Military Deployment
Periodic Occupational and Environmental Monitoring Summary (POEMS):
Camp Taji, Iraq
Calendar Years: (2014 to 2015)

AUTHORITY: This periodic occupational and environmental monitoring summary (POEMS) has been developed in accordance with Department of Defense (DoD) Instructions 6490.03, 6055.05, and JCSM (MCM) 0017-12 (References 1-3).

PURPOSE: This POEMS documents the Department of Defense (DOD) assessment of occupational and environmental health (OEH) risk for Camp Taji, Iraq. It presents a qualitative summary of health risks identified at this location and their potential medical implications. The report is based on information collected from 1 January 2014 to 31 December 2015 to include deployment occupational and environmental health surveillance (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 Camp Taji during this period was performed at representative exposure points selected to characterize health risks at the *population level*. Due to the nature of environmental sampling, the data upon which this report is based may not be fully representative of all the fluctuations in environmental quality or capture unique occurrences. While one might expect health risks pertaining to historic or future conditions at this site to be similar to those described in this report, the health risk assessment is limited to 1 January 2014 through 31 December 2015.

The POEMS can be useful to inform healthcare providers and others of environmental conditions experienced by individuals deployed to Camp Taji 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: Camp Taji (originally Al Taji Army Airfield) was located approximately 20–30 kilometers (km) northwest of Baghdad, near the city of Taji. Before the war, the site was a huge military/industrial facility. Camp Taji was divided with Iraqi and U.S. sides. Camp Taji was bordered by canals to the north and south, by railroad tracks to the west, the Tigris River to the east, and was bisected by Highway 1 (MSR Tampa). The surrounding area was primarily small farms and villages. There was a market area to the southwest and a large industrial complex, the Al Samud Plant, about 3 km north along Highway 1. Most cultivated land was irrigated by a system of canals and ditches, some well prepared and concrete-lined, others merely ditches in the soil.

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 Camp Taji. 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 Camp Taji and vicinity:

Food/waterborne diseases (e.g., bacterial diarrhea, hepatitis A, typhoid/paratyphoid fever, diarrhea-cholera, diarrhea-protozoal, brucellosis, hepatitis E); other endemic diseases (cutaneous leishmaniasis (acute), Crimean-Congo hemorrhagic fever, sandfly fever, scrub typhus(mite-borne), leptospirosis, schistosomiasis, Tuberculosis (TB), rabies, Q fever); and heat stress. 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 (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, and bed net use, as well as minimizing areas of standing water and other vector-breeding areas. For water contact diseases (leptospirosis and schistosomiasis), 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, Q fever), pose year-round risk. For heat stress, risk can be greater during months of March through November, and greater for susceptible persons including those older than 45, of low fitness level, unacclimatized, or with underlying medical conditions, and those under operational constraints (equipment,personal protective equipment (PPE), vehicles). Risks from heat stress may have been reduced with preventive medicine controls, work-rest cycles, proper hydration and nutrition, and mitigation.

Air quality: For inhalable coarse particulate matter (PM) less than 10 micrometers in diameter (PM_{10}) from environmental dust, the PM_{10} overall short-term health risk was not evaluated due to insufficient data. For inhalable fine PM less than 2.5 micrometers in diameter ($PM_{2.5}$) from environmental dust, the $PM_{2.5}$ overall short-term health risk was not evaluated due to insufficient data. However, the entire Camp Taji and vicinity area is an arid and dust-prone desert environment, also subject to vehicle traffic. Consequently, exposures to PM_{10} and $PM_{2.5}$ may vary, as conditions may vary, and may result in mild to more serious short-term health effects (e.g., eye, nose or throat and lung irritation) in some personnel while at this site, particularly exposures to high levels of dust such as during high winds or dust storms. For PM_{10} and $PM_{2.5}$, certain subgroups of the deployed forces (e.g., those with pre-existing asthma/cardio-pulmonary conditions) are at greatest risk of developing notable health effects. Two regulated medical waste incinerators and no burn pits were located at Camp Taji and vicinity 1 January 2014 through 31 December 2015. Burn pits (or incinerators or burn barrels) may have been used by the local population; however, there are no reports or sampling data to indicate their presence or absence. The PM_{10} and the $PM_{2.5}$ overall short-term health risks specifically for burn pits were not evaluated due to insufficient environmental samples collected near burn pits provided for analysis– see Section 10.7. Where burn pits exist, exposures may vary, and exposures to high levels of PM_{10} and $PM_{2.5}$ from smoke may result in mild to more serious short-term health effects (e.g., eye, nose or throat and lung irritation) in some personnel and certain subgroups. Although most short-term health effects from exposure to PM 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 while at Camp Taji and vicinity. Personnel who reported with symptoms or required treatment while at site(s) with burn pit activity should have exposure and treatment noted in medical record (e.g., electronic medical record and/or on a 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 Camp Taji and vicinity:

