Military Deployment
Periodic Occupational and Environmental Monitoring Summary (POEMS):
Al Asad Air Base, Iraq: (2003 to 2011)

AUTHORITY: This Periodic Occupational and Environmental Monitoring Summary (POEMS) has been developed in accordance with Department of Defense (DoD) Instructions 6490.03, 6055.05, and JCSM (MCM) 0028-07, *See REFERENCES.*

PURPOSE: This POEMS documents the DoD assessment of Occupational and Environmental Health (OEH) risk for Al Asad Air Base, Iraq and other U.S. military camps in the immediate vicinity. 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 July 2003 through December 2011. This information includes OEH monitoring data.

This assessment assumes that environmental sampling at Al Asad Air Base and the other U.S. military sites in the immediate vicinity 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 from July 2003 through December 2011.

The POEMS can be useful to inform healthcare providers and others of environmental conditions experienced by individuals deployed to Al Asad Air Base 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).

Health protective exposure assumptions are used in the assessment of all health risks, i.e. individuals are assumed to be constantly exposed to environmental conditions. Small groups of personnel assigned to Al Asad Air Base or the other nearby sites addressed in this summary may be at greater risk than the general population due to operational requirements; these groups are identified when appropriate.

IRAQI OPERATION DESCRIPTION: US forces started military operations in Iraq on March 20, 2003 and ended on December 18, 2011. During this period, several hundred camps and forward operating bases (FOBs) were established by using existing facilities such as air bases and airports and/or former presidential palaces and associated grounds or building new facilities on unoccupied land. Al Asad Air Base and the two other locations listed below are included in this assessment.

1) Camp Mejid is located within the footprint of Al Asad Air Base, along the northwest perimeter.
2) Khan Al Baghdadi is located on the Euphrates River approximately 10 km northeast of Al Asad Air Base.

Based on available data, Al Asad Air Base was occupied by U.S. military forces from May 2003 through March 2010. The last civilian personnel were airlifted from the air base on December 16, 2011 and control of the airbase was returned to the Government of Iraq on December 31, 2011. The airbase now serves as the headquarters of the 7th Division of the Iraqi Army.

Al Asad Air Base:

Al Asad Air Base, previously known by the Iraqis as Qadisiyah Air Base, is located in the Al Anbar Province of Iraqi. The air base was originally built in 1985 to support the Iraqi Air Force and expanded in 1995 to a final footprint of approximately 42 km^2. It is located approximately 10 km southwest of the city of Khan al Baghdadi, 12 km from the Euphrates River and approximately 225 km northwest of Baghdad. It was the second largest air base used by US forces in Iraq. During the war in Iraq, Al Asad Air Base served as the home to the 2nd and 3rd Marine Air Wings. Other major tenants included: the 82nd Airborne Division, U.S. Army Advise and Assist Brigade, 507th Corps Support Group, 321st Sustainment Brigade, Electronic Attack Squadron 142, Navy Customs Battalion Juliet, 32nd Multifunctional Medical Battalion (MMB), Forward Distribution Team, Vertical onboard Delivery Detachment, 532nd Expeditionary Operations Support Squadron (EOSS), 557th Red Horse Support Squadron, various US Navy construction battalions and elements of the Iraqi Army's 7th Division.

During the Iraqi War, the air base was initially secured by the Australian Special Air Service Regiment and turned over to the 3rd Armored Cavalry Regiment (ACR) in May 2003. The 3rd ACR was relieved by the Marines of 1st Marine Expeditionary Force in March 2004. Al Asad Air Base became the largest coalition base in western Iraq hosting approximately 20,000 personnel at its peak. The vast majority of the air base was dedicated to airfield operations but it also served as a major convoy hub, hosting hundreds of fuel and supply trucks every day. The majority of the living quarters were situated in the southern half of the base. Additional living quarters, the motor pool and administrative areas were in the natural valley formed by the dry river bed to the north. Most of the housing on this base consisted of shipping containers manufactured as living quarters or Southwest Asia Huts (SWAhut). Some of the original barracks were used as living quarters as were overflow tents during periods of transition when the base population would nearly double.

Camp Mejid:

Camp Mejid is located within the footprint of Al Asad Air base along the northern perimeter. During U.S. occupation of the air base it served as a headquarters and training center for 7th Iraqi Army Division. Although there was no permanent U.S. military presence on the camp, Marines and U.S. Army personnel routinely provided combat skills and combat support training to members of the 7th Iraqi Infantry Division. They also participated in a variety of construction and renovation projects on the camp and the adjacent oasis.

Khan al Baghdadi

The town of Khan al Baghdadi is located approximately 10 Km from Al Asad Air Base. The town's water treatment plant provided the source water for the base's reverse osmosis water treatment plant as well as the plumbed water to the existing, permanent structures on base. Similar to Camp Mejid, the U.S. military maintained no permanent presence in the town but military personnel made frequent civil affairs visits for to both the town and water treatment plant.

Al Anbar Province Climate

Al Anbar province has a desert climate with low rainfall and a large variation in temperature between day and night. Summer temperatures during July and August can reach 118° Fahrenheit (F). Between September and May average high temperatures range from 60-104°F with lows from 28–68°F. During the winter months, it is not unusual to have temperature changes of 40°F between daytime highs to nighttime lows with nighttime temperatures dropping below freezing in January. Roughly 90% of the annual rainfall occurs between November and April. Rainfall during the remaining six months, particularly the hottest ones of June, July, and August, is rare. Rainfall ranges from about 10-18 centimeters (4-7 inches) annually with an annual average of approximately 11.5 centimeters (4.5

inches). The summer months are marked by two kinds of wind phenomena, Sharqi and Shamal winds. Sharqi are the southern and southeasterly dry and dusty winds that occur from April to early June and again from late September through November. Sharqi winds can gust up to 50 miles per hour (MPH) and are often accompanied by violent dust storms. The Shamal winds are steady winds, absent only occasionally during mid-June to mid-September. Shamal winds are primarily from the north and northwest. These dry winds contribute to the extremely dusty conditions that occur in the region year round.

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 Al Asad Air Base. As indicated in the detailed sections that follow Table 2, controls that have been established to reduce health risk have been factored into this assessment. In some cases, e.g. ambient air, specific controls are noted, but not routinely available/feasible.

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

Short-term health risks & medical implications:
The following may have caused acute health effects in some individuals ***during deployment*** at Al Asad Air base.

Inhalation of dust: Both coarse particulate matter less than 10 micrometers in diameter (PM_{10}) and fine particulate matter less than 2.5 micrometers in diameter ($PM_{2.5}$) are routinely present in the air in Iraq at higher concentrations than would typically be experienced in the United States. Air sampling data for PM_{10} during June 2008 and again during at least one brief period in February 2009 revealed a **High** short-term health risk. Inhalation of PM_{10} at these concentrations may have resulted in mild to more serious short-term health effects (e.g., eye, nose, throat and lung irritation, coughing, sneezing, runny nose and shortness of breath). It is likely that some individuals sought treatment for acute respiratory irritation during this period. Individuals who sought medical treatment for these symptoms while deployed should have exposure/treatment noted in their medical record.

Heat injury: The short-term health risk of heat injury for unacclimatized individuals (i.e. on site less than four weeks) and those with underlying health conditions is **moderate**. For all other individuals the risk is **low**.

Leishmaniasis: The short-term risk for cutaneous leishmaniasis was moderate, particularly during the period of 2003-2005. Individuals who deployed from Al Asad Air Base or the other locations in the immediate vicinity, to urban or rural outlying areas, may have experienced increased short-term risk. Cutaneous leishmaniasis typically presents as skin lesions, single or multiple, that start as a papule and enlarge into an ulcer. Few reports of vector-borne disease were received thru official DoD medical event reporting systems. More cases of cutaneous leishmaniasis in U.S. troops were reported in the scientific literature than were reported in service-mandated reporting systems.

Long-term health risks & medical implications: **No long-term health risks were identified.**

POEMS Table 2: Population-Based Health Risk Estimates – Al Asad Air Base, Iraq			
Source of Identified Health Risk[3]	**Unmitigated Health Risk Estimate[4]**	**Control Measures Implemented[5]**	**Residual Health Risk Estimate[4]**
Air			
Particulate matter less than 10 microns in diameter (PM_{10})	Short-term: **Low** risk for typical exposures. There were two occasions during which the acute risk was elevated to **High**. Based on the available data, this occurred regularly during June 2008 and at least one 24-hour period in February 2009. The majority of the time no acute health effects e.g., eye and/or upper respiratory tract irritation, from PM_{10} exposures are anticipated to have occurred. During peak exposure days, more serious effects were possible in susceptible persons (e.g., those with asthma/existing respiratory diseases).	Most personnel live and work in air conditioned buildings or tents. For those not working in air condition spaces, minimize time outdoors and keep doors or tent flaps closed. Use of water for dust control on unpaved roads and work areas.	Short-term: **Low.**
	Long-term: **Health guidelines not defined**		Long-term: **Health guidelines not defined.**
Particulate matter less than 2.5 microns in diameter ($PM_{2.5}$)	Short-term: **Low** risk for typical exposures. The majority of the time no acute health effects such as eye, nose, or throat irritation from $PM_{2.5}$ exposure are anticipated to have occurred. Mild acute (short-term) health effects were possible for those individuals who spent much of their time outdoors. Existing medical conditions (e.g., asthma or respiratory diseases) may be exacerbated.	Limit strenuous physical activities when air quality is poor, minimize time outdoors and keep doors, windows and tent flaps closed.	Short-term: **Low**
	Long-term: **Low**. The majority of time no anticipated chronic health effects from $PM_{2.5}$ are anticipated to have occurred. A small percentage of individuals may have been at increased risk of developing chronic health conditions. These conditions include reduced lung function, chronic bronchitis, chronic obstructive pulmonary disease (COPD), asthma, and other cardiopulmonary diseases. Those with a history of asthma or pre-existing cardiopulmonary disease have a higher risk for developing these chronic conditions.		Long-term: **Low**
Airborne Metals	Short-Term: **None identified** Long-term: **None identified**	Locate open pit burning downwind of occupied areas of the camp.	Short-Term: **None identified** Long-term: **None identified**

