Military Deployment
Periodic Occupational and Environmental Monitoring Summary (POEMS):
Camp Dwyer, Afghanistan, Calendar Years: 2009 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 base camp level deployment occupational and environmental health surveillance (OEHS) exposure data for Camp Dwyer, Afghanistan. It presents the identified health risks and assessments along with associated medical implications. The findings are based on information collected from 1 January 2009 through 31 August 2011 to include deployment OEHS sampling and monitoring data (e.g. air, water, and soil), field investigation and health assessment reports, as well as country and area-specific information on endemic diseases. While this assessment may reflect similar exposures and health risks pertaining to historic or future conditions at this site, the underlying data are limited to the time period(s) and area(s) sampled and thus may not reflect fluctuations or unique occurrences. It also may not be fully representative of all the fluctuations during the timeframe. To the extent that the data allow, this summary describes the general ambient conditions at the site and characterizes the health risks at the *population–level*. While useful to inform providers and others of potential health effects and associated medical implications, it does not represent an individual exposure profile. Actual individual exposures and specific resulting health effects depend on many variables and, should be addressed in individual medical records by providers as appropriate at the time of an evaluation of a unique exposure.

SITE DESCRIPTION: Camp Dwyer is located in the Helmand Province of Afghanistan near the town of Garmsir. Prior to 2009, Dwyer was a British Forward Operating Base (FOB); in 2009 it was transferred to the United States of America. North, South and West of Camp Dwyer is desert with no industry, agriculture, or residential areas within at least 6 miles. East of the camp is desert for approximately 4 miles until the Helmand River valley; residential and agricultural areas are present along the river valley. The surface of the camp is covered with rock aggregate gravel on top of a fine powder mixture of sand-clay and silt, known as “moon dust.” Tents are used for housing, office space, dining facilities, the gym, the chapel, billeting, showers, and the fire station. Lightweight maintenance enclosures are used for vehicle and heavy equipment maintenance. Semi-permanent structures (huts, steel frame buildings, and improvised structures) are used for housing, showers, and office space.

The populations of interest for this assessment are personnel who were deployed at Camp Dwyer for up to one year between January 2009 and August 2011. Based on historical Operation Enduring Freedom (OEF) rotations, military deployment lengths typically did not exceed 14 months at any one time.

SUMMARY: Summarized below are the key health risks estimates that present a Moderate or greater risk of medical concern along with recommended follow-on medical actions, if any, that providers should be aware of. The Table on the following pages provides a list of all the identified health risks at Camp Dwyer, Afghanistan (Table 1). As indicated in the detailed sections that follow the table, controls that have been effectively established to reduce health risk levels have been factored into this overall assessment. In some cases, e.g. ambient air, specific controls are noted but not routinely available/feasible.

Short-term health risks & medical implications:

The following may have caused acute health effects in some personnel during deployment at Camp Dwyer:
Food/waterborne diseases (e.g., bacterial diarrhea, Hepatitis A, Typhoid fever, diarrhea-cholera, diarrhea-protozoal, Brucellosis, Hepatitis E); other endemic diseases (cutaneous leishmaniasis, Crimean-Congo hemorrhagic fever, Sandfly fever, typhus-miteborne, Leptospirosis, Tuberculosis (TB), soil-transmitted helminthes, Rabies, Q fever); venomous animals and insects; heat stress; and continuous noise. For food/waterborne diseases (e.g., bacterial diarrhea, Hepatitis A, Typhoid fever, diarrhea-cholera, diarrhea-protozoal, Brucellosis, Hepatitis E), if ingesting food and water off post, the health effects can temporarily incapacitate personnel (diarrhea) or result in prolonged illness (Hepatitis A, Typhoid fever, and Brucellosis, Hepatitis E). Risks from food/waterborne diseases may have been reduced with preventive medicine controls and mitigation, which includes Hepatitis A and Typhoid fever vaccinations, and only drinking from approved water sources in accordance with standing CENTCOM policy. For other vector-borne endemic diseases (cutaneous leishmaniasis, Crimean-Congo hemorrhagic fever, Sandfly fever, typhus-miteborne), these diseases may constitute a significant risk due to exposure to biting vectors; risk is reduced to low by proper wear of treated uniform, application of repellent to bed net and exposed skin, and appropriate chemoprophylaxis. For water contact diseases (Leptospirosis) activities involving extensive contact with surface water increase risk. For respiratory diseases (Tuberculosis (TB)), personnel in close-quarter conditions could have been at risk for person-to-person spread. For soil-transmitted helminthes (hookworm, strongyloidiasis, and cutaneous larva migrans), potential risk is moderate with transmission generally limited to the warmer months and 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 not debilitating. Animal contact diseases (Rabies, Q fever) pose year-round risk. For venomous animals and insects, if encountered, effects of venom vary with species from mild localized swelling (e.g. widow spider) to potentially lethal effects (e.g. Haly's Pit Viper). For heat stress, risk can be greater for susceptible persons including those older than 45, of low fitness level, unacclimatized personnel, or individuals with underlying medical conditions. Risks from heat stress may have been reduced with preventive medicine control, use of appropriate work-rest cycles, and mitigation. For continuous noise, risk is to personnel working near major noise sources; risk is reduced to personnel working near major noise sources by wearing proper hearing protection.