Air quality: For inhalable fine PM less than 2.5 micrometers in diameter ($PM_{2.5}$) from environmental dust, the overall long-term health risk was not evaluated due to insufficient data. Inhalable coarse PM less than 10 micrometers in diameter (PM_{10}) from environmental dust was not evaluated for long-term health risk due to no available health guidelines. However, the entire Camp Taji and vicinity area is an arid and dust-prone desert environment, also subject to vehicle traffic, and conditions may have varied. Two regulated medical waste incinerators and no burn pits were located at Camp Taji and vicinity 1 January 2014 through 31 December 2015. Burn pits (or incinerators or burn barrels) may have been used by the local population; however, there are no reports or sampling data to indicate their presence or absence. – see Section 10.7. Burn pit exposures may vary, as conditions may have varied. For inhalational exposure to high levels of dust containing PM_{10} and $PM_{2.5}$, such as during high winds or dust storms, and for exposures to burn pit smoke, it is considered possible that some otherwise healthy personnel, who were exposed for a long-term period to dust and PM, could develop certain health conditions (e.g., reduced lung function, cardiopulmonary disease). Personnel with a history of asthma or

Long-term health risk & medical implications (continued):

cardiopulmonary disease could potentially be more likely to develop such chronic health conditions. While the dust and PM 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 - Camp Taji, Iraq [1, 2]

Source of Identified Health Risk[3]	Unmitigated Health Risk Estimate[4]	Control Measures Implemented	Residual Health Risk Estimate[4]
AIR			
Particulate matter less than 10 micrometers in diameter (PM_{10})	Short-term: Insufficient data to evaluate health risk. Daily levels vary, acute health effects (e.g., upper respiratory tract irritation) more pronounced during peak days. More serious effects are possible in susceptible persons (e.g., those with asthma/existing respiratory diseases).	Limiting strenuous physical activities when air quality is especially poor; and actions such as closing tent flaps, windows, and doors.	Short-term: Insufficient data to evaluate health risk. Daily levels vary, acute health effects (e.g., upper respiratory tract irritation) more pronounced during peak days. More serious effects are possible in susceptible persons (e.g., those with asthma/existing respiratory diseases).
	Long-term: No health guidelines		Long-term: No health guidelines
Particulate matter less than 2.5 micrometers in diameter ($PM_{2.5}$)	Short-term: Insufficient data to evaluate health risk. A majority of the time mild acute (short-term) health effects are anticipated; certain peak levels may produce mild eye, nose, or throat irritation in some personnel and pre-existing health conditions (e.g., asthma, or cardiopulmonary diseases) may be exacerbated.	Limiting strenuous physical activities when air quality is especially poor; and actions such as closing tent flaps, windows, and doors.	Short-term: Insufficient data to evaluate health risk. A majority of the time mild acute (short-term) health effects are anticipated; certain peak levels may produce mild eye, nose, or throat irritation in some personnel and pre-existing health conditions (e.g., asthma, or cardiopulmonary diseases) may be exacerbated.
	Long-term: Insufficient data to evaluate health risk. 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: Insufficient data to evaluate health risk. 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).
ENDEMIC DISEASE			
Food borne/Waterborne (e.g., diarrhea-bacteriological)	Short-term: Variable, (bacterial diarrhea, hepatitis A, typhoid fever) to Moderate (diarrhea-cholera, diarrhea-protozoal, brucellosis and hepatitis E). If local food/water were consumed, the health effects can temporarily incapacitate personnel (diarrhea) or result in prolonged illness (Hepatitis A, Typhoid fever, Brucellosis, Hepatitis E).	Preventive measures include Hepatitis A and Typhoid fever vaccination and consumption of food and water only from approved sources.	Short-term: Low to none
	Long-term: none identified		Long-term: No data available
Arthropod Vector Borne	Short-term: Variable, Moderate for leishmaniasis-cutaneous, Crimean-Congo hemorrhagic fever, sandfly fever and typhus-miteborne; Low for West Nile fever, and Plague.	Preventive measures include proper wear of treated uniform, application of repellent to exposed skin, and bed net use, minimizing areas of standing water and appropriate chemoprophylaxis.	Short-term: Low
	Long-term: Low (Leishmaniasis-visceral infection)		Long-term: No data available
Water-Contact (e.g., wading, swimming)	Short-term: Moderate for leptospirosis and schistosomiasis.	Control measures implemented: Avoid water contact and recreational water activities, proper wear of uniform (especially footwear), and utilize	Short-term: Moderate for leptospirosis and schistosomiasis.
	Long-term: No data available		Long-term: No data available

