed sections that follow Table 2, controls established to reduce health risk were factored into this assessment. In some cases, e.g. ambient air, specific controls are noted, but not routinely available/feasible.

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

Short-term health risks & medical implications:

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

Inhalable coarse particulate matter less than 10 micrometers in diameter (PM_{10}) from environmental dust and/or burn pits; inhalable fine particulate matter less than 2.5 micrometers in diameter ($PM_{2.5}$) from environmental dust and/or burn pits; 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, sandfly fever, scrub typhus (mite-borne), 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 U.S. Central Command (CENTCOM) policy. For other vector-borne endemic diseases (malaria, cutaneous leishmaniasis (acute), Crimean-Congo hemorrhagic fever, sandfly fever, scrub typhus (mite-borne), these diseases may constitute a significant risk due to exposure to biting vectors; risk reduced to 'Low' by proper wear of the treated uniform, application of repellent to exposed skin, bed net use, and appropriate chemoprophylaxis, as well as minimizing areas of standing water and other vector-breeding areas. For water contact diseases (leptospirosis) activities involving extensive contact with surface water increase risk. For respiratory diseases (TB), personnel in close-quarter conditions could have been at risk for person-to-person spread. Animal contact diseases (rabies, anthrax, Q fever), pose year-round risk. For heat stress, risk can be greater during months of April through October, 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 PM_{10}, the PM_{10} overall short-term risk was 'None to High' for the locations KAF, Camp Brown, Camp Hero, JRAC, Camp/FOB Lindsey, and Camp Wilson (aka Pasab). For $PM_{2.5}$, the $PM_{2.5}$ overall short-term risk was 'None to High' for the locations KAF, Camp Brown, Camp Hero, JRAC, Camp/FOB Lindsey, and was 'Low' for Camp Wilson (aka Pasab). However, exposures to PM_{10} and $PM_{2.5}$ may vary, as conditions may vary, and may result in mild to more serious short-term health effects (e.g., eye, nose or throat and lung irritation) in some personnel while at this site, particularly exposures to high levels of dust such as during high winds or dust storms. For PM_{10} and PMv, 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 'Moderate to High' for the locations KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey. For burn pits, the short-term risk for $PM_{2.5}$ was 'Low to High' for the locations KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey. For burn pits, 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 Kandahar and vicinity. Personnel who reported with symptoms or required treatment while at this site should have exposure and treatment noted in medical record (e.g., electronic medical record and/or on a Standard Form (SF) 600 (Chronological Record of Medical Care).

Long-term health risks & medical implications:

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

$PM_{2.5}$ and burn pits.

Air quality: For $PM_{2.5}$, the overall long-term risk was 'Low to Moderate' for the locations KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey, and was 'Moderate' for Camp Wilson (aka Pasab). Inhalable coarse particulate matter less than 10 micrometers in diameter (PM10) was not evaluated for long-term risk due to no available health guidelines. However, the area is a dusty desert environment, and conditions may have varied. In addition, for burn pits, the long-term risk for $PM_{2.5}$ was 'Moderate' for the locations KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey. For burn pits, PM_{10} was not evaluated for long-term risk due to no available health guidelines. For burn pits, see Section 10.7. However, exposures may vary, as conditions may have varied. For inhalational exposure to high levels of dust, PM10 and $PM_{2.5}$, such as during high winds or dust storms, and for exposure to burn pit smoke, it is considered possible that some otherwise healthy personnel who were exposed for a long-term period to dust and particulate matter could develop certain health conditions (e.g., reduced lung function, cardiopulmonary disease). Personnel with a history of asthma or

cardiopulmonary disease could potentially be more likely to develop such chronic health conditions. While the dust and particulate matter exposures and exposures to burn pits are acknowledged, at this time there were no specific recommended, post-deployment medical surveillance evaluations or treatments. Providers should still consider overall individual health status (e.g., any underlying conditions/susceptibilities) and any potential unique individual exposures (such as burn pits/barrels, incinerators, occupational or specific personal dosimeter data) when assessing individual concerns. Certain individuals may need to be followed/evaluated for specific occupational exposures/injuries (e.g., annual audiograms as part of the medical surveillance for those enrolled in the Hearing Conservation Program; and personnel covered by Respiratory Protection Program and/or Hazardous Waste/Emergency Responders Medical Surveillance).

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

Source of Identified Health Risk[3]	Unmitigated Health Risk Estimate[4]	Control Measures Implemented	Residual Health Risk Estimate[4]
AIR			
PM_{10}	Short-term: KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey: None to High. Camp Wilson (aka Pasab): None to High. Daily levels vary, acute health effects (e.g., upper respiratory tract irritation) are 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: KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey: None to High. Camp Wilson (aka Pasab): None to High. Daily levels vary, acute health effects (e.g., upper respiratory tract irritation) are 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
$PM_{2.5}$	Short-term: KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey: None to High. Camp Wilson (aka Pasab): Low. 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: KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey: None to High. Camp Wilson (aka Pasab): Low. 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: KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey: Low to Moderate. Camp Wilson (aka Pasab): 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: KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey: Low to Moderate. Camp Wilson (aka Pasab): 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).

Source of Identified Health Risk[3]	Unmitigated Health Risk Estimate[4]	Control Measures Implemented	Residual Health Risk Estimate[4]
Metals	Short-term: KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey: None to Low for PM_{10} cadmium and $PM_{2.5}$ cadmium. Camp Wilson (aka Pasab): None to Low for PM_{10} cadmium.		Short-term: KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey: None to Low for PM_{10} cadmium and $PM_{2.5}$ cadmium. Camp Wilson (aka Pasab): None to Low for PM_{10} cadmium.
	Long-term: Camp Wilson (aka Pasab): Low for PM_{10} cadmium.		Long-term: Camp Wilson (aka Pasab): Low for PM_{10} cadmium.
Volatile Organic Compounds (VOC)	Short-term: None.		Short-term: None.
	Long-term: KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey: Low for acrolein and benzoic acid.		Long-term: KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey: Low for acrolein and benzoic acid.
Water			
Consumed Water (Water Used for Drinking)	Short-term: KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey: None to Low for boron, chloride, magnesium, and sulfate.	Army Public Health Center (Provisional) former U.S. Army Veterinary Command (VETCOM) approved bottled water and potable water only from approved water sources	Short-term: KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey: None to Low for boron, chloride, magnesium, and sulfate.
	Long-term: None.		Long-term: None.
Water for Other Purposes	Short-term: KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey: None to Low for sulfate.	Water treated in accordance with standards applicable to its intended use	Short-term: KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey: None to Low for sulfate.
	Long-term: None.		Long-term: None.
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) to Low (polio) 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-mite borne; 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 to Low for meningococcal	Providing adequate living and work space; medical	Short-term: Low

Source of Identified Health Risk[3]	Unmitigated Health Risk Estimate[4]	Control Measures Implemented	Residual Health Risk Estimate[4]
	meningitis.	screening; vaccination.	
	Long-term: No data available		Long-term: No data available
Animal Contact	Short-term: Variable; Moderate for rabies, anthrax, Q-fever to Low for H5N1 avian influenza.	Prohibiting contact with, adoption, or feeding of feral animals in accordance with 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 (e.g. *Hemorrhis ravergieri*) to potentially lethal effects (e.g. *Latrodectus dahlia*).	Risk reduced by avoiding contact, proper wear of uniform (especially footwear), and proper and timely treatment.	Short-term: Low; If encountered, effects of venom vary with species from mild localized swelling (e.g. *Hemorrhis ravergieri*) to potentially lethal effects (e.g. *Latrodectus dahlia*).
	Long-term: No data available		Long-term: No data available
HEAT/COLD STRESS			
Heat	Short-term: Low to Extremely High; Risk of heat injury is Extremely High for May-September, High in April, Moderate in October, and Low for all other months.	Work-rest cycles, proper hydration and nutrition, and Wet Bulb Globe Temperature (WBGT) monitoring.	Short-term: Low; Risk of heat injury in unacclimatized or susceptible personnel is Extremely High for May-September, High in April, Moderate in October, and Low for all other months.
	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 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.
Cold	Short-term: Low risk of cold stress/injury.	Risks from cold stress reduced with protective measures such as use of the buddy system, limiting exposure during cold weather, proper hydration and nutrition, and proper wear of issued protective clothing.	Short-term: Low risk of cold stress/injury.
	Long-term: Low; Long-term health implications from cold injuries are rare but can occur, especially from more serious injuries such as frost bite.		Long-term: Low; Long-term health implications from cold injuries are rare but can occur, especially from more serious injuries such as frost bite.
Unique Incidents/ Concerns			
Burn Pits	Short-term: KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey: Moderate to High for PM_{10}. Low to High for $PM_{2.5}$.	Control measures may have included locating burn pits downwind of prevailing winds, increased distance from	Short-term: KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey: Moderate to High for PM_{10}. Low to High for $PM_{2.5}$.

Source of Identified Health Risk[3]	Unmitigated Health Risk Estimate[4]	Control Measures Implemented	Residual Health Risk Estimate[4]
	None to Low for PM_{10} and $PM_{2.5}$ cadmium.	living and working areas when possible, and improved waste segregation and management techniques. All burn pits at locations with populations of more than 100 people were closed by July 2013.	None to Low for PM_{10} and $PM_{2.5}$ cadmium.
	Long-term: KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey: Moderate for $PM_{2.5}$. Low for PM_{10} cadmium. Low for acrolein and benzoic acid.		Long-term: KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey: Moderate for $PM_{2.5}$. Low for PM_{10} cadmium. Low for acrolein and benzoic acid.