Air quality: Although there were not enough ambient air data for short-term assessment of particulate matter less than 10 micrometers in diameter (PM_{10}), the area is a dusty desert environment. In addition, there were two burn pits on the site; however, insufficient samples were available for short-term assessment. For inhalational exposure to high levels of dust and particulate matter, such as during high winds or dust storms, and for exposure to burn pits, exposures 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, and certain subgroups of the deployed forces (e.g., those with pre-existing asthma/respiratory and cardio-pulmonary conditions) are at greatest risk of developing notable health effects. Although most effects from exposures to dust and particulate matter and burn pits should have resolved post-deployment, providers should be prepared to consider the relationship between deployment exposures and current complaints. Some individuals may have sought treatment for acute respiratory irritation during their time at Camp Dwyer. Personnel who reported with symptoms or required treatment while at this site should have exposure/treatment noted in medical record (e.g., electronic medical record and/or on a Standard Form (SF) 600 (Chronological Record of Medical Care).

Long-term health risks & medical implications:

The hazard associated with potential long-term health effects from exposure during deployment at Camp Dwyer includes inhalable fine particulate matter less than 2.5 micrometers in diameter ($PM_{2.5}$), soil-transmitted helminthes, and continuous noise.

For continuous noise exposure, the long-term risk is to personnel working near major noise sources. Risk may have been reduced to personnel working near major noise sources by wearing proper hearing protection. 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). For soil-transmitted helminthes ((hookworm, strongyloidiasis, and cutaneous larva migrans), potential risk is moderate with transmission generally limited to the warmer months and could occur among personnel with direct skin exposure to soil contaminated with human or animal feces (including sleeping on bare ground, walking barefoot); systemic symptoms of fever, cough, abdominal pain, nausea, and diarrhea may develop weeks to months after initial infection with hookworm or Strongyloides. Chronic intestinal infection may persist for months to years. More severe infections may be debilitating.

Air Quality: It is considered possible that some otherwise healthy personnel who were exposed for a long-term period to particulate matter less than 2.5 micrometers in diameter ($PM_{2.5}$) could develop certain health conditions (e.g., reduced lung function, cardiopulmonary disease). Although there were insufficient data to evaluate burn pit generated $PM_{2.5}$, there were two burn pits on site. For inhalational exposure to high levels of dust and particulate matter, such as during high winds or dust storms, and for exposure to burn pits, it is considered possible that some otherwise healthy personnel who were exposed for a long-term period to dust and particulate matter and burn pits could develop certain health conditions (e.g., reduced lung function, cardiopulmonary disease). Personnel with a history of asthma or cardiopulmonary disease could potentially be more likely to develop such chronic health conditions. While the PM exposures are documented and archived, at this time there are 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, or occupational or specific personal dosimeter data) when assessing individual concerns.

Population-Based Health Risk Estimates – [Camp Dwyer, Afghanistan] [1, 2]

Sources of Identified Health Risk[3]	Health Risk Assessment Summary [4]	
	Short-Term Health Risk	Long-Term Health Risk
AIR	Airborne Chemicals – Overall Short Term Risks:	Airborne Chemicals – Overall Long-Term Risks:
Particulate matter less than 10 micrometers in diameter (PM_{10})	Not enough data to evaluate risk	
Particulate matter less than 2.5 micrometers in diameter ($PM_{2.5}$)	Low for average exposure Moderate for peak exposure	Moderate
Metals	Not enough data to evaluate a short-term or long-term risk	
Chemical Pollutants (gases and vapors)	Not enough data to evaluate a short-term or long-term risk	
WATER	Not enough data to evaluate a short-term or long-term risk	
SOIL	Not enough data to evaluate long-term risk	
MILITARY UNIQUE	Military Unique– Overall Short-Term Risk: Low	Military Unique – Overall Long-Term Risk: Low
Ionizing Radiation	Low for general population of Camp Dwyer	
Non-Ionizing Radiation	Not enough data to evaluate a short-term or long-term risk	
ENDEMIC DISEASE	Endemic Disease – Overall Short-Term Risk: Variable (Low to High).	Endemic Disease – Overall Long-Term Risk: Variable (None to Low).
Food borne/Waterborne (e.g., diarrhea- bacteriological)	**Moderate to High:** High (bacterial diarrhea, hepatitis A, typhoid fever) to Moderate (diarrhea-cholera, diarrhea-protozoal, brucellosis, hepatitis E)) If ingesting local food/water, the health effects can temporarily incapacitate personnel (diarrhea) or result in prolonged illness (Hepatitis A, Typhoid fever, Hepatitis E, Brucellosis). Risk reduced Low with preventive medicine measures, which include Hepatitis A and Typhoid fever vaccination, and consumption of food and water only from approved sources.	**No hazards identified.**
Arthropod Vector Borne	**Low to Moderate:** Moderate for Leishmaniasis - cutaneous, Crimean-Congo hemorrhagic fever, Sandfly fever, typhus-miteborne; and Low for malaria, the Plague, and West Nile fever. Risk reduced to low by proper wear of the treated uniform and application of repellent to exposed skin and bed netting, and appropriate chemoprophylaxis.	**Low** for visceral leishmaniasis.
Water-Contact (e.g. wading, swimming)	**Moderate** for Leptospirosis.	**None identified based on available data**.
Respiratory	**Low to Moderate:** Moderate for tuberculosis to Low for meningococcal meningitis.	**None identified based on available data**. TB is evaluated as part of the Post Deployment Health Assessment. A TB skin test is required post-deployment if potentially exposed.
Soil Contact	**Moderate** for soil-transmitted helminths (hookworm, strongyloidiasis, and cutaneous larva migrans)	**Moderate** for soil-transmitted helminths (hookworm, and strongyloidiasis and cutaneous larva migrans.
Animal Contact	**Low to Moderate:** Moderate for rabies, Q-fever to Low short-term risk (due to rare occurrence) for anthrax, H5N1 avian influenza.	**Low** for Rabies.
VENOMOUS ANIMAL/INSECTS	**Venomous Animals/Insects – Overall Short Term Risks:**	**Venomous Animals/Insects – Overall Long Term Risks:**