POEMS Table 2: Population-Based Health Risk Estimates – Al Asad Air Base, Iraq			
Source of Identified Health Risk[3]	**Unmitigated Health Risk Estimate[4]**	**Control Measures Implemented[5]**	**Residual Health Risk Estimate[4]**
Volatile Organic Compounds (VOC)	Short-Term: **Low.** All VOC concentrations were less than their respective military exposure guidelines.	Locate open pit burning downwind of occupied areas of the camp. Fuel spills cleaned up quickly if they occur.	Short-Term: **Low.**
	Long-term: **Low.** All VOC concentrations were less than their respective military exposure guidelines.		Long-term: **Low.**
Soil			
Soil	Short-Term: **None identified** Long-term: **None identified**	Locate open pit burning downwind of occupied areas of the camp. Fuel spills cleaned up quickly if they occur.	Short-Term: **None identified** Long-term: **None identified**
Water			
Consumed Water (Water Used for Drinking)	Short-term: **No short-term health risk identified.** US Army Veterinarian approved bottled water was provided for drinking. No analyte was detected above the 14 day 15L/day Negligible drinking water military exposure guidelines.	Use of U.S. Army Veterinary Command approved bottled water was consumed. Other than during a brief period during the onset of the war. Active and ongoing drinking water surveillance program.	Short-term: **None.**
	Long-term: **No long-term health risk identified.** US Army Veterinarian approved bottled water was provided for drinking. No analyte was detected at or above the 1year 15L/day Negligible drinking water military exposure guidelines.		Long-term: **None.**
Water used for other purposes (non-drinking)	Short-term health risk: **None identified**	Water surveillance programs which routinely monitor for disinfectant residual and bacteriological contamination	Short-term: **None.**
	Long-term health risk : **None identified**		Long-term: **None.**
Endemic Disease			
Gastrointestinal	Short-term: **Moderate.** If ingesting local food/water, the health effects can temporarily incapacitate personnel (diarrhea) or result in prolonged illness (hepatitis A, typhoid fever, brucellosis, hepatitis E). Viral gastroenteritis can present to a high rate of personnel turnover, shared dining, berthing, bathroom facilities, and working spaces.	Standard Preventive Medicine measures: immunizations (hepatitis A and typhoid fever), the consumption of food and water from approved sources, and habitability inspections to ensure cleanliness/sanitation.	Short-term: **Low.** Based on disease incident reporting from Iraq, bacterial and protozoal gastrointestinal diseases, cholera, brucellosis, and hepatitis E infections present a low risk.
	Long-term: **Low**. The majority of gastrointestinal diseases do not cause prolonged illness.		Long-term: **Low** based on disease incident reporting from Iraq.

POEMS Table 2: Population-Based Health Risk Estimates – Al Asad Air Base, Iraq			
Source of Identified Health Risk[3]	**Unmitigated Health Risk Estimate[4]**	**Control Measures Implemented[5]**	**Residual Health Risk Estimate[4]**
Arthropod Vector Borne	Short-term: Competent vectors and reservoirs for disease are present. Risk is **low** for malaria, West Nile Disease, rickettsioses and Sindbis, **moderate** for sandfly fever, Crimean-Congo hemorrhagic fever, and Leishmaniasis.	Standard Preventive Medicine measures: proper wearing of insecticide-treated uniforms and the application of insect repellent to the skin, removal of vector harborages within camps, and the application of pesticides.	Short-term: **Moderate** for cutaneous leishmaniasis. **Low** for all other vector-borne diseases based on disease incident reporting from Iraq.
	Long-term: **Moderate** for leishmaniasis, visceral.		Long-term: **Low** based on disease incident reporting from Iraq.
Water-Contact	Short-term: **Low**. The occurrence of flooding after heavy rainfall facilitates the spread of leptospirosis already present in the soil. Fresh water sources (standing, rivers, etc.) support the snail vector for schistosomiasis.	Avoidance of fresh water sources, such as rivers, puddles/standing water, drainage areas, etc. Treatment (primarily chlorination) process for non-drinking water (water used for bathing, cooking, etc.) kills schistosomiasis cercariae.	Short-term: **Low** based on disease incident reporting from Iraq.
	Long-term: **Low** based on disease incident reporting from Iraq.		Long-term: **Low** based on disease incident reporting from Iraq.
Respiratory	Short-term: **Moderate**. The high rate of personnel turnover, shared dining, berthing, recreational facilities, and working spaces allow for the easy transmission of upper respiratory infections, including influenza.	Influenza immunizations are given either before or during deployment. Local and third country national workers/contractors are required to complete health screening prior to employment.	Short-term: **Low** for upper respiratory infections.
	Long-term: **Low.** The majority of respiratory diseases do not cause prolonged illness.		Long-term: **Low** based on disease incident reporting from Iraq.
Animal Contact	Short-term: Exposures to animals and/or locations where animals are kept (barnyards, slaughterhouses) are the primary infection sources for: **Low**. Anthrax **Moderate**. Q-Fever and rabies.	Standard Preventive Medicine measures, as well as COCOM policy, generally prohibit contact with, adoption, or feeding of feral animals. Immunizations for anthrax and rabies (rabies vaccination and/or immune globulin given if clinically directed).	Short-term: **Low** based on disease incident reporting from Iraq.
	Long-term: **Low** based on disease incident reporting from Iraq.		Long-term: **Low** based on disease incident reporting from Iraq.

POEMS Table 2: Population-Based Health Risk Estimates – Al Asad Air Base, Iraq			
Source of Identified Health Risk[3]	**Unmitigated Health Risk Estimate[4]**	**Control Measures Implemented[5]**	**Residual Health Risk Estimate[4]**
Venomous Animal/ Insects			
Snakes, scorpions, and spiders	Short-term: **Low.** If encountered, effects of venom vary with species from mild localized swelling (e.g. scorpion species) to potentially lethal (e.g. saw-scaled viper).	Standard Preventive Medicine measures, such as the reduction of harborages for these animals, as well as education on how to avoid them (shake out boots before donning, etc.), reduce the risk of exposure.	Short-term: **Low.**
	Long-term: **No long-term health risk identified**.		Long-term: **No long-term health risk identified**.
Heat/Cold Stress			
Heat	Short-term: **Moderate** risk of heat injury in summer months for unacclimatized personnel.	Adequate periods of acclimatization for newly reporting or returning personnel. Adjustment of work-rest cycles based on monitoring of climatic conditions and proper hydration and nutrition.	Short-term: **Low.**
	Long-term: **Low.**		Long-term: **Low.**
Cold	Short-term: **Low**. The risk for cold stress/injuries is largely dependent on clothing/equipment worn, operational work intensity and individual factors rather than environmental factors alone.	Provision of adequate foul weather clothing Appropriate work/rest cycles during cold weather	Short-term: **Low.**
	Long-term: **Low**		Long-term: **Low**
Noise			
Noise (Continuous)	Short-term**: Low**.	Use of hearing protection. Labeling noise hazardous areas. Leadership enforcement of compliance with available PPE.	Short-Term: **Low**.
	Long-term: **Data not available**.		Long-Term: **Low**.
Unique Concerns			
None identified based on existing data.	Short and Long Term: **Data not available.**	**None**	Short and Long Term: **Data not available**.

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Table 2: Population-Based Health Risk Estimates – Al Asad Air Base, Iraq

Foot Notes:

[1] This Summary Table provides a qualitative estimate of population-based short-and long-term health risks associated with the occupational and environment conditions at Al Asad Air Base and other locations frequented by U.S. military personnel in the immediate vicinity of Al Asad Air Base. It does not represent an individual exposure profile. Actual individual exposures and health effects depend on many variables. For example, while a chemical may be present in the environment, if a person does not inhale, ingest, or contact a specific dose of the chemical for adequate duration and frequency, then there may be no health risk. Alternatively, a person at a specific location may experience a unique exposure, such as at the burn pit, which could result in a significant individual exposure. Any such person seeking medical care should have their specific conditions of exposure documented on Form SF600.

[2] This assessment is based on specific environmental sampling data and reports obtained from July 2003 through December 2011. 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 Al Asad Air Base. The health risks are presented as Low, Moderate, High or Extremely High for both acute and chronic health effects. The risk level is based on an assessment of both the potential severity of the health effects that could be caused and probability that exposure would occur at a level to produce such health effects. Details can be obtained from the Navy and Marine Corps Public Health Center. More detailed descriptions of OEH exposures that were evaluated are discussed in the following sections of this report.