Source of Identified Health Risk[3]	Unmitigated Health Risk Estimate[4]	Control Measures Implemented	Residual Health Risk Estimate[4]
		protective coverings for cuts/abraded skin.	
espiratory	Short-term: Variable; Moderate for tuberculosis (TB) to Low for meningococcal meningitis and Middle East respiratory syndrome coronavirus (MERS-CoV).	Providing adequate living and work space; medical screening; vaccination	Short-term: Low
	Long-term: No data available		Long-term: No data available
Animal Contact	Short-term: Variable; Moderate for rabies and Q-fever, and Low for Anthrax and avian influenza.	Prohibiting contact with, adoption, or feeding of feral animals IAW U.S. Central Command (CENTCOM) General Order (GO) 1B. Risks are further reduced in the event of assessed contact by prompt post-exposure rabies prophylaxis IAW The Center for Disease Control's (CDC) Advisory Committee on Immunization Practices guidance.	Short-term: No data available
	Long-term: Low (Rabies)		Long-term: No data available
Soil Contact	Short-term: Low for Soil transmitted helminthes.	Reduce risk by avoiding/minimizing contact with moist soil.	Short-term: Low for Soil transmitted helminthes.
	Long-term: No data available		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., *Scorpio maurus*) to potentially lethal effects (e.g., *Vipera albicornuta*).	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., *Scorpio maurus*) to potentially lethal effects (e.g., *Vipera albicornuta*).
	Long-term: No data available		Long-term: No data available
HEAT/COLD STRESS			
Heat	Short-term: Variable; Risk of heat injury is High from April – October, Moderate from November – March, and Low from December – February.	Work-rest cycles, proper hydration and nutrition, and Wet Bulb Globe Temperature (WBGT) monitoring.	Short-term: Variable; Risk of heat injury in unacclimatized or susceptible personnel is High from April – October, Moderate from November – March, and Low from December – February.
	Long-term: Low, The long-term risk was Low. However, the risk may be greater to certain susceptible persons– those older (i.e., greater than 45 years), in lesser physical shape, or with underlying medical/health conditions.		Long-term: Low, The long-term risk is Low. However, the risk may be greater to certain susceptible persons– those older (i.e., greater than 45 years), in lesser physical shape, or with underlying medical/health conditions.
Cold	Short-term: Low risk of cold stress/injury.	Risks from cold stress reduced with protective measures such as use of the buddy system, limiting exposure during cold weather, proper hydration	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 frostbite.		Long-term: Low; Long-term health implications from cold injuries are rare but can occur, especially from more serious injuries such as frostbite.

Source of Identified Health Risk[3]	Unmitigated Health Risk Estimate[4]	Control Measures Implemented	Residual Health Risk Estimate[4]
		and nutrition, and proper wear of issued protective clothing.	
Unique Incidents/ Concerns			
Burn Pits	Short-term: No data were available to evaluate health risk; two RMW incinerators were in operation in the hazardous material disposal yard located on the north side of Camp Taji. No Burn pits were located at the camp—see section 10.7. Exposure to burn pit (or incinerator or burn barrel) smoke is variable. Exposure to high levels of PM_{10} and $PM_{2.5}$ from smoke may result in mild to more serious short-term health effects (e.g., eye, nose or throat and lung irritation) in some personnel and certain subgroups.	Control measures may have included locating burn pits downwind of prevailing winds, increased distance from living and working areas when possible, and improved waste segregation and management techniques	Short-term: No data were available to evaluate health risk; two RMW incinerators were in operation in the hazardous material disposal yard located on the north side of Camp Taji. No Burn pits were located at the camp—see section 10.7. Exposure to burn pit (or incinerator or burn barrel) smoke is variable. Exposure to high levels of PM_{10} and $PM_{2.5}$ from smoke may result in mild to more serious short-term health effects (e.g., eye, nose or throat and lung irritation) in some personnel and certain subgroups.
	Long-term: No data were available to evaluate health risk; two RMW incinerators were in operation in the hazardous material disposal yard located on the north side of Camp Taji. No Burn pits were located at the camp—see section 10.7. Exposure to burn pit (or incinerator or burn barrel) smoke is variable. Exposure to high levels of PM_{10} and $PM_{2.5}$ in the smoke may be associated with some otherwise healthy personnel, who were exposed for a long-term period, possibly developing certain health conditions (e.g., reduced lung function, cardiopulmonary disease). Personnel with a history of asthma or cardiopulmonary disease could potentially be more likely to develop such chronic health conditions.		Long-term: No data were available to evaluate health risk; however, there may have been burn pits—see section 10.7. Exposure to burn pit (or incinerator or burn barrel) smoke is variable. Exposure to high levels of PM_{10} and $PM_{2.5}$ in the smoke may be associated with some otherwise healthy personnel, who were exposed for a long-term period, possibly developing certain health conditions (e.g., reduced lung function, cardiopulmonary disease). Personnel with a history of asthma or cardiopulmonary disease could potentially be more likely to develop such chronic health conditions.

[1]This Summary Table provides a qualitative estimate of population-based short- and long-term health risks associated with the occupational environment conditions at Camp Taji. 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 SF 600.

[2] This assessment is based on specific environmental sampling data and reports obtained from 1 January 2014 through 31 December 2015. 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 Camp Taji. 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 U.S. Army Public Health Center (APHC). Where applicable, "None Identified" is used when though a potential exposure is identified, and no health risks of either a specific acute or chronic health effects are determined. More detailed descriptions of OEH exposures that are evaluated but determined to pose no health risk are discussed in the following sections of this report.