Sources of Identified Health Risk[3]	Health Risk Assessment Summary [4]	
	Short-Term Health Risk	Long-Term Health Risk
Snakes, scorpions, and spiders	**Low to High:** If encountered, effects of venom vary with species from mild localized swelling (e.g. widow spider) to potentially lethal effects (e.g. Haly's Pit Viper).	**None identified.**
HEAT/COLD STRESS	Heat/Cold – Overall Short-Term Risk: Moderate	Heat/Cold – Overall Long-Term Risk: Low
Heat	Moderate: Moderate risk of heat injury for unacclimatized personnel. Risk of heat injury is reduced through preventive measures.	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	Low	Low
NOISE	Noise – Overall short-term risk: Moderate	No impulse noise evaluations conducted, not evaluated.
Continuous	Variable (Low to Moderate): Moderate risk to personnel working near major noise sources. Low risk to the majority of personnel working near major noise sources who wear proper hearing protection.	Moderate risk to personnel working near major noise sources. Low risk to personnel working near major noise sources who wear proper hearing protection.
UNIQUE INCIDENT/CONCERNS	Unique Incident/Concerns – Overall Short-term risk: Variable (Low to Moderate)	Unique Incident/Concerns – Overall Long-term risk: Variable (None identified to moderate)
Fuel/petroleum products/industrial chemical spills	Low	Low
Pesticides/Pest Control	Low	Low
Burn Pits	There were two burn pits on the site but insufficient air samples were available to conduct a short-term risk assessment. Short-term health effects could have included eye, nose, throat, and lung irritation. More serious effects were possible in susceptible persons (e.g., those with asthma/pre-existing respiratory diseases).	Not enough samples to evaluate a long term risk for $PM_{2.5}$. The long term risk for PM_{10} was not evaluated-no available health guidelines for PM_{10}.

[1] This Summary Table provides a qualitative estimate of population-based short- and long-term health risks associated with the general ambient and occupational environment conditions. It does not represent a unique individual exposure profile. A person at a specific location may experience 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 electronic health record (EHR) or on an SF600 where the EHR is not available.

[2] This assessment is based on available data and reports obtained from the January 2009-August 2011 timeframe. It is a historical representation of general site conditions but may not reflect certain fluctuations or unique exposure incidents. Acute health risk estimates are generally consistent with field-observed health effects.

[3] This Summary Table (and the following discussions) is organized by major categories. It only lists those sub-categories specifically identified and addressed. 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 the probability that the exposure would produce such health effects. Where applicable, "None Identified" is used when though an exposure was identified, no risk of either a specific acute or chronic health effects were determined. More detailed descriptions of OEH exposures that were evaluated are discussed in the following sections

[4] 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 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 Dwyer, Afghanistan by Source

The following sections describe the major source categories of potential health risk that were evaluated at Camp Dwyer. For each category, the evaluation process includes identifying what, if any, specific sub-categories/health concerns are present. This initial step results in "screening out" certain sub-categories that pose no identifiable health risk (for example if all data are below screening levels). While these sections may include sub-categories that have been determined to present no identifiable health risk, the summary table on the previous page only contains those sub-categories that were determined to pose moderate or higher potential health risks.

Data were reviewed from the Defense Occupational and Environmental Health Readiness System (DOEHRS), the Military Exposure Surveillance Library (MESL), and documents on the SIPRNET.

2 Air

2.1 Site-Specific Sources Identified

Camp Dwyer is situated in a dusty semi-arid desert environment in the flat and waterless Dasht-I Margo Desert. Violent sandstorms may occur at any time of the year, but are most frequent in May through September. Inhalational exposure to high levels of dust and particulate matter, such as during high winds or dust storms, may result in mild to more serious short-term health effects (e.g., eye, nose or throat and lung irritation) in some personnel. Additionally, certain subgroups of the deployed forces (e.g., those with pre-existing asthma/cardio pulmonary conditions) are at greatest risk of developing notable health effects. Airborne environmental hazards at Camp Dwyer include wind-blown sand and vehicle emissions.

Typical military operations, including vehicular traffic, generators, aircraft and other local sources (including burning of waste) also contribute to the ambient environment at Camp Dwyer.

Limited environmental health surveillance occurred between 2009 and 2011. The summary of results follows.

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

2.2.1 Sample data/Notes:

Exposure Guidelines:
Short-term (24-hour) PM_{10} (µg/m^3): Negligible MEG=250, Marginal MEG=420, Critical MEG=600.
Long-term PM_{10} MEG (µg/m^3): Not Available.

There were only two 24-hour PM_{10} samples, one from December 2010 and the other from February 2011. The 2010 PM_{10} sample concentration was 137 µg/m^3. The 2011 PM_{10} sample concentration was 94 µg/m^3. Due to the limited amount of samples, a risk assessment could not be conducted.

2.2.2 Short-term health risks:

Not Evaluated. Not enough data were available to support a short-term health risk assessment.

2.2.3 Long-term health risk:

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

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

2.3.1 Sample data/Notes:

Exposure Guidelines:
Short-term (24-hour) $PM_{2.5}$ MEGs (µg/m^3): Negligible MEG=65, Marginal MEG=250, Critical MEG=500.
Long-term $PM_{2.5}$ MEGs: Negligible MEG=15, Marginal MEG=65.

A total of 41 valid $PM_{2.5}$ air samples were collected from 2009 – 2011 including 10 samples from the burn pits area. The range of 24-hour $PM_{2.5}$ concentrations was 13 µg/m^3 – 422 µg/m^3 with an average concentration of 134 µg/m^3 (95% CI = 110 µg/m^3 – 157 µg/m^3).