[4] Risks in this Summary Table are based on quantitative surveillance thresholds (e.g. review of disease surveillance data) or screening levels (e.g. Military Exposure Guidelines (MEG) for chemicals). Some previous assessment reports may provide slightly inconsistent risk estimates because quantitative criteria such as MEG 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 few samples.

[5] All OEH risk estimates represent residual risk after accounting for preventive controls in place. Occupational exposures and exposures to endemic diseases are greatly reduced by preventive measures in place. 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.

1 Discussion of Health Risks at Al Asad, 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 US Army Public Health Command 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 in place. 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 Area-Specific Sources Identified

The combination of multiple on base air pollution sources, climatic conditions and topographic features contribute to air quality degradation in Al Anbar Province.

- The hot, dry climate of Al Anbar Province results in very dusty conditions in and around Al Asad Air Base throughout the year. Two kinds of wind phenomena, Sharqi and Shamal, are present. Both contribute significantly to the amount of airborne dust present. Sharqi are the south to southeasterly dry and gusty winds which occasionally gust to 50 miles per hour. The Sharqi occur from April to early June and again from late September through November. These winds are often accompanied by violent dust storms. The Shamal are a steadier north to northwesterly wind, present from mid-June to mid-September. The very dry air brought by the Shamal, accompanied by intensive sun heating, robs the soil of any remaining moisture.

- There were no off site industrial sources present in the immediate vicinity of Al Asad Air Base.

- Al Asad Air Base initially disposed of refuse via open burning. Open burning eventually transitioned to the use of incinerators. Smoke plumes from refuse burning periodically impacted sectors Al Asad Air base depending on the prevailing winds.

- Prior to 2007 electric power was provided by numerous tactical generators located throughout the air base. After 2007, power was supplied by a central 35MW Power Plant. Some tactical generators remained in use post 2007 but the number of operating generators was significantly reduced. Exhaust products associated with diesel/JP-8 fuel for electric power generation include particulate matter, hydrocarbons and other gaseous air emissions such as carbon monoxide and nitrogen oxides.

- Emissions from different types of small and large military vehicles, and combustion by-products associated with jet fuel were also probable contributors to the air pollution in the vicinity. Emissions from these sources are similar to those produced in electric power generation.

2.2 Particulate Matter

Particulate matter (PM) is a complex mixture of extremely small particles suspended in the air. 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. PM can include sand, soil, metals, volatile organic compounds, allergens, and other compounds such as nitrates or sulfates that are formed by condensation or transformation of combustion exhaust. PM composition and particle size vary considerably depending on the source. Generally particulate matter of health concern is divided into two fractions: PM_{10}, which includes coarse particles with a diameter of

10 micrometers or less (0.0004 inches or one-seventh the width of a human hair), and fine particles less than 2.5 micron ($PM_{2.5}$), 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 than 10 microns (PM_{10})

2.3.1 Exposure Guidelines:

Short-term (24-hour) PM_{10} (mg/m^3):

- Negligible MEG=0.250
- Marginal MEG=0.420
- Critical MEG=0.600

Long-term PM_{10} MEG (mg/m^3):

- Not defined.

2.3.2 Sample data/notes:

A total of Sixty-three, 24-hour PM_{10} samples were collected from the July 2003 to December 2011 at Al Asad Air Base. No air sampling information was available from Camp Mejid and Khan al Baghdadi sites.

Air sampling was done sporadically at Al Asad Air Base from 2003 to 2011. For example, samples were collected only during one quarter of 2003 (3rd quarter, 8 air samples), 2005 (4th quarter, 6 air samples), 2006 (3rd quarter, 1 air sample), 2007 (3rd quarter, 2 air samples), 2010 (2nd quarter, 1 air sample), and 2011 (3rd quarter, 2 air samples) but no data are available for the remainder of those years. Two air samples were collected in 2009 (one each during the 1st and 3rd calendar quarter) but no samples were collected the remainder of the year. Finally, air sampling was performed only during three calendar quarters of 2004 (1st, 2nd, and 4th quarter, total of 18 air samples) and 2008 (1st, 2nd, and 3rd quarter, total of 22 air samples).

2.3.3 Short-term (acute) health risk for PM_{10}:

Approach:

Camp Mejid is located within the footprint of Al Asad Air base along the northern perimeter. For purposes of this assessment, air sampling data from Al Asad Air Base were considered representative of both locations. To assess acute risk associated with PM_{10}, the peak concentrations of PM_{10} were used to arrive at the acute risk for the period from July 2003 to December 2011. The peak concentrations ranged 0.076 mg/m^3 to 1.917 mg/m^3. The average of these quarterly peak concentrations, 0.413 mg/m^3, was used as the starting point for assessment of acute risk. A single sample, collected on June 30, 2008, was excluded from this range and the calculation of the peak average concentration because it was more than 14 times the next highest peak detected in any other sample. However, the acute risk assessment does incorporate the June 30, 2008 sample as well as two other samples collected in June 2008 which represented the third and fourth highest peak concentrations detected at Al Asad Air Base during the eight years included in this POEMS.

Khan al Baghdadi is approximately 10 km from Al Asad Air base. This distance precludes using particulate data generated at Al Asad to assess health risk at Khan Al Baghdadi. No sampling data exist for this location.

Risk Summary:

Al Asad Air Base and Camp Mejid.

Overall, the acute health risk associated with PM_{10} exposure at the concentrations found at Al Asad Air Base and Camp Mejid was **low**. There were, however, at least two periods during which sampling data indicated that acute health risk was elevated to **high**. This occurred regularly during June 2008 and again during a brief period in February 2009.

Medical implications: At the low risk level, a small number of individuals may have experienced eye, nose, and throat irritation and sought medical attention. In most of these individuals the symptoms would have been mild and temporary requiring no medical treatment. During periods of high risk, more individuals may have been affected and the severity of symptoms increased. It is likely that more individuals sought medical attention during the periods of elevated risk. Symptoms associated with exposure to PM_{10} would be expected to resolve after exposure ceases. The health status of persons with pre-existing conditions (e.g., asthma, or cardiopulmonary diseases) may have worsened, especially during peak exposure periods.

Confidence in the risk assessment: Confidence in the risk assessment is **low** based on the limited PM_{10} air sampling data available and inconsistency of sampling.

2.3.4 Long-term (chronic) health risk for PM_{10}:

Health guidelines not defined for PM_{10}. The EPA has retracted its long-term standard (NAAQS) for PM_{10} due to an inability to clearly link chronic health effects with PM_{10} exposures, therefore, there is no chronic health hazard defined for PM_{10}

Khan Al Baghdadi. Indeterminate, no data exist.
Return to Table 2

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

2.4.1 Exposure Guidelines:

Short-term (24-hour) $PM_{2.5}$ MEGs (mg/m3):
- Negligible MEG=0.065
- Marginal MEG=0.250
- Critical MEG=0.500

Long-term (1year) $PM_{2.5}$ MEGs (mg/m3):
- Negligible MEG=0.015
- Marginal MEG=0.065.

2.4.2 Sample data/notes:

From 1st quarter 2004 through the 4th quarter 2011, 47 ambient, 24-hour air samples were collected at Al Asad Air base for $PM_{2.5.}$ $PM_{2.5}$ sampling was sporadic during this period with no sampling data available for 2003 and 2006 through 2008. No $PM_{2.5}$ data exist from Camp Mejid and Khan al Baghdadi.

2.4.3 Short-term (acute) health risk for $PM_{2.5}$:

Approach: To assess acute risk associated with $PM_{2.5}$, quarterly peak concentrations of $PM_{2.5}$ were used to estimate acute risk for the 1st quarter 2004 through the 4th quarter 2011. Quarterly peak concentrations ranged from 0.024 mg/m^3 to 0.223 mg/m^3. The average of these quarterly peak concentrations of 0.089 mg/m^3 was used as the starting point for assessment of acute risk. The risk

assessment was then repeated on each of the 5 highest quarterly peak concentrations to determine if there were periods of elevated risk.

Risk Summary:

Al Asad Air Base and Camp Mejid.

From 1st quarter 2004 through the 4th quarter 2011, the acute risk associated with $PM_{2.5}$ exposure at the concentrations found at Camps and vicinity camp areas was **low**.

Medical implications: At the **low** risk level, a small percentage of individuals may experience short-term health effects such as eye, nose, throat and lung irritation, coughing, sneezing, runny nose and shortness of breath. Some individuals might seek outpatient medical care although most individuals would have experienced only mild effects which would have typically resolve when exposure ceased. A small number of individuals may experience more pronounced effects such as decreased lung function and worsening of pre-existing medical conditions such as asthma.

Confidence in the risk assessment: Confidence in the risk assessment is **low** based on the limited $PM_{2.5}$ air sampling data available and inconsistency of sampling.

2.4.4 Long-term (chronic) health risk for $PM_{2.5}$:

Approach: For chronic health risk, it was assumed that the longest deployment lasted twelve to fifteen months. To assess chronic risk associated with $PM_{2.5}$, the overall yearly average concentration of $PM_{2.5}$ was used to arrive at a long term health risk for 1st quarter 2004 through the 4th quarter 2011. The average concentration during the period was 0.097 mg/m^3, with a range from 0.024 mg/m^3 to 0.223 mg/m^3. If sufficient data were available, the risk assessment was then repeated using the annual average concentrations for each year $PM_{2.5}$ data exist.