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

[2] This assessment is based on specific environmental sampling data and reports obtained from 1 October 2009 through 30 September 2014. 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 Kandahar and vicinity. The health risks are presented as Low, Moderate, High or Extremely High for both acute and chronic health effects. The health risk level is based on an assessment of both the potential severity of the health effects that could be caused and probability of the exposure that would produce such health effects. Details can be obtained from the Army Public Health Center (Provisional). 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 KAF 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 US Army Public Health Command (USAPHC) Technical Guide 230, *Environmental Health Risk Assessment and Chemical Exposure Guidelines for Deployed Military Personnel* (USAPHC TG 230). All OEH risk estimates represent residual risk after accounting for 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

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

An insufficient number of air samples were available to sufficiently assess risk for the following locations: COP AJK, [ANCOP HQ, Police Substation 8, COP Ware (aka Charbaugh), Millet (aka Deh Kuchay)], [Aziz Ullah, COP Hutal (aka COP Rath)], [Bagh E Pol (Bagh E Pul), Police Substations 2 and 7], [FOB Belanday, Strong Point Gorgon, FOB Shoja], Checkpoint 1, Checkpoint 2, Deh Qobad, Ezabad (aka Maiwand), Checkpoint Gerandai, [COP Ghundy Ghar, COP Sperwan Ghar], [Strong Point Haji Ramuddin II, COP Nalgham], [FOB Howz-E-Madad (aka Panjawa Howze Madad), COP Sangsar], COP Kandalay, COP Khenjakak, [COP Luke and Shurandam], [FOB Masum Ghar, COP Pashmul South, Panjawi (aka Pajwai), Salim Aka], Camp Nathan Smith, COP Neshin (aka COP Neshan), [OCCP Kandahar, COP Ahmad Khan (aka COP Admadkhan), Old PHQ (aka Old ANP), FOB Walton, Kandahar PHQ, Police Substations 1, 9, 10, 12, and 16], Pa'in Kelay, [Checkpoint Perozi, Checkpoint Mullah Mahdi, FOB Zangabad (aka FOB Saidon), COP Mushan, COP Talukan], FOB Scorpion, FOB Siah Choy, and [Strong Point Edgerton (aka Dand District), ACS 4, Provincial Reserve Kandahar].

Air samples were not collected from the following locations: ACS 14-2, Ainsworth/Emarat, Alizi, ANP Hill, ACS-5, COP Ashoque, Babaghday, Camp Baker, Camp Belambay (aka Camp Belambai), Burmohommad, Busha (aka Panjsher), Cabacoy (aka Zalakhan), COP Caron (aka COP Caran), Checkpoint 72, Checkpoint 7-4, Demaiwand, Diwar, Fathollah, Folad, Camp Ghecko, Strong Point Haji Ramuden, Jawkari, COP Jelawur, COP Johnston, COP Kolk, COP Lakhokhel, Loy Kariz, COP Macthab (aka COP Ballpeen, Area Control Point 15), COP Makuan, COP Nejat, New PHQ, COP Now Ruzi, OCCD-P, Old Corps, OP-971, Palace, Police Substation 3, Pul, Rostum, COP Sablaghay, FOB Sakari Karez (aka FOB Ramrod), Shobat (aka Sohbat), Camp Simmons 2, Strong Point Gharibon, COP Tarnak (aka COP Marianne), COP Terminator (aka COP Atta Mohammed Khan), Strong Point Theinhart (aka Strong Point Theinert), Walakan, Zhari Dosht (aka Zhari Dasht), COP Zharif Kel (aka COP Zarifkhel).

All personnel were assumed to be exposed to emissions from burn pits and incinerators located in the vicinity of KAF. Therefore, air samples associated with a burn pit or incinerator at KAF and vicinity were included in the following assessment of the air at KAF and vicinity.

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. PM_{10} and $PM_{2.5}$ concentrations are measured in micrograms per cubic meter of air ($\mu g/m^3$).

2.3 Particulate matter, less than 10 micrometers (PM_{10})

2.3.1 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.

2.3.2 Sample data/Notes:

KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey: A total of 217 valid PM_{10} air samples were collected from 2009 to 2014. The range of 24-hour PM_{10} concentrations was 69 $\mu g/m^3$ – 722 $\mu g/m^3$ with an average concentration of 395 $\mu g/m^3$.

Camp Wilson (aka Pasab): A total of 32 valid PM_{10} air samples were collected from 2009 to 2014. The range of 24-hour PM_{10} concentrations was 43 $\mu g/m^3$ – 914 $\mu g/m^3$ with an average concentration of 321 $\mu g/m^3$.

2.3.3 Short-term health risks:

KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey: **None to High:** The short-term PM_{10} health risk assessment is none to low based on average PM_{10} sample concentrations and low to high based on annual peak PM_{10} sample concentrations, and the likelihood of exposure at these hazard severity levels. Therefore, on typical days, exposure to PM_{10} was likely to range between little or no impact on accomplishing the mission through significant degradation of mission capabilities. Peak exposures could have occurred, increasing the health risk level (Reference 9, Table 3-2). Under peak exposures, mission capabilities may have had little or no impact or may have been significantly degraded in terms of the required mission standard, inability to accomplish all parts of the mission, or inability to complete the mission.

Out of all 24-hour PM_{10} sampling events in KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey, 20% showed no hazard, 44% showed low health risk, 29% showed moderate health risk, and 8% showed high health risk. Confidence in the short-term PM_{10} health risk assessment is high (Reference 9, Table 3-6).

The hazard severity was negligible to marginal for average PM_{10} concentrations in KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey. During typical exposures at the marginal hazard severity level (420 ug/m^3 - 600 ug/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. During typical exposures at the negligible hazard severity level (250 ug/m^3 - 420 ug/m^3), a few personnel may have experienced notable eye, nose, and throat irritation; most personnel would have experienced only mild effects. Those with a history of asthma or cardiopulmonary disease were expected to experience increased symptoms at the negligible and marginal hazard severity levels (Reference 9, Table 3-11).

The hazard severity was negligible to critical for the peak PM_{10} concentrations in KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey. During peak exposures at the critical hazard severity level (greater than 600 ug/m^3), most if not all personnel would have experienced very notable eye, nose, and throat irritation and respiratory effects. Visual acuity was impaired, as was overall aerobic capacity. Some personnel would not have been able to perform assigned duties. Some lost-duty days were expected. During typical exposures at the negligible hazard severity level (250 ug/m^3 - 420 ug/m^3), a few personnel may have experienced notable eye, nose, and throat irritation; most personnel would have experienced only mild effects. Those with a history of asthma or cardiopulmonary disease were expected to experience increased symptoms at the negligible and critical hazard severity levels (Reference 9, Table 3-11).

Camp Wilson (aka Pasab): **None to High:** The short-term PM_{10} health risk assessment is none to low based on average PM_{10} sample concentrations and low to high based on annual peak PM_{10} sample concentrations, and the likelihood of exposure at these hazard severity levels. Therefore, on typical days, exposure to PM_{10} was likely to range between little or no impact on accomplishing the mission through significant degradation of mission capabilities. Peak exposures could have occurred, increasing the health risk level (Reference 9, Table 3-2). Under peak exposures, mission capabilities may have had little or no impact or may have been significantly degraded in terms of the required mission standard, inability to accomplish all parts of the mission, or inability to complete the mission.

Out of all 24-hour PM_{10} sampling events in Camp Wilson (aka Pasab), 53% showed no hazard, 27% showed low health risk, 3% showed moderate health risk, and 17% showed high health risk. Confidence in the short-term PM_{10} health risk assessment is high (Reference 9, Table 3-6).

The hazard severity was negligible for average PM_{10} concentrations in Camp Wilson (aka Pasab). During typical exposures at the negligible hazard severity level (250 ug/m^3 - 420 ug/m^3), a few personnel may have experienced notable eye, nose, and throat irritation; most personnel would have experienced only mild effects. Those with a history of asthma or cardiopulmonary disease were expected to experience increased symptoms at the negligible and marginal hazard severity levels (Reference 9, Table 3-11).

The hazard severity was negligible to critical for the peak PM_{10} concentrations in Camp Wilson (aka Pasab). During peak exposures at the critical hazard severity level (greater than 600 ug/m^3), most if not all personnel would have experienced very notable eye, nose, and throat irritation and respiratory effects. Visual acuity was impaired, as was overall aerobic capacity. Some personnel would not have been able to perform assigned duties. Some lost-duty days were expected. During typical exposures at the negligible hazard severity level (250 ug/m^3 - 420 ug/m^3), a few personnel may have experienced notable eye, nose, and throat irritation; most personnel would have experienced only mild effects. Those with a history of asthma or cardiopulmonary disease were expected to experience increased symptoms at the negligible and critical hazard severity levels (Reference 9, Table 3-11).

2.3.4 Long-term health risk:

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

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

2.4.1 Exposure Guidelines:

Short Term (24-hour) $PM_{2.5}$ ($\mu g/m^3$):
- Negligible MEG = 65
- Marginal MEG = 250
- Critical MEG = 500

Long-term (1-year) $PM_{2.5}$ MEGs ($\mu g/m^3$):
- Negligible MEG = 15
- Marginal MEG = 65.

2.4.2 Sample data/Notes:

KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey: A total of 229 valid $PM_{2.5}$ air samples were collected from 2009 to 2014. The range of 24-hour $PM_{2.5}$ concentrations was 11 $\mu g/m^3$ – 891 $\mu g/m^3$ with an average concentration of 112 $\mu g/m^3$.

Camp Wilson (aka Pasab): A total of 27 valid $PM_{2.5}$ air samples were collected from 2009 to 2014. The range of 24-hour $PM_{2.5}$ concentrations was 23 $\mu g/m^3$ – 188 $\mu g/m^3$ with an average concentration of 76 $\mu g/m^3$.

2.4.3 Short-term health risks:

KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey: **None to High:** The short-term $PM_{2.5}$ health risk assessment in KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey was none to low based on average $PM_{2.5}$ concentrations and low to high based on annual peak $PM_{2.5}$ concentrations. Therefore, on typical days, exposure to $PM_{2.5}$ was likely to have little or no impact on accomplishing the mission. In theatre medical resources should not have been needed for protection and treatment as a result of exposure to $PM_{2.5}$ levels on a typical day. Mission capabilities should not have been affected. Peak exposures could have occurred, increasing the health risk level (Reference 9, Table 3-2). Under peak exposures there may have been little or no impact on accomplishing the mission or mission capabilities may have been significantly degraded in terms of the required mission standard, inability to accomplish all parts of the mission, or inability to complete the mission, and may have required some in-theater medical countermeasures and resources.

Out of all 24-hour $PM_{2.5}$ sampling events in KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey, 38% show no hazard, 58% have low heath risk, 1% have moderate health risk, and 3% have high health risk. Confidence in the short-term $PM_{2.5}$ health risk assessment was medium (Reference 9, Table 3-6).

The hazard severity was negligible for average $PM_{2.5}$ exposures in KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey. During typical exposures at the negligible hazard severity level (65 ug/m^3 - 250 ug/m^3), a few personnel may have experienced notable eye, nose, and throat irritation; most personnel would have experienced only mild effects. Those with a history of asthma or cardiopulmonary disease were expected to experience increased symptoms at the negligible hazard severity level.

The hazard severity was negligible to critical for the peak $PM_{2.5}$ exposure in KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey. During peak exposures at the critical hazard severity level (greater than 500 ug/m^3), most if not all personnel would have experienced very notable eye, nose, and throat irritation and respiratory effects. Visual acuity was impaired, as was overall aerobic capacity. Some personnel would not have been able to perform assigned duties. During peak exposures at the negligible hazard severity level (65 ug/m^3 - 250 ug/m^3), a few personnel may have experienced notable eye, nose, and throat irritation; most personnel would have experienced only mild effects. Those with a history of asthma or cardiopulmonary disease were expected to experience increased symptoms at the critical and negligible hazard severity levels.