The nine burn pit $PM_{2.5}$ samples from 2009, all taken in October, did not have specific information on where they were taken other than they were taken at the burn pit. The one burn pit $PM_{2.5}$ sample from 2011, taken in January, was collected 100 yards from the burn pit. No information on the wind direction and placement of the samplers was available.

2.3.2 Short-term health risks:

Low/Moderate:

The short-term average $PM_{2.5}$ health risk estimate was Low based on the average concentration (134µg/m^3). The hazard severity was negligible (65µg/m^3 - 250µg/m^3) for average $PM_{2.5}$ exposures. The results predict that while a few personnel may have experienced notable eye, nose, and throat irritation, most personnel would only experience mild effects. Pre-existing health conditions (e.g., asthma, or cardiopulmonary diseases) could have been exacerbated (TG 230 Table 3-10). A low risk estimate for typical concentrations suggests that short-term exposure to $PM_{2.5}$ at Camp Dwyer would be expected to have little or no impact on mission readiness. Confidence in short-term $PM_{2.5}$ risk assessment is medium (TG 230, Table 3-6).

The short-term peak $PM_{2.5}$ health risk estimate was moderate based on the highest observed $PM_{2.5}$ concentration (422 µg/m^3). For the highest observed $PM_{2.5}$ concentration, the hazard severity was marginal (250µg/m^3 - 500µg/m^3). A moderate risk estimate for peak concentrations suggests that short-term exposure to peak $PM_{2.5}$ at Camp Dwyer would be expected to have an impact on mission readiness. During peak exposures at the marginal hazard severity level, a majority of personnel would experience notable eye, nose, and throat irritation and some respiratory effects. Some lost duty days would have been expected. Significant aerobic activity would increase risk. (TG 230 Table 3-10). The field data sheet for the $PM_{2.5}$ sample with the peak concentration on 27 July 2010 had no specific notes about conditions on that day.

2.3.3 Long-term health risks:

Moderate:

The long-term health risk estimate was moderate based on an average $PM_{2.5}$ concentration (134 µg/m^3) that exceeded the long-term $PM_{2.5}$ marginal MEG of 65 µg/m^3. A Moderate risk estimate for typical exposure concentrations suggests that long-term exposure to $PM_{2.5}$ at Camp Dwyer would be expected to require limited future medical surveillance activities and related resources. Confidence in the long-term $PM_{2.5}$ risk assessment is medium (TG 230 Table 3-6).

The hazard severity was marginal (>65µg/m^3) for average $PM_{2.5}$ exposures. The results predict that with repeated exposures above the marginal hazard severity threshold, it is plausible that development of chronic health conditions such as reduced lung function, exacerbated chronic bronchitis, chronic obstructive pulmonary disease (COPD), asthma, atherosclerosis, or other cardiopulmonary diseases could occur in generally healthy troops. Those with a history of asthma or cardiopulmonary disease are considered to be at particular risk.

2.4 Airborne Metals from PM_{10}

2.4.1 Sample data/Notes:

There were only two valid PM_{10} samples and there were no detected metals in the samples. A short-term or long-term health risk from metals in air could not be determined based on the very limited data available.

2.4.2 Short-term health risk:

Not Evaluated. Not enough data were available to support a short-term health risk assessment.

2.4.3 Long-term health risk:

Not Evaluated. Not enough data were available to support a long-term health risk assessment.

2.5 Volatile Organic Compounds (VOC)

2.5.1 Sample data/Notes:

There were four air samples collected and analyzed for volatile organic compounds (VOCs) using the EPA TO-17 sampling method; two in January 2011 and two in February 2011. Due to the extremely limited sampling data, short-term and long-term health risks from airborne organics cannot be identified at Camp Dwyer.

In the four TO-17 samples, 11 chemicals were detected in one or more samples. Ten of the detected chemicals had 1-year negligible air MEGs but none of those ten chemicals exceeded their MEGs. One chemical, Decane, was detected in two of the four TO-17 samples; however, there was no 1-year negligible air MEG for Decane. Only 1 hour negligible, marginal and critical air MEGs for Decane were available. The maximum detected Decane concentration, 2.09 µg/m^3 was significantly below the negligible 1 hour air MEG of 1000 µg/m^3.

2.5.2 Short and long-term health risks:

Not Evaluated. No data were available to support a short-term or long-term health risk assessment.

3 Soil

3.1 Site-Specific Sources Identified

3.2 Sample data/Notes:

Fourteen soil samples were collected at Camp Dwyer during 2009 and 2010 and analyzed for the following parameters: heavy metals, semi-volatile organic compounds (SVOCs), VOCs, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), insecticides, herbicides fungicides and radionuclides. In 2009, three samples were collected from centrally located areas of Camp Dwyer. In 2010, eleven samples were collected at or near the burn pit.

Nine chemicals were detected in the 2009 soil samples at the camp. Of those chemicals, only Phenanthrene did not have a 1-year negligible soil MEG. The remaining detected chemicals did not exceed their 1-year negligible soil MEG.

Fifty Eight chemicals were detected in the soil samples collected in 2010 at the burn pits. Sixteen chemicals were detected that do not have 1-year negligible soil MEGs. The burn pit soil specific samples are discussed and evaluated in section 10.5. One of the chemicals without a soil MEG detected in the burn pit soil samples was Phenanthrene.

Phenanthrene was the only chemical detected in the camp soil in 2009 and in the burn pit soil in 2010. Phenanthrene is a polycyclic aromatic hydrocarbons (PAH). There is no 1-year negligible soil MEG for Phenanthrene, therefore a TG230 based risk estimate for Phenanthrene was not possible.