Risk Summary:

From 1st quarter 2004 through the 4th quarter 2011, the long term (chronic) risk associated with $PM_{2.5}$ exposure at the concentrations found at these locations was **low**. There was insufficient data to determine if periods of elevated long-term health risk existed.

Medical implications: A small percentage of individuals may have been at increased risk of developing chronic health conditions. These conditions include reduced lung function, chronic bronchitis, chronic obstructive pulmonary disease, asthma and certain cardiopulmonary diseases. Those with a history of asthma or pre-existing cardiopulmonary disease have a higher risk for exacerbating these chronic conditions. However, as the majority of the population at Al Asad Air Base did not work outdoors for more than eight to twelve hours/day the risk for these chronic conditions is likely overstated.

Confidence in the risk assessment: Confidence in the risk assessment is **low** based on the limited $PM_{2.5}$ air sampling data available and inconsistency of sampling.

Khan Al Baghdadi. Indeterminate, no data exist.
Return to Table 2

2.5 Airborne Metals

2.5.1 Sample data/Notes:

From July 2003 through December 2011, metals analysis was performed on 110 (PM_{10} and $PM_{2.5}$) ambient air samples collected at Al Asad Air Base. No metals were detected above their corresponding military exposure guidelines published in the USAPHC TG 230. No sampling data exist for the Khan al Baghdadi.

Risk Summary:
Al Asad Air base and Camp Mejid.

2.5.2 Short-term (acute) health risk:

No short-term health risk was identified based on available sampling data.

2.5.3 Long-term (chronic) Health risk:

No long-term health risk was identified based on available sampling data.

Confidence in the risk assessment: Confidence in this risk assessment is medium based on available sampling data within this region and similar sampling results from throughout western Iraq.

Khan al Baghdadi. Indeterminate, no data exist.
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2.6 Volatile Organic Compounds (VOC)

2.6.1 Sample data/Notes:

From 3rd quarter 2003 through 4th quarter 2011, 20 air samples were collected at Al Asad Air Base for VOC analysis. For screening purposes, sample results were compared with each of the corresponding short/long-term MEG published in the USAPHC TG 230. None of the detected VOCs were present at concentrations above their corresponding MEG values.

Risk Summary:

Al Asad Air base.

2.6.3 Short-term (acute) health risk of VOCs*:*

No short-term health risk was identified based on available sampling data.

Confidence in the risk assessment: Confidence in this risk assessment is low based the relatively few samples taken and the laboratory's limited capability to quantify some VOC compounds.

2.6.4 Long-term (chronic) health risk of VOCs*:*

No long-term health risk was identified based on available sampling data.

Confidence in the risk assessment: Confidence in this risk assessment is medium based the relatively few samples taken and the laboratory's limited capability to quantify some VOC compounds.

Camp Mejid. Indeterminate, no sampling data exist.

Khan al Baghdadi. Indeterminate, no sampling data exist.
Return to Table 2

3 Soil

3.1 Site-Specific Sources Identified

3.1.2 Sample data/Notes*:*

From July 2003 through December 2011, 47 surface soil samples were collected at Al Asad Air Base. According to field data sheets, all samples were collected from areas and/or activities where there was high potential for soil exposure such as in maintenance areas, physical training (PT) areas, during excavation, while filling sand bags and/or during construction activities. Laboratory analysis of soil samples included volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), polycyclic aromatic hydrocarbons (PAHs), heavy metals, polychlorinated biphenyls (PCB), pesticides, fungicides, herbicides, insecticides, and radionuclides. No soil sampling data are available for Camp Mejid or the Khan Al Baghdadi.

3.1.3 Short-term (acute) health risk for soil:

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

3.1.4 Long-term (chronic) health risk for soil:

Approach: For screening purposes, sample results were compared with each of the corresponding long-term MEG published in the USAPHC TG 230. None of the VOCs, SVOCs, PAHs, heavy metals, PCBs, fungicides, herbicides, insecticides, or radionuclides detected were at concentrations above their corresponding MEG values.

Risk Summary:

No long-term health risk was identified based on available sampling data.

Confidence in risk estimate: Confidence in the risk assessment is medium based on 47 samples collected across regional soils.

Camp Mejid. Indeterminate, no sampling data exist.

Khan al Baghdadi Water. Indeterminate, no sampling data exist.
Return to Table 2

4 Water

4.1 Site-Specific Sources Identified

Historically, bottled water was provided at all U.S. military sites in Al Anbar Province of Iraq for drinking. At least six vendors were identified as having provided bottled water in Al Anbar Province at some point during military operations in Iraq including, Nestle, Aquafina, Disi, Monz, Safa and Hayat. All these suppliers, except Hayat, were US Army Veterinary Command (now a part of U.S. Army Public Health Command) approved sources. According to U.S. Army veterinary personnel, bottled water from the Hayat Bottled Water Company was supplied only for a short period of time in 2005. In addition, local water sources such as wells,

lakes, ponds and host nation municipal supplies served as source waters for U.S. military or U.S. contractor operated reverse osmosis (RO) treated systems.

Disinfected fresh water and RO treated water were also supplied for non-drinking purposes at Al Asad Air base. The disinfected fresh water from the Khan Al Baghdadi Water Treatment Plant was used only for personal hygiene such as, hand washing and showering, laundry and cleaning. RO treated water was supplied to the dining facilities for cooking, used for personal hygiene and also used in water tanks/truck/buffalos during convoys. RO treated water also served as the emergency drinking water supply for the air base. Source water for the RO treatment units was supplied from the Khan Al Baghdadi Water treatment plant and onsite wells.

4.2 Consumed Water (bottled water)

4.2.1 Sample date/notes:

Eight bottled water samples were collected at Al Asad Air base from April 2004–March 2005.

4.2.2 Short-term (acute) health risk for drinking bottled water:

Approach: In order to determine acute health risk associated with consumption of bottled water the following assumptions were made.

- Camp residents ingest 15 liters of bottled water per day or less.
- Deployments last a maximum of 12 -15 months.

Based on these assumptions, the maximum detected concentration for each analyte was compared to its respective 14-day, Negligible MEG for consumption of up to 15 liters of water per day (15L/day) and/or the short-term Field water standards published in TB MED 577, Sanitary Control and Surveillance of Field Water Supplies.

Risk Summary:

No health risk identified based on available sampling data. Analytical results of the eight bottled water samples collected revealed that no analytes were detected above their respective 14-day, 15 L/day drinking water MEG or the respective short-term potability standard published in TB MED 577.

Medical implications: None. There are no identified or expected adverse health outcomes associated with consumption of bottled water at Al Asad Air Base.

Confidence in the risk assessment: Despite the relatively limited number of bottled water samples, confidence in the risk assessment is medium because US Army veterinary personnel performed quarterly audits of all bottled water suppliers to ensure consistency of quality throughout Operation Iraqi Freedom.

4.2.3 Long-term (chronic) health risk:

Approach: Bottled water was supplied to the camps in Al Anbar Province in distinct lots and from multiple vendors. Thus it is inappropriate to average analytical results across the spectrum of water samples/suppliers. As a result, the maximum detected concentration for each analyte was used to perform the long-term health risk screening. This process could result in overestimation of the long-term health risk as it assumes that camp residents consume water at the maximum detected concentration consistently during their deployment.

Risk Summary:

No health risk identified based on available sampling data. Analytical results of the eight bottled water samples collected at revealed that no analytes were detected above their respective 1-year, 15 L/day drinking water MEG or the respective long-term potability standard published in TB MED 577.

Medical implications: None. There are no identified or any expected adverse health outcomes from approved bottled water for drinking purpose.

Confidence in the risk assessment: Despite the relatively limited number of bottled water samples, confidence in the risk assessment is medium because US Army veterinary personnel performed quarterly audits of all bottled water suppliers to ensure consistency of quality throughout operation Iraqi Freedom.
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4.3 Water for Non-Drinking/Other purposes (RO and other sources of treated water)

4.3.1 Sample data/notes:

From July 2003 to December 2011, forty-two treated water samples (including ROWPU, disinfected fresh and municipal water types) were collected at Al Asad Air Base (40), Camp Mejid (1) and the Khan Al Baghdadi Water Treatment Plan (1). Water samples were analyzed for inorganic compounds, volatile organic compounds (VOCs), semi-volatile organic chemicals and various physical characteristics. Preventive medicine surveillance for microbiological contaminants (coliforms/*E.coli*) is standard surveillance procedure but data associated with bacteriological analyses were not evaluated.

4.3.1.1 Al Asad Air Base: Of the forty samples collected at the air base, thirty-nine were RO treated water samples. The remaining sample, collected in 2006, was collected from the previously existing, on-base water distribution system.

4.3.1.2 Camp Mejid: A single disinfected fresh water sample was collected in 2010 from the existing, on-base water distribution system.

4.3.1.3 Khan Ali Baghdadi Water Treatment Plant: Water from the Khan al Baghdadi Water Treatment Plant was supplied to all permanent buildings at Al Asad Air Base via fixed plumbing. It was also supplied to fire hydrants and the outdoor swimming pools. In April 2006, one water sample was collected at the Khan Ali Baghdadi Water Treatment Plant. This water sample was collected as part of military civil affairs program. Results of analysis indicated none of the detected analytes were present at concentrations above their corresponding MEG values.