Camp Wilson (aka Pasab): **Low:** The short-term $PM_{2.5}$ health risk assessment is low based on average and peak $PM_{2.5}$ sample concentrations, and the likelihood of exposure at these hazard severity levels. Therefore, on typical and peak days, exposure to $PM_{2.5}$ was likely to have little or no impact on accomplishing the mission through significant degradation of mission capabilities (Reference 9, Table 3-2).

Out of all 24-hour $PM_{2.5}$ sampling events in Camp Wilson (aka Pasab), 44% showed no hazard, 56% showed low health risk, and none showed moderate or high health risk. Confidence in the short-term $PM_{2.5}$ health risk assessment is high (Reference 9, Table 3-6).

The hazard severity was negligible for average $PM_{2.5}$ concentrations in Camp Wilson (aka Pasab). During typical exposures at the negligible hazard severity level (65 ug/m^3 - 250 ug/m^3), a few personnel may have experienced notable eye, nose, and throat irritation; most personnel would have experienced only mild effects. Those with a history of asthma or cardiopulmonary disease were expected to experience increased symptoms at the negligible and marginal hazard severity levels (Reference 9, Table 3-11).

The hazard severity was negligible for the peak $PM_{2.5}$ concentrations in Camp Wilson (aka Pasab). During typical exposures at the negligible hazard severity level (65 ug/m^3 - 250 ug/m^3), a few personnel may have experienced notable eye, nose, and throat irritation; most personnel would have experienced only mild effects. Those with a history of asthma or cardiopulmonary disease were expected to experience increased symptoms at the negligible and marginal hazard severity levels (Reference 9, Table 3-11).

2.4.4 Long-term health risks:

KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey: **Low to Moderate:** $PM_{2.5}$ in KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey had average concentrations in 2009 (140 ug/m^3), 2010 (172 ug/m^3), 2011 (91 ug/m^3), and 2013 (63 ug/m^3) that exceeded the long-term 1 year negligible MEG (15 ug/m^3). Insufficient samples were available to assess risk in 2012 and 2014. The long-term health risk assessment for $PM_{2.5}$ concentrations ranged from low to moderate based on average $PM_{2.5}$ concentrations. Therefore, no to limited future medical surveillance activities and related resources are anticipated for long-term exposure to $PM_{2.5}$.

The hazard severity was negligible to marginal for long-term $PM_{2.5}$ exposures in KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey. During long-term exposures at the negligible hazard severity level, with repeated exposure it is considered possible that 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. During long-term exposures at the marginal hazard severity level, many exposed personnel are plausibly expected to develop delayed onset, irreversible effects. Confidence in the health risk assessment was low (Reference 9, Table 3-6).

Camp Wilson (aka Pasab): **Moderate:** $PM_{2.5}$ in Camp Wilson (aka Pasab) had an average concentration in 2011 (99 ug/m^3) that exceeded the long-term 1 year marginal MEG (65 ug/m^3). The long-term health risk assessment for $PM_{2.5}$ concentrations was moderate based on average $PM_{2.5}$ concentrations. Therefore, limited future medical surveillance activities and related resources are anticipated for long-term exposure to $PM_{2.5}$.

The hazard severity was marginal for long-term $PM_{2.5}$ exposures in Camp Wilson (aka Pasab). During long-term exposures at the marginal hazard severity level, many exposed personnel were plausibly expected to develop delayed onset, irreversible effects. Confidence in the health risk assessment was low (Reference 9, Table 3-6).

2.5 Airborne Metals

2.5.1 Exposure Guidelines:

Short Term Cadmium (ug/m^3):
- 1 hour Critical MEG = 4.7E+3
- 1 hour Marginal MEG = 7.6E+2
- 1 hour Negligible MEG = 1.0E+2
- 8 hour Negligible MEG = 4.1E+1
- 14 day Negligible MEG = 2.15E-2

Long-term Cadmium MEGs (ug/m^3):
- 1 year Negligible MEG = 6.8E-3

2.5.2 Sample data/Notes:

KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey: A total of 226 valid PM_{10} airborne metal samples were collected in KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey from 2009 to 2014. A total of 280 valid $PM_{2.5}$ airborne metal samples were collected in KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey from 2009 to 2014. Cadmium in PM_{10} and $PM_{2.5}$ in 2010 and 2011 was the only contaminant detected in levels above the short-term MEGs. Airborne metals in PM_{10} and $PM_{2.5}$ were not detected in levels above the long-term MEGs.

Camp Wilson (aka Pasab): A total of 30 valid PM_{10} airborne metal samples were collected in Camp Wilson (aka Pasab) from 2009 to 2014. Cadmium in PM_{10} was detected in levels above the short-term MEGs in 2011. PM_{10} Cadmium was the only contaminant detected in levels above the short-term MEGs. A total of 28 valid $PM_{2.5}$ airborne metal samples were collected in Camp Wilson (aka Pasab) from 2009 to 2014. Airborne metals in $PM_{2.5}$ were not detected in levels above the short-term or long-term MEGs.

2.5.3 Short-term health risks:

KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey: **None to Low:** The short-term PM_{10} cadmium and $PM_{2.5}$ cadmium health risk assessment in KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey was none based on average PM_{10} cadmium concentrations (7.20E-4 ug/m^3 in 2010 and 1.74-3 ug/m^3 in 2011) and average $PM_{2.5}$ cadmium concentrations (1.99E-3 ug/m^3 in 2010 and 1.85E-3 ug/m^3 in 2011) and low based on peak PM_{10} cadmium concentrations (6.53E-2 ug/m^3 in 2010 and 1.34E-1 ug/m^3 in 2011) and peak $PM_{2.5}$ cadmium concentrations (1.06E-1 ug/m^3 in 2010 and 5.97E-2 ug/m^3 in 2011). Therefore on typical days there is no risk from exposure to PM_{10} cadmium and $PM_{2.5}$ cadmium. On peak days exposure to PM_{10} cadmium and $PM_{2.5}$ cadmium was likely to have little or no impact on accomplishing the mission. In theatre medical resources should not have been needed for protection and treatment as a result of exposure to PM_{10} cadmium and $PM_{2.5}$ cadmium levels on a typical day. Mission capabilities should not have been affected.

The hazard severity was negligible for peak PM_{10} and $PM_{2.5}$ cadmium exposures in KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey. During peak exposures at the negligible hazard severity level, a few personnel may have experienced notable health effects; exposed personnel are expected to be able to effectively perform all critical tasks during mission operations.

Camp Wilson (aka Pasab): **None to Low:** The short-term PM_{10} cadmium health risk assessment in Camp Wilson (aka Pasab) was none based on average PM_{10} cadmium concentrations (6.05E-3 ug/m3) and low based on peak PM_{10} cadmium concentrations (1.25E-1 ug/m3) in 2011. Therefore on typical days there is no risk from exposure to PM_{10} cadmium. On peak days exposure to PM_{10} cadmium was likely to have little or no impact on accomplishing the mission. In theatre medical resources should not have been needed for protection and treatment as a result of exposure to PM_{10} cadmium levels on a typical day. Mission capabilities should not have been affected.

The hazard severity was negligible for peak PM_{10} cadmium exposures in Camp Wilson (aka Pasab). During peak exposures at the negligible hazard severity level, a few personnel may have experienced notable health effects; exposed personnel are expected to be able to effectively perform all critical tasks during mission operations.

2.5.4 Long-term health risks:

KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey: **None identified based on the available sampling data.**

Camp Wilson (aka Pasab): **Low:** The long-term PM_{10} cadmium health risk assessment in Camp Wilson (aka Pasab) was low based on average PM_{10} cadmium concentrations in 2011. Therefore, no specific medical action is required.

The hazard severity was negligible for long-term PM_{10} cadmium exposures in Camp Wilson (aka Pasab). During long-term exposures at the negligible hazard severity level, few exposed personnel (if any) are expected to develop delayed onset, irreversible effects. Confidence in the health risk assessment was low (Reference 9, Table 3-6).

2.6 Polyaromatic Hydrocarbons (PAHs), Volatile Organic Compounds (VOCs), and Semi-Volatile Organic Compounds (SVOCs)

2.6.1 Exposure Guidelines:

Short-Term Acrolein MEGs (mg/m^3):
- 1 hour Critical MEG = 3.2
- 1 hour Marginal MEG = 2.3E-1
- 1 hour Negligible MEG = 7.0E-2
- 8 hour Negligible MEG = 7.0E-2
- 14 day Negligible MEG = 4.6E-2

Long-term Acrolein MEGs (mg/m^3):
- 1 year Negligible MEG = 1.4E-4

Short-Term Benzoic Acid MEGs (mg/m^3):
- 1 hour Critical MEG = 4.0E+2
- 1 hour Marginal MEG = 7.5E+1
- 1 hour Negligible MEG = 1.3E+1

Long-term Benzoic Acid MEGs (mg/m^3):
- 1 year Negligible MEG = 1.37E-3

2.6.2 Sample data/Notes:

KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey: A total of 58 valid PAH, VOC, SVOC air samples were collected in KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey from 1 October 2009 to 30 September 2014. Acrolein and benzoic acid were detected at levels above the long-term MEGs.

Camp Wilson (aka Pasab): A total of 7 valid VOC air samples were collected in Camp Wilson (aka Pasab) from 1 October 2009 to 30 September 2014. No VOCs or SVOCs were detected at levels above the short or long-term MEGs.

2.6.3 Short-term health risks:

None identified based on the available sampling data.

2.6.4 Long-term health risks:

KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey: **Low:** Acrolein in KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey had an average concentration in 2013 (1.1E-3 mg/m^3) that exceeded the long-term 1 year negligible MEG (1.4E-4 mg/m^3). The long-term health risk assessment for acrolein was low. Therefore, no specific medical attention is required for long-term exposure to acrolein.

The hazard severity was negligible for long-term acrolein exposures in KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey. During long-term exposures at the negligible hazard severity level, with repeated exposure few exposed personnel (if any) are expected to develop delayed onset, irreversible effects. Confidence in the health risk assessment was low (Reference 9, Table 3-6).

Low: Benzoic acid in KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey had an average concentration in 2013 (3E-3 mg/m^3) that exceeded the long-term 1 year negligible MEG (1.37E-3 mg/m^3). The long-term health risk assessment for benzoic acid was low. Therefore, no specific medical attention is required for long-term exposure to benzoic acid.