Chemicals detected in soil samples that do not have soil MEGs limited the ability to analyze the soil data. There were not enough information to conduct a camp wide long-term soil health risk assessment because limited sample information and a lack of MEGs for some of the detected chemicals.

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:

Not Evaluated. There were not enough data available to support a long-term health risk assessment.

4 Water

In order to assess the risk to US personnel from exposure to water in theater, the USAPHC identified the most probable exposure pathways based on available information. They were primary ingestion sources (a mix of bottled and treated water) and non-drinking. Non-drinking exposures (such as personal hygiene or food preparation sources) include sources for which significantly less than 5 liters of water are assumed to be ingested per day. The water samples were analyzed for metals, PAHs, VOCs, and SVOCs.

4.1 Drinking Water:

Camp Dwyer switched from Class I bottled water to water packaged by the Expeditionary Water Packing System (EWPS) in 2010. No samples were collected of the Class I bottled water prior to this transition. Only two samples of water produced by the EWPS were available in the DOEHRS.

Well water was treated with a reverse osmosis water purification unit (ROWPU) at Camp Dwyer. There were very limited samples; only six samples were collected in 2010, and a single sample in 2011. In four of the six ROWPU treated water samples taken in 2010, boron was detected. In the six samples, boron's average concentration of 0.98mg/L was above the 1 year negligible water MEG for 15 liters per day of water consumption, 0.93 mg/L. The average boron concentration in the ROWPU treated water was only slightly above the 1 year negligible water MEG for 15 liters per day of water consumption. The actual water consumption of personnel at Camp Dwyer would have influenced if boron screened out of analysis. The boron water MEG is based on a total dose of boron in a day. At 5 liters a day, the negligible MEG concentration is 2.8 mg/L, or a dose of 14mg daily. At 15 liters a day, the negligible MEG concentration is 0.93 mg/L, or a dose of 14mg daily. The average concentration of boron in the water at Dwyer was 0.98mg/l, so if personnel did not consume more than 14.2 liters of water a day, the hazard severity from boron would have been negligible.

The short-term risk and the long-term risk were related because the 14 day boron negligible water MEG was the same as the 1 year MEG. Boron is a chemical that deviates from the standard MEG hierarchy because following the standard hierarchy, the 1-year MEG would have allowed a higher long-term exposure than the 14 day MEG allowed for a short-term exposure.

4.1.1 Short-term health risk:

Not Evaluated. Not enough data were available to support a short-term health risk assessment on drinking water. There were insufficient samples to monitor for short-term water quality; the available samples are too sparse to reflect short duration changes in water quality. Short term health risks are based on peak concentrations but with less than a sample a month, peak concentrations data were not adequately monitored.

4.1.2 Long-term health risk:

Not Evaluated. Not enough data were available to support a long-term health risk assessment on drinking water. The available samples did not have a good temporal spacing during the year for an average to reflect the entire year.

4.2 Water: Used for Other Purposes (Personal Hygiene, Cooking, Showering, etc.)

Although the primary route of exposure for most microorganisms is ingestion of the 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.

Six samples representing non-drinking water exposures (personal hygiene, etc) were available for Camp Dwyer. These were from 2009 (five samples), and 2010 (one sample). Three of the samples from 2009 were treated water for non drinking use. The remaining three samples, two from 2009 and 1

from 2010, were non drinking water samples; however the field data sheet was unclear of the intended use of the water. There may have been contact before treatment or the field data sheet may have been incomplete. Due to the limited samples and the uncertainty of the use of some of the water, there are not enough data to support a risk assessment on water used for non drinking purposes.

In the five 2009 non drinking water samples, no chemicals exceeded their negligible 1 year screening criteria (2.5 times the negligible 5 liter per day 1 year negligible MEG). In 2009, sulfate ions were detected above the acute screening criteria (2.5 times the negligible 5 liter per day 14 day negligible MEG). No higher severity MEG was available.

4.2.1 Short-term health risk:

Not Evaluated. Not enough data available to support a short-term health risk assessment on non-drinking water.

4.2.2 Short and long-term health risks:

Not Evaluated. Not enough data were available to support a long-term health risk assessment for non-drinking water.

5 Military Unique

5.1 Chemical Biological, Radiological Nuclear (CBRN) Weapons:

The DOEHRS and MESL databases were searched for any information on this topic along with an Occupational and Environmental Health Site Assessment for Camp Dwyer. No military unique issues were found.

5.2 Depleted Uranium (DU):

No specific hazard sources were documented in DOEHRS or MESL or the Occupational and Environmental Health Site Assessment for Camp Dwyer. According to the DOD, the use of Depleted Uranium has not been used in Afghanistan.

5.3 Ionizing Radiation:

Ionizing radiation is emitted from medical X-ray and CAT scanners. Camp Dwyer has a Combat Support Hospital with several ionizing radiation sources. Exposure limiting controls are in place. Concrete barriers are used to contain the hazard area and warning signs are posted to clearly mark hazard area. No worker exposures exceeding radiation exposure standards have been identified.

Short-term and long-term health risks:

Low/Moderate: Low for persons not working in the combat support hospital, with a low confidence level. Moderate for the radiology staff and personnel frequently in the X-ray and CAT scan hazard area with a low confidence level.

5.4 Non-Ionizing Radiation:

No specific hazard sources were documented in the DOEHRS or deployment MESL from January 2009 through August 2011.

6 Endemic Disease1

Information was taken directly from the National Center for Medical Intelligence (NCMI), Baseline Infectious Disease Risk Assessment for Afghanistan, dated 24 August 2011. This document lists the endemic disease reported in the region, its specific unmitigated risks and severity and general health information about the disease. In addition, the Camp Dwyer OEHSA was reviewed for any related reporting of vectors and annotated where applicable.