Source of Identified Health Risk[3]	Unmitigated Health Risk Estimate[4]	Control Measures Implemented	Residual Health Risk Estimate[4]
[4]Health risks in this Summary Table are based on quantitative surveillance thresholds (e.g., endemic disease rates; host/vector/pathogen surveillance) or screening levels, e.g., Military Exposure Guidelines (MEGs) for chemicals. Some previous assessment reports may provide slightly inconsistent health risk estimates because quantitative criteria such as MEGs may have changed since the samples were originally evaluated and/or because this assessment makes use of all historic site data while previous reports may have only been based on a select few samples.			

1 Discussion of Health Risks at Camp Taji, Iraq by Source

The following sections provide additional information about the OEH conditions summarized above. All risk assessments were performed using the methodology described in the U.S. Army Public Health Command Technical Guide 230 (*Environmental Health Risk Assessment and Chemical Exposure Guidelines for Deployed Military Personnel*) (Reference 4). All OEH risk estimates represent residual risk after accounting for preventive controls in place. Occupational exposures and exposures to endemic diseases are greatly reduced by preventive measures. For environmental exposures related to airborne dust, there are limited preventive measures available, and available measures have little efficacy in reducing exposure to ambient conditions.

2 Air

2.1 Site-Specific Sources Identified

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

2.2 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 (VOCs), allergens, and other compounds such as nitrates or sulfates that are formed by condensation or transformation of combustion exhaust. The PM composition and particle size vary considerably depending on the source. Generally, PM of health concern is divided into two fractions: PM_{10}, which includes coarse particles with a diameter of 10 micrometers or less, and fine particles less than 2.5 micrometers ($PM_{2.5}$), which can reach the deepest regions of the lungs when inhaled. Exposure to excessive PM is linked to a variety of potential health effects.

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

2.3.1 Exposure Guidelines:

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

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

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

- Not defined and not available.

2.3.2 Sample data/Notes:

No PM_{10} air samples were available for analysis during the time period of 1 January 2014 through 31 December 2015.

2.3.3 Short-term health risks:

Not Evaluated. Please see Camp Taji 2009 – 2011 POEMS for the most recent PM_{10} risk characterization.

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) for PM_{10} due to an inability to clearly link chronic health effects with chronic PM_{10} exposure levels.

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

2.4.1 Exposure Guidelines:

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

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

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

- Negligible MEG = 15
- Marginal MEG = 65.

2.4.2 Sample data/Notes:

A total of two valid $PM_{2.5}$ air samples were collected on 28 February 2015 and 2 March 2015. The range of 24-hour $PM_{2.5}$ concentrations was 44 $\mu g/m^3$ – 102 $\mu g/m^3$.

2.4.3 Short-term health risks:

Not Evaluated. There were insufficient data to characterize risk. Please see Camp Taji 2009 – 2011 POEMS for the most recent $PM_{2.5}$ risk characterization.

2.4.4 Long-term health risks:

There were insufficient data to characterize risk. Please see Camp Taji 2009 – 2011 POEMS for the most recent $PM_{2.5}$ risk characterization.

2.5 Airborne Metals

2.5.1 Exposure Guidelines:

No $PM_{2.5}$ airborne metal concentrations exceeded the short- or long-term MEGs.

2.5.2 Sample data/Notes:

A total of two valid $PM_{2.5}$ airborne metal samples were taken on 28 February 2015 and 2 March 2015. None of the analyzed metals in the samples were found at concentrations above the 1-year negligible MEGs.

2.5.3 Short-term and long-term health risk:

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

2.6 Volatile Organic Compounds (VOCs)

2.6.1 Exposure Guidelines:

Acrolien

Short-term (14 day) acrolein (µg/m^3):
- Negligible MEG = 45.9

Long-term (1 year) acrolein (µg/m^3):
- Negligible MEG = 0.137

Small amounts of acrolien can be formed through combustion such as the burning of fuels. Short-term health effects of acrolein exposure can result in decreased respiratory rate, and nose and throat irritation. However, no long-term human exposure data were found (ATSDR 2007).

2.6.2 Sample data/Notes:

Two valid airborne VOC samples were collected on 28 February 2015 and 2 March 2015. Acrolien was detected in only one sample, which was collected from the flightline on 2 February 2015. The sample concentration of acrolien (1.6 ug/m^3) was greater than the long-term MEG concentrations of 0.137 ug/m^3.

2.6.3 Short and long-term health risks:

Not Evaluated. There were insufficient data to characterize risk.

3 Soil

3.1 Site-Specific Sources Identified

3.2 Sample data/Notes

A total of three valid surface soil samples were collected on 28 February 2015 and 2 March 2015 to assess OEH health risk to deployed personnel. The primary soil contamination exposure pathways are dermal contact and dust inhalation. Typical parameters analyzed for included semi volatile organic compounds (SVOCs), heavy metals, polychlorinated biphenyls (PCBs), pesticides, and herbicides. If the contaminant was known or suspected, other parameters may have been analyzed for (i.e., Total petroleum hydrocarbons (TPH) and polycyclic aromatic hydrocarbons (PAH) near fuel spills). The percent of the population exposed to soil and associated dust in the sampled areas was > 75% for all samples. For the risk assessment, personnel are assumed to remain at this location for 6 months to 1 year. No detected chemicals exceeded the 1-year Negligible MEGs.