The hazard severity was negligible for long-term benzoic acid exposures in KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey. During long-term exposures at the negligible hazard severity level, with repeated exposure few exposed personnel (if any) are expected to develop delayed onset, irreversible effects. Confidence in the health risk assessment was low (Reference 9, Table 3-6).

2.7 Dioxins and Furans

2.7.1 Sample data/Notes:

KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey: A total of 27 valid dioxin and furan air samples were collected in KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey from 1 October 2009 to 30 September 2014. The summed dioxin and furan concentration was below the short and long-term MEGs.

2.7.2 Short and long-term health risks:

None identified based on the available sampling data. The summed dioxin and furan concentration was below the short and long-term MEGs.

3 Soil

3.1 Site-Specific Sources Identified

3.2 Sample data/Notes:

A total of 79 valid surface soil samples were collected at COP AJK, [ANCOP HQ, Police Substation 8, COP Ware (aka Charbaugh), and Millet (aka Deh Kuchay)], [FOB Aziz Ullah and COP Hutal (aka COP Rath)], [Bagh E Pol (aka Bagh E Pul) and Police Substations 2 and 7], Camp Belambay (aka Camp Belambai), [FOB Belanday, Strong Point Gorgon, and FOB Shoja], Deh Qobad, [Strong Point Edgerton (aka Dand District), ACS 4, and Provincial Reserve Kandahar], Ezabad (aka Maiwand), Checkpoint Gerandai, [COP Ghundy Ghar and COP Sperwan Ghar], [Strong Point Haji Ramuddin II and COP Nalgham], [FOB Howz-E-Madad (aka Panjawa Howze Madad) and COP Sangsar], COP Jelawur, COP Kandalay, COP Khenjakak, COP Kolk, [COP Luke and Shurandam], COP Makuan, [FOB Masum Ghar, COP Pashmul South, Panjawi (aka Pajwai), and Salim Aka], Camp Nathan Smith, COP Neshin (aka COP Neshan), Pa'in Kelay, [Checkpoint Perozi, Checkpoint Mullah Mahdi, FOB Zangabad (aka FOB Saidon), COP Mushan, and COP Talukan], FOB Scorpion, FOB Siah Choy, COP Terminator (aka COP Atta Mohammed Khan), Camp Wilson (aka Pasab) from 1 October 2009 to 30 September 2014, to assess OEH health risk to deployed personnel. Soil samples were not collected at any other location. 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, herbicides. 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. Based on the information provided from the field, all untreated water samples were associated with complete exposure pathways. Therefore, untreated samples were assessed as potential health hazards.

4.1 Ingested Water

4.1.1 Site-Specific Sources Identified

An insufficient number of ingested water samples were available to sufficiently assess risk for the following locations: [FOB Aziz Ullah, COP Hutal (aka COP Rath)], [FOB Howz-E-Madad (aka Panjawa Howze Madad), COP Sangsar], COP Jelawur, [COP Luke and Shurandam], [FOB Masum Ghar, COP Pashmul South, Panjawi (aka Pajwai), Salim Aka], [OCCP Kandahar, COP Ahmad Khan (aka COP

Admadkhan), Old PHQ (aka Old ANP), FOB Walton, Kandahar PHQ, Police Substations 1, 9, 10, 12, and 16], and Camp Wilson (aka Pasab).

Ingested water samples were not collected from the following locations: ACS 14-2, Ainsworth (aka Emarat), COP AJK, Alizi, [ANCOP HQ, Police Substation 8, COP Ware (aka Charbaugh), Millet (aka Deh Kuchay)], ANP Hill, ACS-5, COP Ashoque, Babaghday, [Bagh E Pol (Bagh E Pul), Police Substations 2 and 7], Camp Baker, [FOB Belanday, Strong Point Gorgon, FOB Shoja], Camp Belambay (aka Camp Belambai), Burmohommad, Busha (aka Panjsher), Cabacoy (aka Zalakhan), COP Caron (aka COP Caran), Checkpoint 1, Checkpoint 2, Checkpoint 72, Checkpoint 7-4, Deh Qobad, Demaiwand, Diwar, Ezabad (aka Maiwand), Fathollah, Folad, Checkpoint Gerandai, Camp Ghecko, [COP Ghundy Ghar, COP Sperwan Ghar], [Strong Point Haji Ramuddin II, COP Nalgham], Strong Point Haji Ramuden, Jawkari, COP Johnston, COP Kandalay, COP Khenjakak, COP Kolk, COP Lakhokhel, Loy Kariz, COP Macthab (aka COP Ballpeen, Area Control Point 15), COP Makuan, Camp Nathan Smith, COP Nejat, COP Neshin (Aka COP Neshan), New PHQ, COP Now Ruzi, OCCD-P, Old Corps, OP-971, Pa'in Kelay, Palace, [Checkpoint Perozi, Checkpoint Mullah Mahdi, FOB Zangabad (aka FOB Saidon), COP Mushan, COP Talukan], Police Substation 3, Pul, Rostum, COP Sablaghay, FOB Sakari Karez (aka FOB Ramrod), FOB Scorpion, Shobat (aka Sohbat), FOB Siah Choy, Camp Simmons 2, [Strong Point Edgerton (aka Dand District), ACS 4, Provincial Reserve Kandahar], Strong Point Gharibon, COP Tarnak (aka COP Marianne), COP Terminator (aka COP Atta Mohammed Khan), Strong Point Theinhart (aka Strong Point Theinert), Walakan, Zhari Dosht (aka Zhari Dasht), COP Zharif Kel (aka COP Zarifkhel).

A total of 17 valid water samples from KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey were evaluated for drinking or ingestion exposure.

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 water for short-term exposures and ingested 5 L/day of water for long-term exposures. It was further assumed that control measures were not used. Boron, chloride, magnesium, and sulfate were detected at KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey at levels above their short-term MEGs in 2012. Boron, magnesium, and sulfate were detected at KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey at levels above their short-term MEGs in 2013. Insufficient data was available to characterize risk from drinking water at KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey for all other years.

4.1.2 Short -term health risks:

KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey: **None to Low:** Boron in KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey had typical and peak concentrations in 2012 and peak concentrations in 2013 that exceeded the 14-day negligible MEG. Typical concentrations in 2013 did not exceed the 14-day negligible MEG. The short-term health risk assessment for boron concentrations in drinking water showed no to Low risk based on typical concentrations and was Low based on peak concentrations. Therefore, there was no specific medical action required for short-term exposure to boron in drinking water in KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey.

Chloride in KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey had peak concentrations in 2012 that exceeded the 14-day negligible MEG. Typical concentrations in 2012 did not exceed the 14-day negligible MEG. The short-term health risk assessment for chloride concentrations in drinking water showed no risk based on typical concentrations and was Low based on peak concentrations.

Therefore, there was no specific medical action required for short-term exposure to chloride in drinking water in KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey.

Magnesium and sulfate in KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey had typical and peak concentrations in 2012 and peak concentrations in 2013 that exceeded the 14-day negligible MEG. Typical concentrations in 2013 did not exceed the 14-day negligible MEG. The short-term health risk assessment for magnesium and sulfate concentrations in drinking water showed no to Low risk based on typical concentrations and was Low based on peak concentrations. Therefore, there was no specific medical action required for short-term exposure to magnesium and sulfate in drinking water in KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey.

The hazard severity was negligible for short-term boron, chloride, magnesium, and sulfate in drinking water exposures in KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey. During short-term exposures at the negligible hazard severity level, few exposed personnel (if any) were expected to develop delayed onset, irreversible effects. Confidence in the health risk assessment was low (Reference 9, Table 3-6).

4.1.3 Long-term health risks:

KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey: **None identified based on available sample data.** All collected samples at KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey in 2012 and 2013 were below the short and long-term Negligible MEGs. Boron, chloride, magnesium, and sulfate were not evaluated because long-term MEGs are unavailable.

4.2 Non-Drinking Water

4.2.1 Site-Specific Sources Identified

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

4.2.2 Sample data/Notes:

To assess the potential for adverse health effects to troops the following assumptions were made about dose and duration: All U.S. personnel at this location were expected to remain at this site for approximately 1 year. A conservative (protective) assumption is that personnel routinely consumed less than 5L/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.

An insufficient number of non-drinking water samples were available to sufficiently assess risk for the following locations: COP AJK, [ANCOP HQ, Police Substation 8, COP Ware (aka Charbaugh), Millet (aka Deh Kuchay)], [FOB Aziz Ullah, COP Hutal (aka COP Rath)], [Bagh E Pol (Bagh E Pul), Police Substations 2 and 7], Camp Belambay (aka Camp Belambai), [FOB Belanday, Strong Point Gorgon, FOB Shoja], Checkpoint 1, Checkpoint 2, Deh Qobad, Ezabad (aka Maiwand), [COP Ghundy Ghar, COP Sperwan Ghar], [Strong Point Haji Ramuddin II, COP Nalgham], [FOB Howz-E-Madad (aka Panjawa Howze Madad), COP Sangsar], COP Jelawur, COP Kandalay, COP Khenjakak, COP Kolk, [COP Luke and Shurandam], COP Makuan, [FOB Masum Ghar, COP Pashmul South, Panjawi (aka Pajwai), Salim Aka], Camp Nathan Smith, COP Neshin (Aka COP Neshan), [OCCP Kandahar, COP Ahmad Khan (aka COP Admadkhan), Old PHQ (aka Old ANP), FOB Walton, Kandahar PHQ, Police

Substations 1, 9, 10, 12, and 16], Pa'in Kelay, [Checkpoint Perozi, Checkpoint Mullah Mahdi, FOB Zangabad (aka FOB Saidon), COP Mushan, COP Talukan], Police Substation 3, FOB Scorpion, FOB Siah Choy, COP Terminator (aka COP Atta Mohammed Khan), Camp Wilson (aka Pasab) and Zhari Dosht (aka Zhari Dasht).

Non-drinking water samples were not collected from the following locations: ACS 14-2, Ainsworth (aka Emarat), Alizi, ANP Hill, ACS-5, COP Ashoque, Babaghday, Camp Baker, Burmohommad, Busha (aka Panjsher), Cabacoy (aka Zalakhan), COP Caron (aka COP Caran), Checkpoint 72, Checkpoint 7-4, Demaiwand, Diwar, Fathollah, Folad, Checkpoint Gerandai, Camp Ghecko, Strong Point Haji Ramuden, Jawkari, COP Johnston, COP Lakhokhel, Loy Kariz, COP Macthab (aka COP Ballpeen, Area Control Point 15), COP Nejat, New PHQ, COP Now Ruzi, OCCD-P, Old Corps, OP-971, Palace, Pul, Rostum, COP Sablaghay, FOB Sakari Karez (aka FOB Ramrod), Shobat (aka Sohbat), Camp Simmons 2, [Strong Point Edgerton (aka Dand District), ACS 4, Provincial Reserve Kandahar], Strong Point Gharibon, COP Tarnak (aka COP Marianne), Strong Point Theinhart (aka Strong Point Theinert), Walakan, and COP Zharif Kel (aka COP Zarifkhel).