4.3.2 Short-term (acute) and long-term (chronic) health risks associated with water uses other than drinking:

Approach

In order to assess the health risk associated with water uses other than drinking, the following assumptions were made:

- RO treated water was used for cooking and other personal hygiene purposes.
- Deployments last a maximum of 12 months.
- The primary routes of exposure associated with RO treated water were incidental ingestion through cooking and personal hygiene (i.e., brushing teeth/oral hygiene) and dermal contact when showering.

- Camp residents ingest far less than 5 liters (food preparation) of RO treated water per day.
- Disinfected municipal water was used only for showering and hand washing.

Based on guidance provided in USAPHC Technical Guide 230, *Environmental Health Risk Assessment and Chemical Exposure Guidelines for Deployed Military Personnel* (USAPHC TG 230), any compound with a peak concentration less than or equal to 2.5 times the 14-day Negligible MEG for consuming 5 liters of water per day/ (5-L/day) may be eliminated from further consideration. If a 14 day, 5-L/day Negligible MEG was not available, the more conservative 1-year, 5-L/day Negligible was used for screening purposes.

4.3.2.1 RO Treated Water (used for cooking and personal hygiene).

Al Asad Air Base: From April 2004 to December 2011, thirty-nine samples of water treated by reverse osmosis were collected. Analytical results revealed than all analytes were below the USAPHC TG 230 health risk screening guidelines described above.

Risk Summary: **No acute or chronic health risk was identified based on available data**.

Health Implications: None identified.

Confidence in the Risk Assessment: Confidence in the risk assessment is high. Complete chemical analysis of thirty-nine reverse osmosis water samples taken in eight years is far more sampling data than one would expect to see from drinking water sources in the United States. There was also an active and ongoing drinking water surveillance program at Al Asad Air Base which further increases confidence in this assessment.

4.3.2.2 Treated Water from the host nation (used for showering, hand washing, cleaning, etc.).

Disinfected fresh water from the Khan Al Baghdadi Water Treatment Plant was supplied to all permanent buildings constructed by the host nation at Al Asad Air Base. Three samples of disinfected fresh water were taken during the period April 2006 to April 2010, one sample each at Al Asad Air Base, Camp Mejid and the third taken directly at the Khan Al Baghdadi Water Treatment Plant. Analytical results revealed than all analytes were below the USAPHC TG 230 health risk screening values.

Risk Summary: No acute or chronic health risk was identified based on available data.

Health Implications: None identified.

Confidence in the Assessment: Even though there are relatively few samples in the data set, confidence in this risk assessment is medium based on the limited potential for ingestion of host nation treated water.
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5 Military Unique

5.1 Chemical Biological, Radiological Nuclear (CBRN) Weapons

There were no specific hazard sources or exposure incidents documented in the Defense Occupational and Environmental Health Readiness System (DOEHRS) or the Military Exposure Surveillance Library (MESL) during the period July 2003 to December 2011.

5.1.1 Short and long-term health risks:

Not Evaluated - No data was available specific to Al Asad Air Base.

5.2 Depleted Uranium (DU)

There were no specific hazard sources or exposure incidents documented in DOEHRS or the MESL during the period from 3rd quarter 2003 through 4th quarter 2011.

5.2.1 Short and long-term health risks:

Not Evaluated - No data was available specific to Al Asad Air Base.

5.3 Ionizing Radiation

No specific hazard sources were documented in DOEHRS or the MESL from the 3rd quarter 2003 through 4th quarter 2011 timeframe.

5.3.1 Short and long-term health risks:

Not Evaluated. - No data was available specific to Al Asad Air Base.

5.4 Non-Ionizing Radiation

No specific hazard sources were documented in DOEHRS or the MESL from 3rd quarter 2003 through 4th quarter 2011 timeframe.

5.4.1 Short and long-term health risks:

Not Evaluated. - No data was available specific to Al Asad Air Base.
Return to Table 2

6 Endemic Diseases

6.1 Sample data/notes:

Assessed risk is the residual risk that exists in the presence of preventive measures.

- Department of Defense Directive 6490.02 series, Comprehensive Health Surveillance, establishes policy for routine health surveillance of all DoD personnel throughout their military service.
- The Armed Forces Health Surveillance Center (AFHSC) maintains archives of medical event reports for all Services.

- Medical event reports identified related to deployment in Iraq did not identify specific locations within the country, nor did they describe the probable site of the exposure; therefore, epidemiological analysis of medical event data was limited to the country level.
- Endemic diseases present in Iraq were identified using the "Destinations" section of the Centers for Disease Control and Prevention (CDC) Travelers' Health website, **http://wwwnc.cdc.gov/travel/destinations/iraq.htm**.
- Where effective vaccines, such as those for Hepatitis A and B, are in place, risk to individuals is effectively reduced to none and these endemic diseases were excluded from further assessment.
- Reporting of medical events from deployed environments is inconsistent. Identified reports of endemic disease associated with deployment to Iraq are assumed not to represent all cases of reportable endemic disease events among service personnel deployed to Iraq. Where available, additional relevant reports were used to supplement reportable medical event data for this assessment.

6.2 Gastrointestinal Diseases

U.S. Service members have little or no immunity to the food and waterborne diseases present in Iraq. To prevent food and waterborne diseases among individuals deployed to Iraq, food and water is purchased from approved sources. Food is prepared in facilities where there is public health oversight (certificate of sanitation, health screening of food service workers, periodic inspections, etc.). Due to the potential presence of disease causing organisms, as well as the high prevalence of improper food handling and preparation, local food and water were not approved for consumption. Viral gastroenteritis that is spread through contact or fomites (any inanimate object or substance capable of carrying infectious organisms) presents a recurrent risk due to a high rate of personnel turnover, shared dining, berthing, bathroom facilities, and working spaces.

Approach: The health risk for fomite-borne gastrointestinal infections and endemic food and waterborne diseases to individuals deployed to Iraq during the period of this assessment was epidemiologically assessed based on the combination of identified endemic diseases, knowledge of preventive measures in place, review of medical event reports associated with deployment to Iraq, and review of military public health reports from Al Asad.

6.2.1 Short -term health risks*:*

Risk assessment:

- The short-term risk for viral gastroenteritis was **low.** Risk due to a high rate of personnel turnover, shared dining, berthing, bathroom facilities, and working spaces is not substantially different than that expected in similar settings within the United States.
- The short-term risk associated with food borne and waterborne diseases in Iraq was **low** (bacterial or viral gastroenteritis, protozoal diarrhea, cholera, brucellosis, hepatitis E).

Medical implications: Gastroenteritis, particularly from viral agents, can cause periodic outbreaks in spite of preventive measures. A small number of infections may require greater than 72 hours convalescence and/or hospitalization.

Confidence in the risk assessment: Confidence in the risk assessment is medium. Food and water borne diseases, especially those with short convalescence and lack of long-term health effects are often underreported for deployed military populations.

6.2.2 Long-term (chronic) health risks:

Risk assessment: The long-term risk associated with food and waterborne diseases was **low** for protozoal diarrhea and brucellosis.

Medical implications: Long-term health effects resulting from infection with food and waterborne diseases are rare.

Confidence in the risk assessment: Confidence in the risk assessment was high. Incidence of protozoal diarrhea and brucellosis in the post deployment military population is known to be extremely low.
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6.3 Arthropod Vector-Borne Diseases

The climate and ecological habitat found in Iraq support populations of arthropod vectors, including mosquitoes, ticks, and sand flies. Risk for arthropod-borne disease is higher during warmer months (typically from April through November); with variable rates of disease transmission (vector-borne diseases occur at low or unknown levels). Personnel may have been exposed to mosquitoes, ticks, sandflies, or other biting vectors both during the day or night. Risk is higher in urban and other densely populated areas, or near where animals were kept. Removing vector harborages, spraying for vectors within base camps, avoiding animals or areas where they were kept, proper wearing of insecticide-treated (permethrin) uniforms, use of bednets in field conditions, and the application of insect repellent to the skin (DEET) were the main protective measures against vector-borne diseases. Of the endemic vector-borne diseases present in Iraq, malaria is the only disease for which chemoprophylaxis is available. The overall risk for malaria in Iraq decreased between 2003 and 2008. No endogenous cases were reported for Iraqi nationals for 2008, 2009, and 2010.

Approach: The health risk for endemic vector-borne diseases to individuals deployed to Iraq during the period of this assessment was epidemiologically assessed based on the combination of identified endemic diseases, knowledge of preventive measures in place, review of medical event reports associated with deployment to Iraq, and review of military public health reports from Al Asad.

6.3.1 Short-term (acute) health risks:

Risk assessment:

- The short-term risk for the vector-borne diseases malaria, sandfly fever, West Nile Fever, Crimean-Congo hemorrhagic fever, rickettsioses (tick-borne, spotted fever group), typhus, and Sinbis was **low**. Individuals who deploy from Al Asad, and/or supported base camps, to urban or rural outlying areas may experience increased short-term risk.

- The short-term risk for cutaneous leishmaniasis was **moderate**, particularly during the period of 2003-2005. Individuals who deployed from Al Asad or the other camps in the immediate vicinity, to urban or rural outlying areas, may have experienced increased short-term risk.

Medical implications:

- Malaria, sandfly fever, West Nile Fever, Crimean-Congo hemorrhagic fever, typhus, and rickettsioses present in Iraq have fairly short incubation periods ranging from days to weeks. Any of these diseases would initially present as acute fever and malaise, some accompanied by rash, and would lead to acute, sometimes severe illness.