6.1 Foodborne and Waterborne Diseases

Food borne and waterborne diseases in the area are transmitted through the consumption of local food and water. Sanitation is poor throughout the country, including major urban areas. Local 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 can be 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 can cause prolonged illness in a smaller percentage of unvaccinated personnel. Vaccination is required for DOD personnel and contractors. In addition, although not specifically assessed in this document, viral gastroenteritis (e.g., norovirus) and food poisoning (e.g., *Bacillus cereus*, *Clostridium perfringens*, and *Staphylococcus*) may cause significant outbreaks. Key disease risks are summarized below:

6.1.1 Diarrheal diseases (bacteriological)

High: Potential health risk to U.S. personnel is high year round. Risk is typically highest following spring floods. In general, bacterial agents such as enterotoxigenic *Escherichia coli*, *Campylobacter*, *Shigella*, and *Salmonella* are the most common causes of traveler's diarrhea wherever sanitary conditions are significantly below U.S. standards. The health risk of cholera is considered in its own health risk assessment. An operationally significant attack rate (potentially over 50% per month) could occur among personnel consuming local food, water, or ice. 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

[1] NOTE: “Risk” level refers to both severity of disease (without controls, for example vaccinations) and probability of disease based on local rates/endemic status. Diseases described are those presenting greater risk when compared with U.S. conditions. Most identified disease risks can and are being mitigated with military preventive medicine measures/policies.

High: Potential health risk to U.S. personnel is high year round. In non-indigenous personnel, hepatitis A typically occurs after consumption of fecally contaminated food or water. Infection also may occur through direct fecal-oral transmission under conditions of poor hygiene and sanitation. Childhood hepatitis A infections tend to be asymptomatic or have mild symptoms, whereas adults typically develop jaundice and other symptoms. In areas where high levels of hepatitis A virus circulate, the number of reported cases in the local population is usually low because asymptomatic childhood infections confer lifelong immunity to adults, reflected by high antibody prevalence. A small number of cases (less than 1% per month attack rate) could occur among unvaccinated personnel consuming local food, water, or ice. Field conditions (including primitive sanitation, lack of hand washing) may facilitate outbreaks driven by person-to-person spread. Common source outbreaks are also possible. Mitigation is in place, US Personnel do not drink untreated Afghan water. Water consumed by US/DOD personnel is treated on military camps. Typical case involves 1 to 3 weeks of debilitating symptoms, sometimes initially requiring inpatient care; recovery and return to duty may require a month or more.

6.1.3 Typhoid / paratyphoid fever

High: Potential health risk to U.S. personnel is high year round. Risk is typically highest following spring floods. Typhoid and paratyphoid are acquired through the consumption of fecally contaminated food or water. The two diseases are clinically similar, and in areas where they are endemic, typhoid typically accounts for 90 percent of cases. Asymptomatic carriers are common with typhoid and contribute to sustained transmission. In countries where hygiene and sanitation are poor or nonexistent, most cases occur in children; adult cases and outbreaks are rare because of immunity acquired in infancy or early childhood. In countries with a mixture of primitive and modern sanitation and hygiene, outbreaks of typhoid fever occur and may involve all age groups. A small number of cases (less than 1% per month attack rate) could occur among unvaccinated personnel consuming local food, water, or ice. Common source outbreaks may occur. Mitigation is in place, US Personnel do not drink untreated Afghan water. Water consumed by US/DOD personnel is treated on military camps. With appropriate treatment, typhoid and paratyphoid fever are debilitating febrile illnesses typically requiring 1 to 7 days of supportive care, followed by return to duty.

6.1.4 Diarrhea - protozoal

Moderate: Potential health risk to U.S. personnel is Moderate year round. Risk is typically highest following spring floods. In general, *Cryptosporidium* spp., *Entamoeba histolytica*, and *Giardia lamblia* are the most common protozoal causes of diarrhea wherever sanitary conditions are significantly below U.S. standards. A small number of cases (less than 1% per month attack rate) could occur among personnel consuming local food, water, or ice. Outbreaks affecting a higher percentage of personnel are possible with *Cryptosporidium*. Mitigation is in place, US Personnel do not drink untreated Afghan water. Water consumed by US/DOD personnel is treated on military camps. Symptomatic cases may vary in severity; typically mild disease demonstrating recovery and return to duty in less than 72 hours with appropriate therapy; severe cases may require 1 to 7 days of supportive care, followed by return to duty.

6.1.5 Brucellosis

Moderate: Potential health risk to U.S. personnel is Moderate year round. Brucellosis is a common disease in cattle, sheep, goats, swine, and some wildlife species in most developing countries. Humans contract brucellosis through consumption of contaminated dairy products (or foods made with such products) or by occupational exposures to infected animals. The health risk from direct animal contact is likely to be highest in rural areas where livestock are present. However, the health risk from contaminated dairy products is present countrywide, including urban areas. Rare cases (less than 0.1% per month attack rate) could occur among personnel consuming local dairy products or having direct contact with livestock. Mitigation is in place, US Personnel do not drink untreated Afghan water. Water consumed by US/DOD personnel is treated on military camps. With appropriate treatment, brucellosis is a febrile illness of variable severity, potentially requiring inpatient care; convalescence is usually over 7 days even with appropriate treatment.