A total of twenty valid water samples from KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey were evaluated for non-drinking water exposure. Sulfate was detected at KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey at levels above the short-term MEGs. No chemicals were detected at levels above the short or long-term MEGs for KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey.

4.2.3 Short -term health risks:

KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey: **None to Low:** Sulfate in KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey had peak concentrations in 2013 that exceeded the 14-day negligible MEG. Typical concentrations in 2013 did not exceed the 14-day negligible MEG. The short-term health risk assessment for sulfate concentrations in non-drinking water showed no risk based on typical concentrations and was Low based on peak concentrations. Therefore, there was no specific medical action required for short-term exposure to sulfate in non-drinking water in KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey.

The hazard severity was negligible for short-term sulfate in non-drinking water exposures in KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey. During short-term exposures at the negligible hazard severity level, few exposed personnel (if any) were expected to develop delayed onset, irreversible effects. Confidence in the health risk assessment was low (Reference 9, Table 3-6).

4.2.4 Long-term health risks:

None identified based on available sample data. All collected samples at KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey were below the short and long-term Negligible MEGs. Sulfate was not evaluated because long-term MEGs are unavailable.

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 Environmental Surveillance Library (MESL) from the 1 October 2009 to 30 September 2014 timeframe.

5.2 Depleted Uranium (DU)

No specific hazard sources were documented in the DOEHRS, or MESL from the 1 October 2009 to 30 September 2014 timeframe.

5.3 Ionizing Radiation

No specific hazard sources were documented in the DOEHRS, or MESL from the 1 October 2009 to 30 September 2014 timeframe.

5.4 Non-Ionizing Radiation

Improvised explosive device jammer systems, communication antennas, laser pointers, and communication satellites were documented as used at FOB Aziz Ullah, FOB Walton, FOB Lindsey, Camp Wilson, Strong Point Edgerton (aka Dand District), Ezabad (aka Maiwand), COP Hutal (aka COP Rath) KAF, COP Tarnak (aka COP Marianne), and FOB Sakari Karez (aka FOB Ramrod) (References 17, 25, 30, 43, 47, 52, 53, 74, 75, and 76).

5.4.1 Short and long-term health risks:

Not evaluated. Data was insufficient to assess risk from these potential hazard sources.

6 Endemic Disease

This document lists the endemic diseases reported in the region, its specific health risks and severity and general health information about the diseases. CENTCOM Modification (MOD) 12 (Reference 11) lists deployment requirements, to include immunizations and chemoprophylaxis, in effect during the timeframe of this POEMS.

6.1 Food borne and Waterborne Diseases

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

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

6.1.1 Diarrheal diseases (bacteriological)

High, mitigated to Low: Diarrheal diseases are expected to temporarily incapacitate a very high percentage of personnel (potentially over 50% per month) within days if local food, water, or ice is consumed. Field conditions (including lack of hand washing and primitive sanitation) may facilitate person-to-person spread and epidemics. Typically mild disease treated in outpatient setting; recovery

and return to duty in less than 72 hours with appropriate therapy. A small proportion of infections may require greater than 72 hours limited duty, or hospitalization.

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

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

6.1.3 Polio

Low: Potential health risk to U.S. personnel is Low. Despite a concerted global eradication campaign, poliovirus continues to affect children and adults in Afghanistan, Pakistan and some African countries. Polio is a highly infectious disease that invades the nervous system. The virus is transmitted by person-to-person, typically by hands, food or water contaminated with fecal matter or through direct contact with the infected person's saliva. An infected person may spread the virus to others immediately before and about 1 to 2 weeks after symptoms appear. The virus can live in an infected person’s feces for many weeks. About 90% of people infected have no symptoms, and about 1% have a very severe illness leading to muscle weakness, difficulty breathing, paralysis, and sometimes death. People who do not have symptoms can still pass the virus to others and make them sick.

6.1.4 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, polio) 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. Mitigation strategies were in place and included proper wear of treated uniforms, application of repellent to exposed skin, and use of bed nets and chemoprophylaxis (when applicable). Additional methods included the use of pesticides, reduction of pest/breeding habitats, and engineering controls.

6.2.1 Malaria

High, mitigated to Low Potential unmitigated risk to U.S. personnel is High during warmer months (typically April through November) but reduced to low with mitigation measures. Malaria incidents are often associated with the presence of agriculture activity, including irrigation systems and standing water, which provide breeding habitats for vectors. A small number of cases may occur among personnel exposed to mosquito (Anopheles spp.) bites. Malaria incidents may cause debilitating febrile

illness typically requiring 1 to 7 days of inpatient care, followed by return to duty. Severe cases may require intensive care or prolonged convalescence. Mitigation strategies in place include Individual Protective Measure practices, taking Malaria chemoprophylaxis, permethrin treated uniforms, pesticides, reduction of pest/breading habitats, and engineering controls.

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 causing dermal legions) and visceral (a more latent form of the disease affecting visceral organs such as the spleen and liver). Visceral leishmaniasis is rare in Afghanistan however, it is likely underreported. Cutaneous leishmaniasis is endemic in independent foci in the major cities of Kandahar. Leishmania parasites may survive for years in infected individuals and this infection may go unrecognized by physicians in the U.S. when infections become symptomatic years later. Cutaneous infection is unlikely to be debilitating, though lesions may be disfiguring. Visceral leishmaniasis disease can cause severe febrile illness which typically requires hospitalization with convalescence over 7 days. Treatment for any form of leishmaniasis requires redeployment out of Afghanistan.

6.2.3 Crimean-Congo hemorrhagic fever

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

6.2.4 Sandfly fever

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

6.2.5 Plague

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

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

Moderate, mitigated to Low: Potential health risk to U.S. personnel is Moderate during warmer months (typically March through November) when vector activity is highest. Mitigation measures

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

6.2.7 West Nile fever

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

6.2.9 Short -term health risks:

Low: The unmitigated health risk estimate is High 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 stationed 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/Insect

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 Kandahar and vicinity, and may present a health risk if they are encountered by personnel. See Section 9 for more information about pesticides and pest control measures.

7.1 Spiders

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

7.2 Scorpions

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

- *Compsobuthus rugosulus, Mesobuthus caucasicus, Mesobuthus eupeus, Mesobuthus macmahoni, Orthochirus bicolor, Orthochirus danielleae*, *Orthochirus erardi*, *Orthochirus pallidus, Orthochirus scrobiculosus,* and *Sassanidotus gracilis*: There are a number of dangerous Buthid scorpions, but also others known to cause minimal effects only. Without clinical data it is unclear where these species fit within that spectrum.

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

7.3 Snakes

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

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

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

- *Pseudocerastes persicus* (Persian dwarf snake): Unlikely to cause significant envenoming; limited clinical data suggest bites result in local effects only.

7.4 Short-term health risk:

Low: If encountered, effects of venom vary with species from mild localized swelling (e.g. widow spider) to potentially lethal effects (e.g. central Asian saw-scaled viper). See effects of venom above. Confidence in the health risk estimate is low.

7.5 Long-term health risk:

None identified.

8 Heat/Cold Stress

8.1 Heat

Average monthly peak temperature during the summer months (June – September) was 104.4 degrees Fahrenheit (°F). The health risk of heat stress/injury based on temperatures alone is Low (< 78 °F) from November – March, Moderate (78-81.9°F) in October, high (82-87.9°F) in April, and extremely high (≥ 88°F) from May – September. However, work intensity and clothing/equipment worn pose greater health risk of heat stress/injury than environmental factors alone (Reference 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 Extremely High, mitigated to Low: The risk of heat injury was reduced to low through preventive measures such as work/rest cycles, proper hydration and nutrition, and monitoring Wet Bulb Globe Temperature (WBGT). Risk of heat injury in unacclimatized or susceptible populations (older, previous history of heat injury, poor physical condition, underlying medical/health conditions), and those under operational constraints (equipment, PPE, vehicles) is Extremely High from May – September, High in April, Moderate in October, and Low from November – March. 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) mean daily minimum temperatures range from 33.8 °F to 36.3°F based on historical climatological data. 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 September – April. 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

Airfield, maintenance equipment, and generators were potential continuous noise hazard sources at Camp Nathan Smith, Camp Wilson, COP Jelawur, FOB Howz-E-Madad (aka Panjawa Howze Madad), Strong Point Edgerton (aka Dand District), and FOB Sakari Karez (aka FOB Ramrod) (References 22, 23, 27, 34, 43, 75, and 76). Generators at Ezabad (aka Maiwand) were far enough from living quarters that Soldiers were not affected (Reference 45).

9.1.1 Short and long-term health risks:

Not evaluated. Data was insufficient to assess risk from these potential hazard sources.

9.2 Impulse

Helicopter landing zones were potential impulse noise hazard sources at FOB Walton, Camp Wilson, COP Hutal (aka COP Rath), and COP Tarnak (aka COP Marianne) (References 32, 34, 52, and 74).

9.2.1 Short-term and Long-term health risks:

Not evaluated. Data was insufficient to assess risk from these potential hazard sources.