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 APHC 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 source water for treatment and no exposure pathways were associated with those samples. Therefore, untreated samples are not assessed as potential health hazards. It is assumed that 100% of all U.S. personnel at Camp Taji will be directly exposed to reverse osmosis water purification unit (ROWPU)-treated and disinfected fresh bulk water, since this classification of water is primarily used for personal hygiene, showering, cooking, and for use at vehicle wash racks.

4.1 Drinking Water: Bottled or Packaged Water

4.1.1 Site-Specific Sources Identified:

No bottled water samples were available for analysis. Pearl® was the designated approved bottled water for primary drinking (Reference 10).

4.1.2 Short-term and long-term health risk:

Not Evaluated.

4.2 Non-drinking Water: ROWPU

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. A total of three ROWPU-treated bulk water (Non-drinking) samples collected on 1 March 2015 and 13 December 2015 were evaluated for this health risk assessment. No chemicals were detected at levels above the short or long-term MEGs.

4.2.3 Short- and long-term health risks:

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

5 Military Unique

5.1 Chemical Biological, Radiological Nuclear Weapons

No specific hazard sources were documented in the Defense Occupational and Environmental Health Readiness System (DOEHRS), or the Military Exposure Surveillance Library (MESL) from 1 January 2014 through 31 December 2015 timeframe (References 1 and 5).

5.2 Depleted Uranium

No specific hazard sources were documented in the DOEHRS, or MESL 1 January 2014 through 31 December 2015 timeframe (References 1 and 5).

5.3 Ionizing Radiation

No specific hazard sources were documented in the DOEHRS, or MESL from 1 January 2014 through 31 December 2015 timeframe (References 1 and 5).

5.4 Non-Ionizing Radiation

No specific hazard sources were documented in 1 January 2014 through 31 December 2015 timeframe (References 1 and 5).

6 Endemic Diseases

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

6.1 Foodborne and Waterborne Diseases

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

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

6.1.1 Diarrheal diseases (bacteriological):

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

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

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

6.1.3 Short-term Health Risks:

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

None: Indigenous transmission of malaria in Iraq was eliminated as of 2008 reducing risk among personnel exposed to mosquito bites to None.

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 sandflies. A small number of cases (less than 1% per month attack rate) could occur among personnel exposed to sandfly bites in areas with infected people, rodents, dogs, or other reservoir animals. In groups of personnel exposed to heavily infected sandflies in focal areas, attack rates can be very high (over 50%). There are two forms of the disease; cutaneous (acute form) and visceral (a more latent form of the disease). The leishmaniasis parasites may survive for years in infected individuals and this infection may go unrecognized by physicians in the United States when infections become symptomatic years later. Cutaneous infection is unlikely to be debilitating, though lesions may be disfiguring. Visceral leishmaniasis disease can cause severe febrile illness, which typically requires hospitalization with convalescence over 7 days.

6.2.3 Crimean-Congo hemorrhagic fever:

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

6.2.4 Sandfly fever:

Moderate, mitigated to Low: Sandfly fever has a Moderate risk with potential disease rates from 1% to 10% per month; under worst case conditions disease rates can be as high as 50%. 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 Sindbis (and Sindbis-like viruses):

Low: Sindbis and sindbis-like viruses are maintained in a bird-mosquito cycle in rural areas and occasionally caused limited outbreaks among humans. The viruses are transmitted by a variety of *Culex* mosquito species found primarily in rural areas. A variety of bird species may serve as reservoir or amplifying hosts. Extremely rare cases (less than 0.01% per month attack rate) could have occurred seasonally (April - November). Debilitating febrile illness often accompanied by rash typically requires 1 to 7 days of supportive care; significant arthralgias may persist for several weeks or more in some cases. This disease is associated with a Low health risk estimate.

6.2.6 Rickettsioses, tickborne (spotted fever group):

Low: Rare cases (less than 0.1% per month) of rickettsioses disease are possible among personnel exposed to tick bites. Rickettsioses are transmitted by multiple species of hard ticks, including *Rhipicephalus* spp., which are associated with dogs. Other species of ticks, including *Ixodes* are also capable of transmitting rickettsial pathogens in this group. In addition to dogs, various rodents and other animals also may serve as reservoirs. Ticks are most prevalent from April through November. Incidents can result in debilitating febrile illness, which may require 1

to 7 days of supportive care followed by return to duty. The health risk of rickettsial disease is Low.

6.2.7 Typhus-murine (fleaborne):

Low: Typhus-murine has a Low risk estimate and is assessed as present but at unknown levels. Rare cases are possible among personnel exposed to rodents (particularly rats) and flea bites. Incidents may result in debilitating febrile illness typically requiring 1 to 7 days of supportive care followed by return to duty.