6.1.6 Diarrhea - cholera

Moderate: Potential health risk to U.S. personnel is Moderate year round. Risk is greatest during warmer months when water sources dry up and there is widespread use of open irrigation canals for domestic water. Development of symptomatic cholera requires exposure to large inoculums and typically is associated with ingestion of heavily contaminated food or water. Person-to-person spread of cholera occurs very infrequently, if at all. Children, the elderly, or people with low gastric acidity (or those taking antacids or acid blockers) are at increased risk of developing symptoms. The majority of infections (75 percent or more, depending on biotype) among healthy adults are very mild or asymptomatic. Only a small percentage of infections are severe. Because cholera frequently causes serious public health impact, cholera cases are more likely to be reported under the International Health Regulations than other types of diarrhea. However, official reports generally underestimate the actual levels of circulating pathogen. In addition, the diagnosis of "watery diarrhea" is often used to avoid specific reporting as cholera. Rare cases (less than 0.1% per month attack rate) could occur among personnel consuming local food, water, or ice. Mitigation is in place, US Personnel do not drink untreated Afghan water. Water consumed by US/DOD personnel is treated on military camps. Most symptomatic cases are mild, with recovery and return to duty in less than 72 hours on appropriate outpatient treatment; severe cases may require 1-7 days of supportive or inpatient care, followed by return to duty.

6.1.7 Hepatitis E

Moderate: Potential health risk to U.S. personnel is Moderate year round. Risk is typically highest following spring floods. Hepatitis E occurs in 4 major genotypes. Genotypes 1 and 2, found primarily in Africa and Asia, cause large numbers of sporadic cases, as well as large outbreaks. Fecal contamination of drinking water is the most common source of exposure for these genotypes. Large outbreaks are usually associated with particularly severe breakdowns in baseline sanitation, as often occurs during heavy rainfall which increases mixing of sewage and drinking water sources. Secondary household cases from person-to-person transmission are uncommon. Unlike hepatitis A, where local populations living in poor sanitary conditions are usually highly immune from childhood exposures, immunity levels for hepatitis E are often much lower, even in areas of extremely poor sanitation. Typically, outbreaks of hepatitis E occur primarily among adults; infections among children are less common. Although data are insufficient to assess potential disease rates, we cannot rule out rates approaching 1 percent per month among personnel consuming local food, water, or ice. Rates may

exceed 1 percent per month for personnel heavily exposed during outbreaks in the local population. Mitigation is in place, US Personnel do not drink untreated Afghan water. Water consumed by US/DOD personnel is treated on military camps. Typical case involves 1 to 3 weeks of debilitating symptoms, sometimes initially requiring inpatient care; recovery and return to duty may require a month or more. Infection with genotypes 1 or 2 during the third trimester of pregnancy is associated with a 20 percent fatality rate.

6.1.8 Short-term Health Risks:

Moderate to high: The overall short-term unmitigated risk associated with food borne and waterborne diseases is considered High (for bacterial diarrhea, hepatitis A, typhoid fever / paratyphoid fever) to Moderate (for diarrhea-protozoal, diarrhea-cholera, brucellosis, hepatitis E) if local food or water is consumed. Preventive Medicine measures such as vaccinations reduce the risk estimate to none (for Hepatitis A and Typhoid fever). Additionally, U.S. Forces are provided food and water from approved sources. Confidence in the health risk estimate is High (NCMI 2011).

6.1.9 Long-term Health Risks:

None identified based on available data.

6.2 Arthropod Vector-Borne Diseases

During the warmer months, the climate and ecological habitat support populations of arthropod vectors, including mosquitoes, ticks, mites, and sandflies. Significant disease transmission is sustained countrywide, including urban areas. Malaria, the major vector-borne health risk in Afghanistan, is capable of debilitating a high percentage of personnel for up to a week or more. In addition, other vector-borne diseases are transmitted at low or unknown levels and may constitute a significant health risk.

6.2.1 Malaria (Risk can vary with location, check NCMI site)

High: Potential unmitigated risk to U.S. personnel is High during warmer months (typically March through November). Malaria incidents are often associated with the presence of agriculture activity, including irrigation systems and standing water, which provide breeding habitats for vectors. A small number of cases could occur among personnel exposed to mosquito (Anopheles spp.) bites. Malaria incidents can cause debilitating febrile illness typically requiring 1 to 7 days of inpatient care, followed by return to duty. Severe cases may require intensive care or prolonged convalescence, and fatalities can occur. Mitigation measures include mandated chemoprophylaxis and permethrin treated camouflage utility uniforms.

6.2.2 Leishmaniasis - cutaneous

Moderate: Potential health risk to U.S. personnel is Moderate year round Leishmaniasis is transmitted by sandflies. Transmission generally is limited to the warmer months. 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%). Mitigation measures in place include IPM practices and permethrin treated uniforms. Cutaneous infection is unlikely to be debilitating, though lesions can be disfiguring. Definitive treatment previously required non-urgent evacuation to the continental United States; currently, not all cases require evacuation. Mitigation measures in place include Integrated pest management (IPM) practices, and permethrin treated uniforms. In the 2011 OEHSA for Camp Dwyer, no data indicated a history of sand flies.

6.2.3 Leishmaniasis - visceral

Moderate: Potential health risk to U.S. personnel is Moderate year round. Leishmaniasis is transmitted by sandflies. Transmission generally is limited to the warmer months. Disease is assessed as present, but levels are unknown; rare cases possible among personnel exposed to sandfly bites in areas with infected humans, dogs, or other reservoir animals. Asymptomatic chronic infections may occur which may become symptomatic years later. In groups of personnel exposed to heavily infected sandflies in focal areas, attack rates can be very high (over 50%). Mitigation measures in place include IPM practices and permethrin treated uniforms. Cutaneous infection is unlikely to be debilitating, though lesions can be disfiguring. Definitive treatment previously required non-urgent evacuation to the continental United States; currently, not all cases require evacuation. Mitigation measures in place include Integrated pest management (IPM) practices, and permethrin treated uniforms. In the 2011 OEHSA of Camp Dwyer, no data indicated a history of sand flies.