- Cutaneous leishmaniasis typically presents as skin lesions, single or multiple, that start as a papule and enlarge into an ulcer.

Confidence in the risk assessment: Confidence in the risk assessment is moderate. Few reports of vector borne disease were received thru official DoD medical event reporting systems. More cases of cutaneous leishmaniasis in U.S. troops were reported in the scientific literature than were reported in service-mandated reporting systems.

6.3.2 Long-term (chronic) health risks:

Risk assessment:

- The long-term risk for leishmaniasis, cutaneous and visceral, was **low**.

Medical implications:

- Both visceral and cutaneous leishmaniasis may have extended incubation periods, ranging from a week to years. Although rare, it is possible to be infected during deployment, but not to have clinically evident disease until redeployed. Leishmaniasis should be considered in the differential diagnosis for any unusual skin lesions, or chronic, systemic disease.
  Vivax malaria was the predominate species of malaria found in Iraq. Relapses following blood stage treatment are possible due to hypnozoites that remain dormant in the liver.

Confidence in the risk assessment: Confidence in risk assessment is moderate. Incidence of visceral leishmaniasis in the post deployment military population is known to be low. Cases of cutaneous leishmaniasis were detected and treated post deployment. The military medical community was/is aware of the presence of leishmaniasis in Iraq, and skin lesions in individuals with a history of time spent in Iraq were/are evaluated with that in mind. No cases of relapsing malaria have been reported in the service-mandated reporting systems.
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6.4 Water Contact Diseases

Operations or activities that involve extensive fresh water contact may result in individuals being exposed to leptospirosis or schistosomiasis. The occurrence of flooding after heavy rainfall facilitates the spread of leptospirosis because, as water saturates the environment, leptospirosis present in the soil pass directly into surface waters. Bodies of fresh water that contain snails (an intermediate host for schistosomes) should be considered an exposure source for schistosomiasis. Activities such as wading or swimming in fresh water sources 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 skin conditions, such as bacterial or fungal dermatitis. Elimination of standing, and/or open, bodies of fresh water protects against the spread of water contact diseases.

Approach: The health risk for endemic water contact diseases to individuals deployed to Iraq during the period of this assessment was epidemiologically assessed based on the combination of identified endemic diseases, knowledge of preventive measures in place (such as holding fresh water for 24-48 hours to kill cercariae, as well as water chlorination), review of medical event reports associated with deployment to Iraq, and review of military public health reports from Al Asad.

6.4.1 Short-term (acute) health risks:

Risk assessment: The short-term risk for leptospirosis and schistosomiasis was **low**.

Medical implications:

- Leptospirosis, which has an incubation period of 5-14 days, presents as acute fever with nonspecific symptoms that last for 1 week to several months.
- The predominate schistosoma species found in Iraq is *S. haematobium*, which has an incubation period of 2-6 weeks. Initial presentation of schistosomiasis includes fever, rash and other systemic symptoms. Prolonged infection with *S. haematobium* may lead to urinary manifestations, including painful/difficult urination, urinary frequency, and hematuria at the end of urination.

Confidence in the risk assessment: Confidence in the risk assessment is high. No reported cases of water contact diseases were identified from Iraq during the assessment period.

6.4.2 Long-term (chronic) health risks:

Risk assessment: The long-term risk for schistosomiasis infection was **low**.

Medical implications: Schistosomiasis infection does not always cause acute, systemic manifestations. Human infection with *S. haematobium* may last in excess of 10 years. Although rare, it is possible to be infected while deployed but not to have clinically evident disease until redeployed.

Confidence in the risk assessment: Confidence in risk assessment is high. Incidence of water contact diseases in the post deployment military population is very low.
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6.5 Respiratory Diseases

U.S. military populations living and working in close-quarter conditions were at risk for substantial person-to-person spread of upper respiratory infections such as the common cold and influenza. Primary exposure pathways for tuberculosis were prolonged close contact (generally several hours per day for greater than three days per week in a closed space) with the local population or third country national contractors. U.S. personnel who remained on base have limited to no contact with the local population, and local and third country national workers/contractors were required to complete health screening prior to employment.

Approach: The health risk for respiratory diseases to individuals deployed to Iraq during the period of this assessment was epidemiologically assessed based on the combination of identified endemic diseases, knowledge of preventive measures in place, review of medical event reports associated with deployment to Iraq, and review of military public health reports from Al Asad.

6.5.1 Short-term (acute) health risks:

Risk assessment:

- The short-term risk for upper respiratory infections was **low.** Risk due to a high rate of personnel turnover, shared dining, berthing, recreational facilities, and working spaces is not substantially different than that expected in similar settings within the United States.
- The short-term risk for tuberculosis was **low**.

Medical implications:

- Upper respiratory infections, particularly from viral agents, can cause periodic outbreaks in spite of preventive measures. A small proportion of infections may require greater than 72 hours convalescence and/or hospitalization.

- Symptoms of tuberculosis, including fever, weight loss, night sweats and cough, typically start within 1-6 months of infection. The lifetime risk for tuberculosis disease after becoming infected is 5-10%; half of this risk occurs in the first two years following infection.

Confidence in the risk assessment: Confidence in risk assessment is medium. Upper respiratory infections, especially those with short convalescence and lack of long-term health effects are not reportable for deployed military populations. Tuberculosis prevalence in the local population is unknown due to inconsistent surveillance within the host nation, but no reports of tuberculosis were identified for individuals deployed to Al Asad, or Iraq in general, during the assessment period.

6.5.2 Long-term (chronic) health risks:

Risk assessment: The long-term risk for tuberculosis was **low**.

Medical implications: Symptoms of tuberculosis can be delayed by two or more years following infection. Tuberculosis should be considered in assessing symptoms of fever accompanied by night sweats and cough.

Confidence in the risk assessment: Confidence in risk assessment is high. Actual prevalence of tuberculosis in the local population is unknown due to inconsistent surveillance within the host nation, but prevalence of tuberculosis in the post deployment military population is known to be extremely low.
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6.6 Animal-Contact Diseases

Animals in Iraq were not routinely vaccinated against vaccine preventable diseases such as rabies or anthrax. Q-fever, anthrax, and rabies are known to be present in Iraq. Exposure to animals, and/or locations where animals were kept (stray dogs/cats, barnyards, slaughterhouses), were the primary infection sources for all these diseases, and avoidance of companion and farm animal contacts was the primary prevention strategy. Preventive measures in place include anthrax vaccination, which is effective in preventing both cutaneous and inhalation anthrax, and rabies post exposure prophylaxis, which is effective for preventing onset of rabies in exposed individuals.

Approach: The health risk for endemic animal contact diseases to individuals deployed to Iraq during the period of this assessment was epidemiologically assessed based on the combination of identified endemic diseases, knowledge of preventive measures in place, review of medical event reports associated with deployment to Iraq, and review of military public health reports from Al Asad.

6.6.1 Short-term (acute) health risks:

Risk assessment:

- The short-term risk for anthrax (naturally acquired), and rabies was **low**.
- The short term risk for Q-fever was **low**.

Medical implications:

- Naturally occurring anthrax (non-weaponized) is an acute disease that usually affects the skin, while inhalation anthrax has mild and non-specific initial symptoms among unimmunized individuals.
- Symptoms of acute Q-fever, which may present one week to greater than one month after exposure, include fever, chills and weakness.
- Rabies presents as an acute, viral encephalomyelitis and is almost invariably fatal.

Confidence in the risk assessment: Confidence in risk assessment is high.

6.6.2 Long-term (chronic) health risks:

Risk assessment: The long-term risk for Q-fever and rabies was **low**. However, Q-fever was diagnosed in a small number of personnel after they returned to the U.S.

Medical implications: Q-fever is generally an acute febrile disease. However, considerable variation in severity and duration may be seen; infections may be unapparent or present as a nonspecific undifferentiated febrile syndrome or as pneumonia. Q-fever should be considered in the differential diagnosis of an undifferentiated febrile syndrome when personnel mention a history of being near or in areas where animals were kept or had been kept. Infected animals, most commonly cattle, sheep, or goats, typically do not appear ill. The main mode of transmission to humans is inhalation of aerosols or dust contaminated by infected animals. Direct animal contact is not required for transmission.

Confidence in the risk assessment: Confidence in risk assessment is moderate. Although Q-fever is a Triservice Reportable Medical Event, to be reported within 24 hours of diagnosis, cases of Q-fever are underreported within the DoD healthcare system. More cases of Q-fever in U.S. troops were reported in professional publications than were reported in the service-mandated reporting systems.

In 2010 the CDC released a Health Advisory on the "Potential for Q Fever Infection Among Travelers Returning from Iraq and the Netherlands." The advisory stated: "*Increasing reports of Q fever among deployed U.S. military personnel due to endemic transmission in Iraq, as well as a large ongoing outbreak of Q fever in the Netherlands, may place travelers to these regions at risk for infection. Healthcare providers in the United States should consider Q fever in the differential diagnosis of persons with febrile illness, pneumonia or hepatitis who have recently been in Iraq or the Netherlands."*
Return to Table 2

7 Venomous Animals/Insects

The species listed below have home ranges that overlap the country of Iraq, and may present a health risk if encountered. Information was taken from the Integrated Pest Management Plan for Iraq as prepared by Naval Facilities Engineering Command, Clinical Toxinology Resources, **http://www.toxinology.com/index.cfm**, and the Armed Forces Pest Management Board Living Hazards Database. Little to no regional (within the country of Iraq) animal range information was available. The below list should not be considered all inclusive; other venomous scorpions and snakes may be present in the region. See Section 10 for more information about pesticides and pest control measures.