6.2.8 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 are 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 risk is Moderate for leishmaniasis - cutaneous (acute), Crimean-Congo hemorrhagic fever, and sandfly fever; Low for sindbis, rickettsioses-tickborne, typhus-fleaborne, and West Nile fever. 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.

6.2.10 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

Tactical operations or recreational activities that involve extensive contact with surface water such as lakes, streams, rivers, or flooded fields may result in significant exposure to leptospirosis and schistosomiasis. Arid portions of Iraq without permanent or persistent bodies of surface water do not support transmission of leptospirosis or schistosomiasis. Risk was restricted primarily to areas along rivers and lakes. These diseases can debilitate personnel for up to a week or more. Leptospirosis risk typically increases during flooding. In addition, although not specifically assessed in this document, bodies of surface water are likely to be contaminated with human and animal waste. Activities such as wading or swimming may result in exposure to enteric diseases including diarrhea and hepatitis via incidental ingestion of water. Prolonged water contact also may lead to the development of a variety of potentially debilitating skin conditions including bacterial or fungal dermatitis. 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. This disease is associated with a Moderate health risk estimate.

6.3.2 Schistosomiasis:

Moderate, mitigated to Low: Humans are the principal reservoir for schistosomes; humans shed schistosome eggs in urine or feces. Animals such as cattle and water buffalo may also be significant reservoirs. Rare cases (less than 0.1% per month attack rate) may occur seasonally (typically April through November) among personnel wading or swimming in lakes, streams, or irrigated fields which were frequently contaminated with human and animal waste containing schistosome eggs. In groups with prolonged exposure to heavily contaminated foci, attack rates may exceed 10%. Exceptionally heavy concentrations of schistosomes may occur in discrete foci, which were difficult to distinguish from less contaminated areas. In non-immune personnel exposed to such foci, rates of acute schistosomiasis may be over 50%. Mild infections are generally asymptomatic. In very heavy acute infections, a febrile illness (acute schistosomiasis) may occur, especially with *Schistosoma japonicum* and *S. mansoni*, requiring hospitalization and convalescence over 7 days. This disease is associated with a Moderate health risk estimate.

6.3.3 Short-term health risks:

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

6.3.4 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 PPE when necessary for healthcare providers and detention facility personnel.

6.4.1 Tuberculosis:

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. Tuberculin skin tests screening or blood test may be warranted in personnel with a history of prolonged close exposure to local populations.

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 Middle East respiratory syndrome coronavirus:

Low: Although no cases have been reported in Iraq, MERS-CoV is known to occur within the region. Most MERS patients developed severe acute respiratory illness with symptoms of fever, cough and shortness of breath. MERS-CoV has spread from ill people to others through close contact, such as caring for or living with an infected person. The incubation period for MERS-CoV is usually about 5 to 6 days, but can range from 2 to 14 days. Currently, there is no vaccine to prevent MERS-CoV infection.

6.4.4 Short-term health risks:

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

6.4.5 Long-term health risks:

None identified based on available data. Tuberculosis is evaluated as part of the post-deployment health assessment. 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 were the primary reservoir of rabies in Iraq, and a frequent source of human exposure. In June 2008, the New Jersey Health department in the United States reported a confirmed case of rabies in a mixed-breed dog recently imported from Iraq. 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. No cases of rabies acquired in Iraq have been identified in U.S.

Service members to date. 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 6 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, avoiding animals and farms, dust abatement when working in these areas, vaccinations, and wearing 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 Avian influenza:

Low: Potential health risk to U.S. personnel is Low. Although avian influenza 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% 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 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.

6.6 Soil-contact Diseases

6.6.1 Soil-transmitted helminthes (hookworm, strongyloidiasis, cutaneous larva migrans):

Low: Potential health risk to U.S. personnel is Low during warmer months (typically April through November) when vector activity is highest. Risk reduced with mitigation measures. A small number of cases (less than 0.1% per month attack rate) could occur among personnel with direct skin exposure to soil contaminated with human or animal feces (including sleeping on bare ground, walking barefoot). Initial skin symptoms typically are mild and are not debilitating. However, systemic symptoms of fever, cough, abdominal pain, nausea, and diarrhea may develop weeks to months after initial infection with hookworm or *Strongyloides*. More severe infections with high worm burden may be debilitating in some cases. Rates of infection in U.S. personnel will be highly variable, depending on specific local environmental conditions. Rates of infection in U.S. personnel are expected to be less than 1% per month in most locations. However, rates in some focal areas with heavily contaminated soil could exceed 1% per month.

6.6.2 Short-term health risks:

Low: Low for soil transmitted helminthes. Overall risk was further reduced with mitigation measures. Confidence in the health risk estimate is high.

6.6.3 Long-term health risks:

None identified based on available data.

7 Venomous Animal/Insect

All information was taken directly from the Armed Forces Pest Management Board (Reference 7) and the Clinical Toxinology Resources website from the University of Adelaide, Australia (Reference 8). The species listed below have home ranges that overlap the location of Camp Taji, and may present a health risk if personnel encounter them. See Section 10.4 for more information about pesticides and pest control measures.