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

Solid waste on KAF was incinerated or transported off site by local nationals. An unknown portion of the transported solid waste was burned by local nationals in a nearby off-site burn pit. At times smoke from the off-site burn pit reportedly drifted onto KAF. Solid waste from FOB Aziz Ullah was disposed of in a burn pit and wastewater from FOB Aziz Ullah was transported off the FOB by local nationals (Reference 17). In 2011 solid waste and raw sewage was not properly contained at FOB Aziz Ullah (Reference 13). All regulated medical waste was shipped from FOB Belanday to FOB Lindsey or KAF for disposal (Reference 18). Solid waste from COP Jelawur was disposed of in a burn pit (Reference 24). Solid waste from FOB Lindsey was sent to KAF for disposal (Reference 26). Solid waste from FOB Walton was disposed of in a burn pit or hauled off site by local nationals. Regulated medical waste from FOB Walton was disposed of in the burn pit in 2010 (Reference 31). By 2012, regulated medical waste from FOB Walton was transported to KAF for disposal (Reference 32). Solid waste from Camp Wilson was disposed of in a burn pit and regulated medical waste was disposed of in incinerators located on the camp (Reference 34). Solid waste from Strong Point Edgerton (aka Dand District) was removed by local nationals (Reference 43) and regulated medical waste was burned in a proper incinerator at the site (Reference 44). Solid waste from Ezabad (aka Maiwand) was disposed of in an off-site burn pit (Reference 47). Solid waste from COP Ghundy Ghar was disposed of in a burn pit (Reference 48, 49, and 50). Solid waste from FOB Howz-E-Madad (aka Panjawa Howze Madad) was disposed of in a burn pit (Reference 51). Solid waste from COP Hutal (aka COP Rath) was disposed of in an off-site burn pit by local nationals (Reference 52). Solid waste from COP Kandalay was disposed of in an off-site burn pit (Reference 54 and 55). Solid waste from COP KOLK was disposed of in an off-site burn pit by local nationals (Reference 56). Solid waste from COP Lakhokhel was disposed of in a burn pit (Reference 57). Solid waste from COP Makuan was disposed of in a burn pit located downwind from the COP (Reference 58). Solid waste from COP Nalgham was disposed of in a burn pit (Reference 59). Solid waste from COP Now Ruzi was disposed of in an off-site burn pit by local nationals (Reference 60). Solid waste from COP Pashmul South was disposed of in a burn pit (Reference 61 and 62). Solid waste from COP Sablaghay was disposed of in a burn pit (Reference 63 and 64). Solid waste from COP Sangsar was disposed of in a burn pit (Reference 65). Solid waste from FOB Siah Choy was disposed of in a burn pit (Reference 66, 67, 68, 69). Solid waste from Strong Point Gharibon was disposed of in a burn pit by Soldiers and local nationals (Reference 70). Solid waste from COP Zharif Kel (aka COP Zarifkhel) was disposed of in a downwind, off-site burn pit by local nationals (Reference 71). Solid waste from COP Terminator (aka COP Atta Mohammed Khan) was disposed of in an off-site burn pit by local nationals (Reference 72). Solid waste from FOB Zangabad (aka FOB Saidon) was disposed of in an off-site burn pit (Reference 73). Solid waste from COP Tarnak (aka COP Marianne) was disposed of in an off-site burn pit (Reference 74). Solid waste from FOB Sakari Karez (aka FOB Ramrod) was disposed of in an off-site burn pit located 200 to 300 meters from the FOB (Reference 75 and 76). Regulated medical waste from FOB Sakari Karez (aka FOB Ramrod) was transported to Camp Wilson (aka Pasab) for disposal (Reference 76). All burn pits at locations with populations of more than 100 people were closed by July 2013.

10.2.1 Short and long-term health risks:

Not evaluated. Data was insufficient to assess risk from these potential hazard sources.

10.3 Fuel/petroleum products/industrial chemical spills

No specific hazard sources were documented in the DOEHRS, or MESL from the 1 October 2009 to 30 September 2014 timeframe.

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. No specific hazard sources were documented in DOEHRS or MESL data portal. For each pesticide product applied during this period, the EPA approved label has been archived, providing a framework how each pesticide was handled and applied (see below).

10.4.1 Rodenticides

Brodifacoum and Bromadiolone were used to control rodents.

10.4.2 Insecticides

Insecticides used to control ants, bed bugs, bees, crickets, fleas, flies, gnats, hornets, midges, mosquitoes, sand flies, scorpions, silverfish, spiders, termites, and wasps included: Abamectin B1, *Bacillus thuringiensis* subspecies israelensis, bifenthrin, deltamethrin, d-trans allethrin, phenothrin, fipronil, hydramethylnon, imidacloprid, Z-9-tricosene, lambda-cyhalothrin, methomyl, methoprene, nithiazine, pyrethrins, piperonyl butoxide, and ß-Cyfluthrin.

10.4.3 Short-term and Long-term health risks

No specific hazard sources were documented in DOEHRS or MESL data portal from 1 October 2009 through 30 September 2014.

10.5 Asbestos

Six bulk samples were collected in a building of concern at Camp Brown. The six bulk samples were analyzed and results indicated the materials sampled contained asbestos (Reference 19). During a subsequent sampling effort, 26 air samples were collected from rooms containing the asbestos containing material. Sample concentrations from all of the air samples were below the limit of detection and below occupational exposure limit (Reference 20).

10.5.1 Short and long-term health risks:

None identified based on the available sampling data.

10.6 Lead Based Paint

No specific hazard sources were documented in the DOEHRS, or MESL from the 1 October 2009 to 30 September 2014 timeframe.

10.7 Burn Pit

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

Open burning occurred at KAF prior to October 2012. Incinerators were used at KAF. An unknown portion of solid waste that was transported off-site was burned by local nationals in a nearby off-site burn pit. At times smoke from the off-site burn pit drifted onto KAF.

Burn pits were in use at FOB Aziz Ullah in November 2010 through January 2013 (Reference 13, 14, 15, 16, and 17), COP Ahmad Khan in May 2011 and June 2012 (Reference 35 and 36), at COP AJK in April 2011, June 2011, and January 2012 (Reference 37, 38, and 39), at COP Ashoque in March 2011 (Reference 40), at FOB Belanday in January 2011 (Reference 18 and 41), at Chineh in February 2012 (Reference 42), at FOB Howz-E-Madad (aka Panjawa Howze Madad) in March 2011 through July 2011 (References 21 and 22), at COP Jelawur in April 2011 (Reference 24), at Camp Nathan Smith in July 2010 (Reference 27), at FOB Walton in 2010 through 2012 (References 29, 30, and 32), at Camp Wilson in February 2010 through 2012 (References 33 and 34), at Ezabad (aka Maiwand) in August 2011 and February 2012 (Reference 45, 46, and 47), at COP Ghundy Ghar in April 2011, July 2011, and January 2012 (Reference 48, 49, and 50), at COP Lakhokhel in July 2011 (Reference 51), at COP Nalgham in July 2011 (Reference 59), at COP Pashmul South in April 2011 and May 2012 (References 61 and 62), at COP Sablaghay in April 2011 and July 2011 (References 63 and 64), at COP Sangsar in May 2012 (References 65), at FOB Siah Choy in July 2011 through May 2012 (References 66, 67, 68, 69), at Strong Point Gharibon in January 2012 (Reference 70), and at FOB Sakari Karez (aka FOB Ramrod) in June 2010 and July 2011 (Reference 75 and 76).

Solid waste burned in the burn pit at FOB Aziz Ullah was unsorted (Reference 17). The burn pit at FOB Aziz Ullah was located upwind of the FOB (Reference 13).

The burn pit at FOB Belanday was located within the camp perimeter, less than 400 feet from troops (Reference 18).

Solid waste burned in the burn pit at FOB Howz-E-Madad (aka Panjawa Howze Madad) was unsorted (Reference 21).

The burn pit at Camp Nathan Smith was located in the center of the camp, within 300 feet of 90% of the population (References 27 and 28).

The burn pit at FOB Walton was located at the southeastern side of the FOB, within 100 feet of troops (References 29 and 30).

The burn pit at Camp Wilson was located 300 feet from camp living areas (Reference 33).

The off-site burn pit at FOB Siah Choy was located around 400 feet from the FOB (References 66, 67, 68, 69).

The off-site burn pit at FOB Sakari Karez (aka FOB Ramrod) was located 200 to 300 meters from the FOB (Reference 75 and 76).

All burn pits at locations with populations of more than 100 people were closed by July 2013.

To characterize risk to personnel who were specifically exposed to emissions from burn pits and incinerators located in the vicinity of KAF, only air samples associated with a burn pit or incinerator at KAF and vicinity were included in the following assessment of the air at KAF and vicinity.

An insufficient number of air samples associated with exposure to burn pit or incinerator emissions were available to sufficiently assess risk for the following locations: [Aziz Ullah, COP Hutal (aka COP Rath)], [Bagh E Pol (Bagh E Pul), Police Substations 2 and 7], [FOB Belanday, Strong Point Gorgon, FOB Shoja], Deh Qobad, [Strong Point Haji Ramuddin II, COP Nalgham], [FOB Howz-E-Madad (aka Panjawa Howze Madad), COP Sangsar], [FOB Masum Ghar, COP Pashmul South, Panjawi (aka Pajwai), Salim Aka], Camp Nathan Smith, [OCCP Kandahar, COP Ahmad Khan (aka COP Admadkhan), Old PHQ (aka Old ANP), FOB Walton, Kandahar PHQ, Police Substations 1, 9, 10, 12, and 16], [Checkpoint Perozi, Checkpoint Mullah Mahdi, FOB Zangabad (aka FOB Saidon), COP Mushan, COP Talukan], FOB Scorpion, FOB Siah Choy, and Camp Wilson (aka Pasab).

Air samples associated with exposure to burn pit or incinerator emissions were not collected from the following locations: ACS 14-2, Ainsworth/Emarat, COP AJK, Alizi, [ANCOP HQ, Police Substation 8, COP Ware (aka Charbaugh), Millet (aka Deh Kuchay)], ANP Hill, ACS-5, COP Ashoque, Babaghday, Camp Baker, Camp Belambay (aka Camp Belambai), Burmohommad, Busha (aka Panjsher), Cabacoy (aka Zalakhan), COP Caron (aka COP Caran), Checkpoint 1, Checkpoint 2, Checkpoint 72, Checkpoint 7-4, Demaiwand, Diwar, Ezabad (aka Maiwand), Fathollah, Folad, Checkpoint Gerandai, Camp Ghecko, [COP Ghundy Ghar, COP Sperwan Ghar], Strong Point Haji Ramuden, Jawkari, COP Jelawur, COP Johnston, COP Kandalay, COP Khenjakak, COP Kolk, COP Lakhokhel, Loy Kariz, [COP Luke and Shurandam], COP Macthab (aka COP Ballpeen, Area Control Point 15), COP Makuan, COP Nejat, COP Neshin (aka COP Neshan), New PHQ, COP Now Ruzi, OCCD-P, Old Corps, OP-971, Pa'in Kelay, Palace, Police Substation 3, Pul, Rostum, COP Sablaghay, FOB Sakari Karez (aka FOB Ramrod), Shobat (aka Sohbat), Camp Simmons 2, [Strong Point Edgerton (aka Dand District), ACS 4, Provincial Reserve Kandahar], Strong Point Gharibon, COP Tarnak (aka COP Marianne), COP Terminator (aka COP Atta Mohammed Khan), Strong Point Theinhart (aka Strong Point Theinert), Walakan, Zhari Dosht (aka Zhari Dasht), COP Zharif Kel (aka COP Zarifkhel).

10.7.1 PM_{10} Samples Associated with Exposure to Burn Pit or Incinerator Emissions

10.7.1.1 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.