7.1 Short-term (acute) health risk:

7.1.1 Spiders: Numerous species of spiders are found in Iraq. The Widow Spider (*Latrodectus pallidus*) is the only known species whose bite presents a threat. Widow spider bites are mostly minor and even significant envenomation is unlikely to be lethal. Bite is usually felt as a "sting", with delayed (10+min) local pain, and sweating. More severe envenomation may produce regional pain, tender

draining lymph nodes, nausea, hypertension, and malaise. Health risk was **low**.

7.1.2 Scorpions: Numerous species of scorpion are found in Iraq. The majority of scorpions found in the region have stings that cause only short lived local effects, such as pain, without systemic effects. The following scorpions are listed as present in Iraq and have known detrimental health effects:

- *Androctonus crassicauda* (Black Fat-tailed Scorpion): Most stings cause severe local pain which may have been treated using local anesthetic infiltration. Significant envenomation may cause increased salivation, sweating, irritability, vomiting, and cardio-respiratory effects.
- *Hemiscorpius lepturus*: Initial sting not significantly painful, but over several hours, local skin injury (around 50% of stings) can occur with necrosis and ulceration.
- *Hottentotta saulcyi*: Stings usually cause moderate local pain, swelling, and redness. Potent neurotoxic factors of the venom can cause serious systemic effects, often delayed 1-24 hours, including hypertension, rapid heart rate, and fluid in the lungs.

Overall health risk from scorpions was **low**.

7.1.3 Snakes: Numerous species of snakes are found in Iraq. A number of poisonous snakes, whose range incorporates Iraq, could have been encountered. The below are known to be present and could have posed a health risk if encountered:

- *Cerastes cerastes* (Desert Viper): Bites are severe, with both significant local and systemic effects, including coagulopathy.
- *Cerastes gasperettii* (Arabian Horned Viper): Bites are severe, with both significant local and systemic effects, including coagulopathy.
- *Echis sochureki* (Sochurek's Saw-scaled Viper): Bites are typically moderate to severe, with potentially lethal envenoming, requiring urgent assessment and treatment, including IV fluids, IV antivenin and good wound care. Antivenom is key for the treatment of systemic envenoming.
- *Macrovipera lebetina* (Levantine Viper): Bites may cause mild to severe local effects, including shock and coagulopathy.
- *Vipera albicornuta* (White-horned Viper): Bites may cause mild to severe local effects, including shock and coagulopathy.
- *Walterinnesia aegyptia* (Black Desert Cobra): There is poor clinical documentation of bite reactions. General systemic effects may include pain, swelling and flaccid paralysis.

Overall, the health risk associated with snakes was **low**.

7.5 Long-term (chronic) health risk:

No long-term health risks were identified based on available data.
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8 Heat/Cold Stress

8.1 Site-Specific Conditions: Al Anbar province has a desert climate with low rainfall and a large variation in temperature between day and night. Summer temperatures during July and August can reach 118 Fahrenheit (F). Between September and May Average high temperatures range from 60-104°F with lows from 28–68°F. During the winter months, it is not atypical to have temperature changes of 40°F between daytime highs to nighttime lows. The risk of cold stress/injury increases with colder temperatures, wind, longer exposures, inactivity, and inadequate clothing. The period of greatest risk of cold stress/injury is from October – April.

8.2 Heat

8.2.1 Heat Exposure Guidelines

The risk of heat injury is based on the Wet Bulb Globe Temperature Index as follows:
Low (80-84.9 °F)
Moderate (85-87.9°F)
High (88-89.9°F)
Extremely High (≥ 90°F)

8.2.2 Short (acute) and long-term (chronic) health risk:

Approach: No heat casualty, medical event reports involving heat injuries or heat stress monitoring data were available in the Defense Occupational and Environmental Health Readiness System or the Military Exposure Surveillance Library for any of the camps covered in this assessment. Accordingly, risk estimates are based strictly on existing climatologic data.

Risk Summary:

Short-term (acute) health risk: The short-term health risk of heat injury for unacclimatized individuals (i.e. on site less than four weeks) from May-September was **moderate**. For the remainder of the year, health risk is **low**. Health risk for persons with underlying health conditions may be elevated above these baselines, especially during May-September.

Long-term health risk: The long-term health risk was l**ow.**

Medical implications: Severity of heat injury can range from mild clinical signs such as clamminess, nausea, disorientation or headache to life threatening symptoms requiring hospitalization. Long-term medical implications from heat injuries are rare but can occur, especially from more serious injuries such as heat stroke. Individuals with a history of heat injury, even when medical attention was not sought, are at increased risk for future heat injury; repeat heat injury may have increased severity.

Confidence in the risk assessment: Based on generally available information on climatic conditions and the absence of reported heat injuries, confidence in risk assessment is high. Individuals who experienced mild symptoms of heat illness may not have sought medical attention; this may lead to an underestimation of the risk.
Return to Table 2

8.3 Cold

8.3.1 Short (acute) and long-term (chronic) health risks*:*

Approach: No cold injury data were available in the Defense Occupational and Environmental Health Readiness System or the Military Exposure Surveillance Library for any of the camps covered in this assessment. Accordingly, risk estimates are based strictly on existing climatologic data.

Risk Summary: The risk for cold stress/injuries is largely dependent on clothing/equipment worn, operational work intensity and individual factors rather than environmental factors alone. The acute and chronic risk for non-freezing cold injuries, such as chilblain, trench foot, and hypothermia was **low**.

Medical implications: The cooling of body parts may result in various cold injuries - nonfreezing injuries, freezing injuries and hypothermia which is the most serious. Toes, fingers, ears and nose are at greatest risk because these areas do not have major muscles to produce heat. In addition, the body will preserve heat by favoring the internal organs and thus reducing the flow of blood to the extremities

under cold conditions. The most severe cold injury is hypothermia which occurs from excessive loss of body heat and the consequent lowering of the body's core temperature.

Confidence in the risk assessment: Based on generally available information on climatic conditions and the absence of reported cold injuries, confidence in risk assessment is high. Individuals who experienced mild symptoms of cold injury may not have sought medical attention; this may lead to an underestimation of the risk.
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9 Noise

9.1 Continuous

9.1.1 Exposure Guidelines:

The services have established occupational exposure limits (OEL) for continuous or intermittent noise at 85 decibels on the A-weighted scale (dbA), 84 dbA for the Navy, as an eight hour time-weighted average (TWA). The A-weighted scale of noise measurement is used because it mimics the human ear's response to sound. All services require that individuals routinely exposed to noise levels greater than the OEL be enrolled in the hearing conservation program. Generally, routinely exposed is defined as when the TWA exceeds 84 dbA on average more than 2 days in any month.

9.1.2 Site Specific Conditions:

Sources of potential noise include flight line operations, associated with both fixed and rotary wing aircraft, tactical generators and various hand tools in maintenance shops. Due to the potential noise hazard inherent in flight line operations, personnel were required to wear dual hearing protection.

9.1.3 Short (acute) and long-term (chronic) health risk:

Approach: Knowledge of the Service hearing conservation programs and typical sound pressure level measurements associated with the various potential noise generating sources were used to complete the health risk assessment.

Risk Summary:

Short-term health risk: The short-term risk of noise induced hearing loss with the use of appropriate hearing protection use was **low**. Few exposed individuals expected to have experienced noticeable short-term health effects such as annoyance, speech interference, fatigue and temporary hearing threshold shifts during deployment.

Long-term health risk: The long-term risk of noise induced hearing loss with appropriate hearing protection use is **low**.

Confidence in the Risk Assessment: Confidence in the health risk assessment is low. There is a well established hearing conservation program; hearing protection is readily available and generally worn by individuals with known occupational exposures across the Services. However, the limited availability of information about specific noise sources and enforcement of the use of personal protective equipment diminishes confidence.

9.2 Impulse

No information about potential sources of impulse noise (140 dbA) or greater) was available.

9.2.1 Short-term (acute) and Long-term (chronic) health risks:

Not evaluated: Insufficient data exist upon which to base a health risk assessment.
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10 Unique Concerns

10.1 Asbestos and Lead-Based Paint

10.1 Site-Specific Conditions:

Many former Iraqi structures were occupied by U.S. personnel during the period the camps covered by this assessment were occupied. Information about potential sources of asbestos containing material (ACM) or peeling paint that could contain lead is limited to three samples of potential ACM and two paint chip samples taken in Building 31 in February 2005 and one paint chip sample taken in Building 301 in March 2005. No ACM or lead-based paint was detected.

10.1.1 Short-term (acute) health risk:

Not evaluated: Insufficient data exist upon which to base a health risk assessment.

10.1.2 Long-term (chronic) health risk:

Not evaluated: Insufficient data exist upon which to base a health risk assessment.