7.1 Spiders

Latrodectus pallidus: Clinical effects uncertain, but related to medically important species; therefore, major envenoming cannot be excluded.

7.2 Scorpions

- *Androctonus crassicauda (black scorpion)*: Severe envenoming possible and potentially lethal, however most stings cause only severe local pain.
- *Buthacus leptochelys*, *Buthacus macrocentrus*, *Compsobuthus matthiesseni*, *Compsobuthus werneri, Mesobuthus caucasicus, Mesobuthus eupeus, Orthochirus iraqus*, and *Orthochirus scrobiculosus*: Clinical effects unknown; there are a number of dangerous Buthid scorpions, but there are also some known to cause minimal effects only. Without clinical data, it is unclear where this species fits within that spectrum.
- *Scorpio maurus, Scorpio maurus palmatus*: Mild envenoming only, not likely to prove lethal.

- *Hemiscorpius lepturus*: Severe envenoming possible, potentially lethal.
- *Hottentotta saulcyi*, *Hottentotta scaber*, and *Hottentotta schach*: Moderate envenoming possible but unlikely to prove lethal.

7.3 Snakes

- *Cerastes gasperettii*: Potentially lethal envenoming, though unlikely.
- *Malpolon moilensis*, M*alpolon monspessulanus*, *Pseudocyclophis persicus, and Pseudocyclophis persicus fieldi*: Clinical effects varies, but unlikely to cause significant envenoming.
- *Macrovipera lebetina* subspecies e*uphratica* and subspecies *obtusa, Vipera albicornuta,* and *Walterinnesia aegyptia*: Severe envenoming possible, potentially lethal.

7.4 Short-term health risk

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

7.5 Long-term health risk

None identified.

8 Heat/Cold Stress

8.1 Heat

Summer (June - September) monthly mean daily maximum temperatures range from 107 degrees Fahrenheit (°F) to 115 °F with an average temperature of 111 °F based on historical climatological data from the U.S. Air Force Combat Climatology Center, 14th Weather Squadron. The health risk of heat stress/injury based on temperatures alone is Low (< 78 °F) from December to February, Moderate (78-81.9°F) for November and March, and extremely High (≥ 88°F) from April to October. However, work intensity and clothing/equipment worn pose greater health risk of heat stress/injury than environmental factors alone (Reference 9). Managing risk of hot weather operations included monitoring work/rest periods, proper hydration, and taking individual risk factors (e.g., acclimation, weight, and physical conditioning) into consideration. Risk of heat stress/injury was reduced with preventive measures.

8.1.1 Short-term health risk:

Low to High, mitigated to Low: The risk of heat injury was reduced to Low through preventive measures such as work/rest cycles, proper hydration and nutrition, and monitoring wet bulb globe temperature. Risk of heat injury in unacclimatized or susceptible populations (older, previous history of heat injury, poor physical condition, underlying medical/health conditions), and those under operational constraints (equipment, PPE, vehicles) is High from April to October, Moderate for November and March, and Low from December to February. 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 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 health implications from heat injuries were rare but can occur, especially from more serious injuries such as heat stroke. It was possible that high heat in conjunction with various chemical exposures can increase long-term health risks, though specific scientific evidence was not conclusive. Confidence in these risk estimates was medium (Reference 4, Table 3-6).

8.2 Cold

8.2.1 Short-term health risks:

Winter (December - March) mean daily minimum temperatures range from 46 °F to 55 °F with an average temperature of 50 °F based on historical climatological data from the U.S. Air Force Combat Climatology Center, 14th Weather Squadron. Because even on warm days a significant drop in temperature after sunset by as much as 40 °F can occur, there is a risk of cold stress/injury from December to March. The risk assessment for Non-Freezing Cold Injuries, such as chilblain, trench foot, and hypothermia, is Low, based on historical temperature and precipitation data. Frostbite is unlikely to occur because temperatures rarely drop below freezing. However, personnel may encounter significantly lower temperatures during field operations at higher altitudes. As with heat stress/injuries, cold stress/injuries are largely dependent on operational and individual factors instead of environmental factors alone (Reference 9).

Low: The health risk of cold injury is Low. Confidence in the health risk estimate is medium (Reference 4, Table 3-6).

8.2.2 Long-term health risk:

Low: The health risk of cold injury is Low. Confidence in the health risk estimate is high (Reference 4, Table 3-6).

9 Noise

9.1 Continuous

No specific hazard sources were documented in the DOEHRS or MESL from 1 January 2014 through 31 December 2015.

9.1.1 Short- and long-term health risks:

Not evaluated.

9.2 Impulse

No specific hazard sources were documented in the DOEHRS or MESL from 1 January 2014 through 31 December 2015.

9.2.1 Short-term and Long-term health risks:

Not evaluated.

10 Unique Incidents/Concerns

10.1 Potential environmental contamination sources

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

10.2 Waste Sites/Waste Disposal

No specific hazard sources were documented in the DOEHRS or MESL from 1 January 2014 through 31 December 2015.