10.7.1.2 Sample data/Notes:

KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey: A total of 52 valid PM_{10} air samples associated with exposure to burn pit or incinerator emissions were collected from 2009 to 2014. A sufficient number of air samples associated with exposure to burn pit or incinerator emissions were only available to characterize risk in 2010 and 2011. The range of 24-hour PM_{10} concentrations was 86 $\mu g/m^3$ – 936 $\mu g/m^3$ with an average concentration of 536 $\mu g/m^3$.

10.7.1.3 Short-term health risks:

KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey: **Moderate to High:** The short-term PM_{10} health risk assessment is moderate based on average PM_{10} sample concentrations and high based on peak PM_{10} sample concentrations, and the likelihood of exposure at these hazard severity levels. Therefore, on typical days, exposure to PM_{10} was likely to have degraded mission capabilities and may have resulted in reduced mission capability if hazards occurred during the mission. Peak exposures could have occurred, increasing the health risk level (Reference 9, Table 3-2). Under peak exposures, mission capabilities may have been significantly degraded in terms of the required mission standard, inability to accomplish all parts of the mission, or inability to complete the mission.

Out of all 24-hour PM_{10} sampling events in KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey, 6% showed no hazard, 25% showed low health risk, 23% showed moderate health risk, and 40% showed high health risk. Confidence in the short-term PM_{10} health risk assessment is low (Reference 9, Table 3-6).

The hazard severity was marginal for average PM_{10} concentrations in KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey. During typical exposures at the marginal hazard severity level (420 ug/m^3 - 600 ug/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 (Reference 9, Table 3-11).

The hazard severity was critical for the peak PM_{10} concentrations in KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey. During peak exposures at the critical hazard severity level (greater than 600 ug/m^3), most if not all personnel would have experienced very notable eye, nose, and throat irritation and respiratory effects. Visual acuity was impaired, as was overall aerobic capacity. Some personnel would not have been able to perform assigned duties. Some lost-duty days were expected (Reference 9, Table 3-11).

10.7.1.4 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.

10.7.2 $PM_{2.5}$ Samples Associated with Exposure to Burn Pit or Incinerator Emissions

10.7.2.1 Exposure Guidelines:

Short Term (24-hour) $PM_{2.5}$ (µg/m^3):
- Negligible MEG = 65
- Marginal MEG = 250
- Critical MEG = 500

Long-term (1year) $PM_{2.5}$ MEGs (µg/m^3):
- Negligible MEG = 15
- Marginal MEG = 65.

10.7.2.2 Sample data/Notes:

KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey: A total of 64 valid $PM_{2.5}$ air samples associated with exposure to burn pit or incinerator emissions were collected from 2009 to 2014. A sufficient number of air samples associated with exposure to burn pit or incinerator emissions were only available to characterize risk in 2010 and 2011. The range of 24-hour $PM_{2.5}$ concentrations was 10 µg/m^3 – 891 µg/m^3 with an average concentration of 183 µg/m^3.

10.7.2.3 Short-term health risks:

KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey: **Low to High:** The short-term $PM_{2.5}$ health risk assessment in KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey was low based on average $PM_{2.5}$ concentrations and low to high based on annual peak $PM_{2.5}$ concentrations. Therefore, on typical days, exposure to $PM_{2.5}$ was likely to have little or no impact on accomplishing the mission. In theatre medical resources should not have been needed for protection and treatment as a result of exposure to $PM_{2.5}$ levels on a typical day. Mission capabilities should not have been affected. Peak exposures could have occurred, increasing the health risk level (Reference 9, Table 3-2). Under peak exposures there may have been little or no impact on accomplishing the mission or mission capabilities may have been significantly degraded in terms of the required mission standard, inability to accomplish all parts of the mission, or inability to complete the mission, and may have required some in-theater medical countermeasures and resources.

Out of all 24-hour $PM_{2.5}$ sampling events in KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey, 25% show no hazard, 61% have low heath risk, 8% have moderate health risk, and 7% have high health risk. Confidence in the short-term $PM_{2.5}$ health risk assessment was medium (Reference 9, Table 3-6).

The hazard severity was negligible to marginal for average $PM_{2.5}$ exposures in KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey. During typical exposures at the negligible hazard severity level (65 ug/m^3 - 250 ug/m^3), a few personnel may have experienced notable eye, nose, and throat irritation; most personnel would have experienced only mild effects. During typical exposures at the marginal hazard severity level (250 ug/m^3 - 500 ug/m^3), a majority of personnel may have experienced notable eye, nose, and throat irritation and some respiratory effects. Some lost duty days were expected. Significant aerobic activity will have increased risk. Those with a history of asthma or cardiopulmonary disease were expected to experience increased symptoms at the marginal and negligible hazard severity levels.

The hazard severity was marginal to critical for the peak $PM_{2.5}$ exposure in KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey. During peak exposures at the critical hazard severity level (greater than 600 ug/m^3), most if not all personnel would have experienced very notable eye, nose, and throat irritation and respiratory effects. Visual acuity was impaired, as was overall aerobic capacity. Some personnel would not have been able to perform assigned duties. During peak exposures at the marginal hazard severity level (250 ug/m^3 - 500 ug/m^3), a majority of personnel may have experienced

notable eye, nose, and throat irritation and some respiratory effects. Some lost duty days were expected. Significant aerobic activity will have increased risk. Those with a history of asthma or cardiopulmonary disease were expected to experience increased symptoms at the critical and negligible hazard severity levels.

10.7.2.4 Long-term health risks:

KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey: **Moderate:** $PM_{2.5}$ in KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey had average concentrations in 2010 (254 ug/m^3) and 2011 (119 ug/m^3) that exceeded the long-term 1 year negligible MEG (15 ug/m^3). Insufficient samples were available to assess risk in 2009, 2012, 2013, and 2014. The long-term health risk assessment for $PM_{2.5}$ concentrations was moderate based on average $PM_{2.5}$ concentrations. Therefore, limited future medical surveillance activities and related resources are anticipated for long-term exposure to $PM_{2.5}$.

The hazard severity was marginal for long-term $PM_{2.5}$ exposures in KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey. During long-term exposures at the marginal hazard severity level, many exposed personnel are plausibly expected to develop delayed onset, irreversible effects. Confidence in the health risk assessment was low (Reference 9, Table 3-6).

10.7.3 Airborne Metal Samples Associated with Exposure to Burn Pit or Incinerator Emissions

10.7.3.1 Exposure Guidelines:

Short Term Cadmium (ug/m^3):
- 1 hour Critical MEG = 4.7E+3
- 1 hour Marginal MEG = 7.6E+2
- 1 hour Negligible MEG = 1.0E+2
- 8 hour Negligible MEG = 4.1E+1
- 14 day Negligible MEG = 2.15E-2

Long-term Cadmium MEGs (ug/m^3):
- 1 year Negligible MEG = 6.8E-3

10.7.3.2 Sample data/Notes:

KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey: A total of 53 valid PM_{10} airborne metal samples associated with exposure to burn pit or incinerator emissions were collected in KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey from 2009 to 2014. A total of 64 valid $PM_{2.5}$ airborne metal samples associated with exposure to burn pit or incinerator emissions were collected in KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey from 2009 to 2014. Cadmium in PM_{10} and $PM_{2.5}$ in 2010 and 2011 was the only contaminant detected in levels above the short-term MEGs. Airborne metals in PM_{10} and $PM_{2.5}$ were not detected in levels above the long-term MEGs.

10.7.3.3 Short-term health risks:

KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey: **None to Low:** The short-term PM_{10} cadmium and $PM_{2.5}$ cadmium health risk assessment in KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey was none based on average PM_{10} cadmium concentrations (3.82E-3 ug/m^3 in 2010 and 6.47E-3 ug/m^3 in 2011) and average $PM_{2.5}$ cadmium concentrations (8.3E-3 ug/m^3 in 2010 and 7.3E-3 ug/m^3 in 2011) and low based on peak PM_{10} cadmium concentrations (6.53E-2 ug/m^3 in 2010 and 1.34E-1 ug/m^3 in 2011) and peak $PM_{2.5}$ cadmium concentrations (1.06E-1 ug/m^3 in 2010 and 5.97E-2 ug/m^3 in 2011). Therefore on typical days there was no risk from exposure to PM_{10} cadmium and $PM_{2.5}$ cadmium. On peak days exposure to PM_{10} cadmium and $PM_{2.5}$ cadmium was likely to have little or no impact on accomplishing the mission. In theatre medical resources should not have been

needed for protection and treatment as a result of exposure to PM_{10} cadmium and $PM_{2.5}$ cadmium levels on a typical day. Mission capabilities should not have been affected.

The hazard severity was negligible for peak PM_{10} and $PM_{2.5}$ cadmium exposures in KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey. During peak exposures at the negligible hazard severity level, a few personnel may have experienced notable health effects; exposed personnel are expected to be able to effectively perform all critical tasks during mission operations.

10.7.3.4 Long-term health risks:

KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey: **None identified from $PM_{2.5}$ cadmium based on the available sampling data.**

Low: The long-term PM_{10} cadmium health risk assessment in KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey was low based on average PM_{10} cadmium concentrations in 2010 (3.82E-3 ug/m^3) and 2011 (6.47E-3 ug/m^3). Therefore, no specific medical action is required.

The hazard severity was negligible for long-term PM_{10} cadmium exposures in KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey. During long-term exposures at the negligible hazard severity level, few exposed personnel (if any) are expected to develop delayed onset, irreversible effects. Confidence in the health risk assessment was low (Reference 9, Table 3-6).

10.7.4 PAH, VOC, and SVOC Samples Associated with Exposure to Burn Pit or Incinerator Emissions

10.7.4.1 Exposure Guidelines:

Short-Term Acrolein MEGs (mg/m^3):
- 1 hour Critical MEG = 3.2
- 1 hour Marginal MEG = 2.3E-1
- 1 hour Negligible MEG = 7.0E-2
- 8 hour Negligible MEG = 7.0E-2
- 14 day Negligible MEG = 4.6E-2

Long-term Acrolein MEGs (mg/m^3):
- 1 year Negligible MEG = 1.4E-4

Short-Term Benzoic Acid MEGs (mg/m^3):
- 1 hour Critical MEG = 4.0E+2
- 1 hour Marginal MEG = 7.5E+1
- 1 hour Negligible MEG = 1.3E+1

Long-term Benzoic Acid MEGs (mg/m^3):
- 1 year Negligible MEG = 1.37E-3

10.7.4.2 Sample data/Notes:

KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey: A total of 56 valid PAH, VOC, SVOC air samples associated with exposure to burn pit or incinerator emissions were collected in KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey from 1 October 2009 to 30 September 2014. Acrolein and benzoic acid were detected at levels above the long-term MEGs.