10.2 Potential Environmental Contamination Sources

In addition to environmental exposures already discussed, there may be specific occupational exposure pathways associated with aircraft, vehicle and site maintenance. Typical chemicals of concern associated with potential occupational exposures were petroleum, oils, and lubricants. No industrial hygiene data exist to document the significance of occupational exposures; however, there were typically procedures in place for storage, handling, use and disposal of hazardous materials which generally minimize health risk.

Approach: Knowledge of the U.S. Central Command and service specific policies and procedures served as the basis of this risk assessment.

10.2.1 Short-term (acute) and Long-term (chronic) health risks: **Low**

Confidence in the risk assessment: Confidence in the risk assessment is low. Typical chemicals of concern associated with potential occupational exposures are petroleum, oils, and lubricants. These were generally present in relatively low volumes. Procedures for storage, handling, use and disposal of hazardous materials were in place throughout the theater of operations to minimize health risk.

10.3 Pesticides/Pest Control:

Both contract and military vector control personnel mitigated pests and vectors in accordance with mandated integrated pest management practices. The overwhelming majority of those efforts at Al Asad Air Base were in the reduction of filth flies, rodents, and feral animals. Non-chemical measures such as exclusion measures and sanitation were first and primary efforts. Secondary measures included the use of targeted bait applications for flies and rodents, and various animal trapping methods. Tertiary measures included the application of pesticides which contained active ingredients that degraded rapidly in the Iraqi environment. On-site or regional oversight was provided as available to ensure compliance with Theater, Navy, and DoD practices and regulations.

10.3.1 Short and Long-term (chronic) health risk

Approach: The Integrated Pest Management Plan for Iraq was reviewed for compliance with DoDI 4150.07 requirements. In addition, U. S. military entomologists who served at Al Asad Air Base and the Navy Entomology Center of Excellence were consulted about their knowledge of pest management activities at the air base.

Risk Summary:

Short-term health risk: **No short-term health risk was indentified based on available data.**

Long-term health risk: **No long-term health risk was indentified based on available data.**

Confidence in the risk assessment: Confidence in the risk assessment is high. The integrated pest management plan emphasizes non-chemical control over the use of chemical pesticides. The potential for camp residents to come in contact with improperly formulated insecticides is remote.
Return to Table 2

11 References

POEMS developed according to:

1. **DoDI 6490.03, *Deployment Health*, 2006.**
2. **JCSM (MCM) 0028-07, *Procedures for Deployment Health Surveillance,* 2007.**
3. **DoDI 6055.05, Occupational and Environmental Health, 2008.**
4. **Klaassen, C.D. *Casarett & Doull's Toxicology: the Basic Science of Exposures*, Chapter 2, Principles of Toxicology; Fifth Edition, McGraw Hill, New York.**

Site description and baseline information obtained from:

5. **Environmental Health Site Assessment for Camp Al Asad, Iraq, in support of Deployed Forces of Operation of Iraqi Freedom 04-06, June 17,2005**

Sampling data were obtained from the:

6. **Defense Occupational and Environmental Health Readiness System (referred to as the DOEHRS-EH database) at https://doehrs-ih.csd.disa.mil/Doehrs/. Some of the data may be classified or otherwise have some restricted distribution. See discussion below.**
7. **Military Exposure Surveillance Library: https://mesl.apgea.army.mil/mesl/. Some of the data and reports used may be classified or otherwise have some restricted distribution.**

Additional environmental health reports/survey documents are from the:

8. **Department of Veterans Affairs-Environmental Letter – Burn Pits Throughout Iraq, Afghanistan, and Al Asad, April 26, 2010.**
9. **Integrated Pest Management Plan – Multi-National Coalition Iraq – January 23, 2006.**

10. **Iraq – City History Profile – GlobalSecurity.Org - http://www.globalsecurity.org/military/world/iraq/al-asad.htm**
11. **Al Asad Air Base, Iraq- A Blackanthem Military News Article http://www.blackanthem.com/News/citypages/AL-Asad-Air-Base-Iraq11374.shtml**
12. **List of closed United States Army Installations in Iraq during Operation Iraqi Freedom (OIF) – http://en.wikipedia.org/wiki/List_of_closed_United_States_Army_installations_in_Iraq**
13. **Al Asad Post Report – eDiplomat – Area, Geography, and Climate Updated: July 19, 2005. http://www.ediplomat.com/np/post_reports/pr_iq.htm**
14. **Khan al Baghdadi – Wikepedia article https://en.wikipedia.org/wiki/Khan_al_Baghdadi**
15. **Camp Mejid – Abrahama's Oasis-America's North Shore Journal Article. http://northshorejournal.org/tag/camp-mejid**
16. **Dust and Sand Forecasting in Iraq and Adjoining Countries – AWS/TN-91/001 - Air Weather Service – Scott Air Force Base, Illinois – November 29, 1991. http://homes.comet.ucar.edu/~alanbol/AWS_TN91_1.htm**
17. **Country Pasture/Forage Resource Profile – Iraq – Food and Agriculture Organization of United Nations by University of Sulaimaniyah, Iraq – April 2011. http://www.fao.org/ag/AGP/AGPC/doc/Counprof/PDF%20files/iraq.pdf**

Chemical hazards (air, water, soil) evaluated based on military exposure guidelines (MEGs) and risk assessment methodology in:

18. **USACHPPM June 2010 Revision, Technical Guide (TG230), "Environmental Health Risk Assessment and Chemical Exposure Guidelines for Deployed Military Personnel". For further information, contact USAPHC Environmental Health Risk Assessment Program at: commercial 410-436-2953 or DSN 584-2953.**
19. **Department of the Army Technical Bulletin Medical (TB MED) 577, Sanitary Control and Surveillance of Field Water Supplies, TB Med 577, NAVMED P-5010-10, AFMAN 48-138, 1 May 2010.**
20. **USACHPPM, Particulate Matter Factsheet No. 64-009-0708, 2008.**

Regional/country information on endemic/infectious disease and heat/cold from the:

21. **Centers for Disease Control and Prevention (CDC) Travelers' Health website (http://wwwnc.cdc.gov/travel/destinations/iraq.htm), "Destinations" section, Iraq.**
22. **Clinical Toxinology Resources, University of Adelaide, Australia; http://www.toxinology.com/index.cfm**
23. **World Health Organization (WHO) World Malaria Report 2012, page 141.**
24. **"Cutaneous Leishmaniasis in U.S. Military Personnel – Southwest/Central Asia, 2002-2003." Morbidity and Mortality Weekly Report (MMWR), October 24, 2003 / 52(42);1009-1012. http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5242a1.htm**
25. **Hartzell JD, Peng SW, Wood-Morris RN, Sarmiento DM, Collen JF, Robben PM, et al. Atypical Q fever in US soldiers. Emerg Infect Dis [serial on the Internet]. 2007 Aug. Available from http://wwwnc.cdc.gov/eid/article/13/8/07-0218.htm**
26. **Leung-Shea, Charmaine and Danaher, Patrick J. "Q Fever in Members of the United States Armed Forces Returning from Iraq," Clinical Infectious Diseases 2006; 43:e77–82.**
27. **Faix, Dennis J., Harrison, Dustin J., Riddle, Mark S., Vaughn, Andrew F., Yingst, Samuel L., Earhart, Kenneth, and Thibault, Glenn. "Outbreak of Q Fever in Western Iraq, June-July 2005," Clinical Infectious Diseases 2008; 46:e65-68**
28. **'Leishmaniasis in relation to service in Iraq/Afghanistan, U.S. Armed Forces, 2001 – 2006'. Armed Forces Health Surveillance Center Medical Surveillance Monthly Report, Vol 14. No 1. April 2007. pp 2-5 (http://www.afhsc.mil/viewMSMR?file=2007/v14_n01.pdf)**

NOTE. The DOEHRS-EH database was queried to obtain the available sample data for air, soil, and drinking and nondrinking water sources at Al Asad Air Base and associated 2 sites (Camp Mejid and Camp Khan Ali Baghdadi - Water Treatment Plant), Iraq. The data are currently

assessed using the TG 230 June 2010 Revision as described above contains, the general method involves an initial check of the data which eliminates all chemical substances not detected above 1-year negligible MEG. Those substances screened out are not considered acute or chronic health hazards so are not assessed further. For remaining substances, acute and chronic health effects are evaluated separately for air and water (soil is only evaluated for long-term health risk). This is performed by deriving separate short-term and long-term population exposure level estimates (referred to as population exposure point concentrations (PEPC) that are compared to MEGs derived for similar exposure durations. If less than or equal to negligible MEG, the risk is Low. If levels are higher than negligible, then there is a chemical-specific toxicity and exposure evaluation by appropriate subject matter experts, which includes comparison to any available marginal, critical, or catastrophic MEGs. For drinking water, 15 liters/day (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 2L/day (similar to the US Environmental Protection Agency (USEPA)), which is derived by multiplying the 5-L/day MEG by a factor of 2.5. This value is used to conservatively assess nondrinking uses of water.

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 the Deputy Assistant Secretary of Defense (DASD) for Force Health Protection and Readiness (FHP&R).

Army Institute of Public Health Phone: (800) 222-9698. **http://phc.amedd.army.mil/**

Navy and Marine Corps Public Health Center (NMCPHC) Phone: (757) 953-0700. **http://www-nmcphc.med.navy.mil/**

U.S. Air Force School of Aerospace Medicine (USAFSAM) Phone: (888) 232-3764. **http://www.wpafb.af.mil/afrl/711hpw/usafsam.asp**

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