The previous POEMS, Camp Taji 2009 – 2011, indicates that burn pits were no longer in use after December 2010. The 2015 Occupational and Environmental Health Site Assessment (OEHSA) indicates that two regulated medical waste incinerators were in operation in the hazardous material disposal yard located on the north side of Camp Taji. No burn pits were located at the camp (Reference 10).

Grey and black water waste were trucked off site for disposal (Reference 10).

10.2.1 Short- and long-term health risks:

Not evaluated.

10.3 Fuel/petroleum products/industrial chemical spills

No specific hazard sources were documented in the DOEHRS or MESL from 1 January 2014 through 31 December 2015.

10.3.1 Short- and long-term health risks:

Not evaluated.

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 (e.g., enclosed bait stations for rodenticides, various handheld equipment for spot treatments of insecticides and herbicides, and a number of ready-to-use 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.

10.4.1 Short-term and Long-term health risks

Not evaluated.

10.5 Asbestos

No specific hazard sources were documented in the DOEHRS or MESL from 1 January 2014 through 31 December 2015.

10.5.1 Short- and long-term health risks:

Not evaluated.

10.6 Lead Based Paint

No specific hazard sources were documented in the DOEHRS or MESL from 1 January 2014 through 31 December 2015.

10.6.1 Short and long-term health risks:

Not evaluated.

10.7 Burn Pit

The previous POEMS, Camp Taji 2009 – 2011, indicates that burn pits were no longer in use after December 2010. The 2015 OEHSA indicates that two regulated medical waste incinerators were in operation in the hazardous material disposal yard located on the north side of Camp Taji. No nurn pits were located at the camp (Reference 10).

While not specific to Camp Taji, the consolidated epidemiological and environmental sampling and studies on burn pits that have been conducted as of the date of this publication have been unable to determine whether an association does or does not exist between exposures to emissions from the burn pits and long-term health effects (Reference 10). The Institute of Medicine committee's (Reference 10) review of the literature and the data suggests that service in Iraq or Afghanistan (i.e., a broader consideration of air pollution than exposure only to burn-pit emissions) may be associated with long-term health effects, particularly in susceptible (e.g.,

those who have asthma) or highly exposed subpopulations, such as those who worked at the burn pit. Such health effects would be due mainly to high ambient concentrations of PM from both natural and anthropogenic sources, including military sources. If that broader exposure to air pollution turns out to be relevant, potentially related health effects of concern are respiratory and cardiovascular effects and cancer. Susceptibility to the PM health effects could be exacerbated by other exposures, such as stress, smoking, local climatic conditions, and co-exposures to other chemicals that affect the same biologic or chemical processes. Individually, the chemicals measured at burn pit sites in the study were generally below concentrations of health concern for general populations in the United States. However, the possibility of exposure to mixtures of the chemicals raises the potential for health outcomes associated with cumulative exposure to combinations of the constituents of burn-pit emissions and emissions from other sources.

11 References[1]

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

2. Department of Defense. 2008. DoDI 6055.05, *Occupational and Environmental Health.*

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

4. U.S. Army Public Health Command. June 2013 Revision. Technical Guide 230, *Environmental Health Risk Assessment and Chemical Exposure Guidelines for Deployed Military Personnel*.

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

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

[1] NOTE. The data are currently assessed using the USAPHC 2013 TG 230. The general method involves an initial review of the data, which eliminates all chemical substances not detected above 1-year 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 and 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) that are compared to MEGs derived for similar exposure durations. If less than or equal to negligible MEG the risk is Low. If levels are higher than negligible then there is a chemical-specific toxicity and exposure evaluation by appropriate SMEs, which includes comparison to any available marginal, critical or catastrophic MEGs. For drinking water
15-L/day MEGs are used for the screening while site specific 5-15 L/day are used for more detailed assessment. For non-drinking water (such as that used for personal hygiene or cooking), the 'consumption rate' is limited to 2 L/day (similar to the EPA,) which is derived by multiplying the 5-L/day MEG by a factor of 2.5. This value is used to conservatively assess non-drinking uses of water.

7. Armed Forces Pest Management Board. https://www.acq.osd.mil/ele/afpmb/docs/lhd/venomous_animals_bycountry.pdf. U.S. Army Garrison – Forest Glen, Silver Spring, MD (Accessed August 2017).

8. University of Adelaide, Australia. Clinical Toxinology Resources. http://www.toxinology.com/ (Accessed August 2017).

9. Goldman RF. Ch1: Introduction to heat-related problems in military operations. *In*: Textbook of Military Medicine: Medical Aspects of Harsh Environments (Vol. 1) Bordon Institute, Office of the Surgeon General, Department of the Army, Washington, D.C. 2001. (Accessed August 2017).

10. Occupational and Environmental Health Site Assessment (OEHSA). 2015. Base Camp - Taji 223rd Medical Detachment. February 2015.

11. Institute of Medicine. 2011. Long-term health consequences of exposure to burn pits in Iraq and Afghanistan. Washington, D.C. *The National Academies Press*.

12 Where Do I Get More Information?

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