10.7.4.3 Short-term health risks:

None identified based on the available sampling data.

10.7.4.4 Long-term health risks:

KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey: **Low:** Acrolein in air samples associated with exposure to burn pit or incinerator emissions at KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey had an average concentration in 2013 (1E-3 mg/m^3) that exceeded the long-term 1 year negligible MEG (1.4E-4 mg/m^3). The long-term health risk assessment for acrolein was low. Therefore, no specific medical attention is required for long-term exposure to acrolein.

The hazard severity was negligible for long-term acrolein exposures in KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey. During long-term exposures at the negligible hazard severity level, with repeated exposure few exposed personnel (if any) are expected to develop delayed onset, irreversible effects. Confidence in the health risk assessment was low (Reference 9, Table 3-6).

Low: Benzoic acid in air samples associated with exposure to burn pit or incinerator emissions at KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey had an average concentration in 2013 (3E-3 mg/m^3) that exceeded the long-term 1 year negligible MEG (1.37E-3 mg/m^3). The long-term health risk assessment for benzoic acid was low. Therefore, no specific medical attention is required for long-term exposure to benzoic acid.

The hazard severity was negligible for long-term benzoic acid exposures in KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey. During long-term exposures at the negligible hazard severity level, with repeated exposure few exposed personnel (if any) are expected to develop delayed onset, irreversible effects. Confidence in the health risk assessment was low (Reference 9, Table 3-6).

10.7.5 Dioxin and Furan Samples Associated with Exposure to Burn Pit or Incinerator Emissions

10.7.5.1 Sample data/Notes:

KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey: A total of 27 valid dioxin and furan air samples associated with exposure to burn pit or incinerator emissions were collected in KAF, Camp Brown, Camp Hero, JRAC, and Camp/FOB Lindsey from 1 October 2009 to 30 September 2014. The summed dioxin and furan concentration was below the short and long-term MEGs.

10.7.5.2 Short and long-term health risks:

None identified based on the available sampling data. The summed dioxin and furan concentration was below the short and long-term MEGs.

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[1] NOTE. The data are currently assessed using the 2013 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. 82nd Division Preventive Medicine. May 2012. Preventive Medicine Base Camp Assessment Azzizulah.

16. 4th Preventive Medicine Detachment. November 2010. Preventive Medicine Base Camp Assessment ICO Command Outpost (COP) Aziz Ullah.

17. 4th Preventive Medicine Detachment. December 2010. Occupational and Environmental Health Site Assessment Combat Outpost Aziz Ullah.

18. 4th Preventive Medicine Detachment. 3-6 January 2011. Base Camp Assessment of Strong Point FOB Belanday.

19. Army Institute for Public Health. 5 January 2012. Memorandum for Record. Review of Bulk Potential Asbestos Containing Materials Samples Results Collected at Camp Brown, Kandahar, Afghanistan and Recommendations for Mitigation.

20. Army Institute for Public Health. 16 February 2012. Memorandum for Record. Review of Asbestos Air Sampling Results Collected at Camp Brown, Kandahar, Afghanistan.

21. Task Force Spartan. 29 March 2011. Preventive Medicine Base Camp Assessment. FOB Howz-e-madad.

22. Task Force Spartan. 6 July 2011. Preventive Medicine Base Camp Assessment. FOB Howz-e-Madad.

23. 3rd Preventive Medicine Detachment. 18 June 2010. Preventive Medicine Base Camp Assessment of FOB Jelawar.

24. Task Force Spartan. 8 April 2011. Preventive Medicine Base Camp Assessment. FOB Jelawar.

25. 180th Preventive Medicine Detachment. 1 January 2010. Occupational and Environmental Health Site Assessment FOB Lindsey Kandahar, Afghanistan.

26. 5th Preventive Medicine Detachment. 12 March 2011. Occupational and Environmental Health Site Assessment Forward Operating Base (FOB) Lindsey II, Afghanistan 21-23 March 2011.

27. 3rd Preventive Medicine Detachment. 6 July 2010. Preventive Medicine Base Camp Assessment of FOB Nathan Smith.

28. Forward Deployable Preventive Medicine Unit. 17 July 2010. Occupational and Environmental Health Site Assessment Camp Nathan Smith, Afghanistan July, 2010.

29. 180th Preventive Medicine Detachment. 3 April 2010. Base Camp Assessment of Walton.

30. 180th Preventive Medicine Detachment. 22 April 2010. Occupational and Environmental Health Site Assessment FOB Walton Kandahar, Afghanistan.

31. 2nd Preventive Medicine Detachment. 29 January 2010. Preventive Medicine Base Camp Assessment of FOB Walton.

32. 792nd Preventive Medicine Detachment. 16 April 2012. Occupational and Environmental Health Site Assessment.

33. 180th Preventive Medicine Detachment. 27 February 2010. Base Camp Assessment, 21 February 2010 – 27 February 2010.

34. 782nd Brigade Support Battalion, 4th Brigade Combat Team, 82nd Airborne Division. 20 April 2012. OEHSA Survey Report Base Camp Wilson.

35. Preventive Medicine Base Camp Assessment, COP AhmadKahn. 10 May 2011.

36. Preventive Medicine Base Camp Assessment, Ahmad Khan. 7 June 2012.

37. Preventive Medicine Base Camp Assessment, COP AJK. 11 June 2011.

38. Preventive Medicine Base Camp Assessment, AJK. 13 January 2012.

39. Preventive Medicine Base Camp Assessment, COP AJK (Iron). 26 April 2011.

40. Preventive Medicine Base Camp Assessment, COP Ashoque. 28 March 2011.

41. 4th Preventive Medicine Detachment Base Camp Assessment, Strong Point Belanday. 3-6 January 2011.

42. Preventive Medicine Base Camp Assessment, Chineh. 6 February 2012.

43. 4th & 5th Preventive Medicine Detachment. 4-7 February 2011. Occupational & Environmental Health Site Assessment Strong Point Edgerton, Kandahar Province, Afghanistan.

44. 5th Preventive Medicine Detachment. Base Camp Assessment Report for Strong Point Edgerton, Afghanistan. 30 May 2011.

45. Department of Defense Special Operations Task Force South. Base Camp Assessment (BSA) of Ezabad (Maiwand) VSP, Kandahar Province, Afghanistan. 22 August 2011.

46. Preventive Medicine Base Camp Assessment, De Mai Wand. 6 February 2012.

47. 5th Preventive Medicine Detachment. OEHSA Survey Report Maiwand. 23 July 2011.

48. Preventive Medicine Base Camp Assessment, COP Ghundy Ghar. 26 April 2011.

49. Preventive Medicine Base Camp Assessment, COP Ghundy Ghar. 31 July 2011.

50. Preventive Medicine Base Camp Assessment, COP Ghundy Ghar. 13 January 2012.

51. Task Force Spartan. Preventive Medicine Base Camp Assessment at FOB Howz-e-Madad. 11 July 2011.

52. 4th Preventive Medicine Detachment. Occupational and Environmental Health Site Assessment Combat Outpost (COP) Rath, Maiwand Province, Afghanistan. 21-25 December 2010.

53. 451 AEW/SG Bioenvironmental Engineering. Routine Occupational Health Risk Assessment. 3 December 2011.

54. Task Force Spartan. Preventive Medicine Base Camp Assessment at Kandalay. 17 December 2011.

55. Task Force Fury. Preventive Medicine Base Camp Assessment at Kandalay. 17 February 2012.

56. Task Force Spartan. Preventive Medicine Base Camp Assessment at Kolk. 27 November 2011.

57. Task Force Spartan. Preventive Medicine Base Camp Assessment at COP Lakokhel. 10 May 2011.

58. Task Force Spartan. Preventive Medicine Base Camp Assessment at Makuan. 22 December 2011.

59. Combined Task Force Spartan. Preventive Medicine Base Camp Assessment at COP Nalgham. 07 July 2011.

60. Task Force Spartan. Preventive Medicine Base Camp Assessment at Now Ruzi. 13 December 2011.

61. Task Force Spartan. Preventive Medicine Base Camp Assessment at COP Pashmul South. 22 April 2011.

62. Combined Task Force Fury. Preventive Medicine Base Camp Assessment at COP Pashmul South. 27 May 2012.

63. Task Force Spartan. Preventive Medicine Base Camp Assessment at COP Sablughay. 22 April 2011.

64. Task Force Spartan. Preventive Medicine Base Camp Assessment at COP Sablughay. 19 July 2011.

65. Combined Task Force Fury. Preventive Medicine Base Camp Assessment at Sangsar. 16 May 2012.

66. Task Force Spartan. Preventive Medicine Base Camp Assessment at COP Siah Choy. 19 July 2011.

67. Task Force Spartan. Preventive Medicine Base Camp Assessment at Siah Choy. 18 December 2011.

68. Task Force Spartan. Preventive Medicine Base Camp Assessment at Siah Choy. 16 January 2012.

69. Task Force Spartan. Preventive Medicine Base Camp Assessment at Siah Choy. 27 May 2012.

70. Task Force Spartan. Preventive Medicine Base Camp Assessment at COP Gharibon. 16 January 2012.

71. Task Force Spartan. Preventive Medicine Base Camp Assessment at Zharifkhel. 8 December 2011.

72. Task Force Spartan. Preventive Medicine Base Camp Assessment COP Ata Mohammed. 21 May 2011.

73. 5th Preventive Medicine Detachment. OEHSA Survey Report Area Zangabad VSP. 22 July 2011.

74. 4th Preventive Medicine Detachment. OEHSA Survey Report Area Combat Outpost (COP) Tarnak, Dand District, Kandahar Province. 03-06 February 2011.

75. Forward Deployed Preventive Medicine Unit. Occupational and Environmental Health Site Assessment Forward Operating Base Ramrod, Maywand Province, Afghanistan. June 2010.

76. 5th Preventive Medicine Detachment. OEHSA Survey Report Area Ramrod. 23 July 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 Deputy Assistant Secretary of Defense for Health Readiness Policy and Oversight.
Army Public Health Center Phone: (800) 222-9698. http://phc.amedd.army.mil/
Navy and Marine Corps Public Health Center (NMCPHC) (formerly Navy Environmental Health Center) Phone: (757) 953-0700. http://www.med.navy.mil/sites/nmcphc/Pages/Home.aspx
U.S. Air Force School of Aerospace Medicine (USAFSAM) (formerly Air Force Institute for Operational Health) Phone: (888) 232-3764. http://www.wpafb.af.mil/afrl/711hpw/usafsam.asp
DoD Health Readiness Policy and Oversight Phone: (800) 497-6261. http://fhpr.dhhq.health.mil/home.aspx