6.2.4 Crimean-Congo hemorrhagic fever

Moderate: Potential health risk to U.S. personnel is Moderate year round with peak transmission from March through November. Risk from tick-borne transmission is limited primarily to warmer months. Risk of transmission from animal contact is present year-round. Most primary Crimean-Congo hemorrhagic fever (CCHF) infections occur as sporadic cases or clusters of cases, and are associated with tick bites or occupational contact with blood or secretions from infected animals. Outbreaks of CCHF occur infrequently, but may be associated with changes in agricultural land use that increase tick contact or incursions of susceptible populations into areas where the disease is endemic. Rare cases (less than 0.1% per month attack rate) could occur among personnel exposed to tick bites. Direct contact with blood and body fluids of an infected animal or person may also transmit infection. It is a very severe illness typically requiring intensive care with fatality rates from five to fifty percent. In the 2011 OEHSA of Camp Dwyer, no data indicated a history of ticks.

6.2.5 Sandfly fever

Moderate: Sandfly fever has a moderate health risk, and transmission generally is limited to the warmer months. The disease is transmitted by sandflies, which typically bite at night and breed in dark places rich in organic matter, particularly in rodent or other animal burrows. Other suitable habitats include leaf litter, rubble, loose earth, caves, and rock holes. Sandflies may be common in peridomestic settings. Abandoned dwellings, sometimes used by troops as temporary quarters, also can harbor significant numbers of sandflies. Stables and poultry pens in peridomestic areas also may harbor sandflies. Although data are insufficient to assess potential disease rates, 1 to 10 percent of personnel could be affected per month under worst case conditions. In small groups exposed to heavily infected sandfly populations in focal areas, attack rates can be very high (over 50 percent).

Incidents can result in debilitating febrile illness typically requiring 1 to 7 days of supportive care followed by return to duty. Mitigation measures in place include Integrated pest management (IPM) practices, and permethrin treated uniforms. In the 2011 OEHSA of Camp Dwyer, no data indicated a history of sand flies.

6.2.6 Plague

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

6.2.7 Typhus-miteborne (scrub typhus)

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

6.2.8 West Nile fever

Low: Potential health risk to U.S. personnel is Low with transmission generally limited to the warmer months. West Nile fever is present and is maintained by bird populations and multiple species of *Culex* mosquitoes that help to transfer the diseases from birds to humans. The majority of infections in young, healthy adults are asymptomatic although it can result in fever, headache, tiredness, and body aches, occasionally with a skin rash (on the trunk of the body) and swollen lymph glands.

6.2.9 Short -term health risks:

Low to High: The health risk estimate is high for malaria (infection rate of less than 1% per month), Moderate for leishmaniasis - cutaneous (acute), Crimean-Congo hemorrhagic fever, sandfly fever, typhus-miteborne; and Low for, the plague and West Nile fever. Health risk is reduced to low by proper wear of the uniform, application of repellent to exposed skin, and appropriate chemoprophylaxis. Confidence in health risk estimate is high (NCMI 2011).

6.2.10 Long -term health risks:

Moderate for the visceral [chronic] leishmaniasis. Confidence in the health risk estimate is High (NCMI 2011).

6.3 Water Contact Diseases

Operations or activities that involve extensive water contact may result in personnel being temporarily debilitated with leptospirosis in some locations. Leptospirosis health risk typically increases during flooding. In addition, although not specifically assessed in this document, bodies of surface water are likely to be contaminated with human and animal waste. Activities such as wading or swimming may result in exposures to enteric diseases such as diarrhea and hepatitis via incidental ingestion of water. Prolonged water contact also may lead to the development of a variety of potentially debilitating skin conditions such as bacterial or fungal dermatitis.

6.3.1 Leptospirosis

Moderate: Potential health risk to U.S. personnel is Moderate with transmission generally limited to the warmer months. Leptospirosis is a febrile illness with a worldwide distribution, which often goes unrecognized and unreported. Rodents, domestic livestock, and other animals are reservoirs for the causative agent (a spirochete) and shed the organism in their urine. Organisms remain viable in surface water or mud, particularly at temperatures at or above 22 °C (70 °F). Human infection occurs through direct contact of contaminated water or mud with abraded skin or mucous membranes. Concentrations of the organism in lakes, rivers, or other surface water may vary significantly from location to location. Transmission occurs in both rural and urban areas and may be increased during flooding. Ingestion of contaminated water can also lead to infection. The acute generalized illness associated with infection can 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. Although data are insufficient to assess potential disease rates, up to 1 to 10 % of personnel wading or swimming in bodies of water such as lakes, streams, or irrigated fields could be affected per month. In groups with prolonged exposure to heavily contaminated foci, attack rates can be high (up to 50 percent). Incidence could result in debilitating febrile illness typically requiring 1 to 7 days of inpatient care, followed by return to duty; some cases may require prolonged convalescence.

6.3.2 Short -term health risks:

Moderate: Health risk of leptospirosis is moderate during warmer months. Confidence in the health risk estimate is High (NCMI 2011).

6.3.3 Long -term health risks:

None identified based on available data.

6.4 Respiratory Diseases

Although not specifically assessed in this document, deployed U.S. forces may be exposed to a wide variety of common respiratory infections in the local population. These include influenza, pertussis, viral upper respiratory infections, viral and bacterial pneumonia, and others. 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.

6.4.1 Tuberculosis (TB)

Moderate: Potential health risk to U.S. personnel is Moderate year round. Transmission typically requires close and prolonged contact with an active case of pulmonary or laryngeal tuberculosis (TB), although it also can occur with more incidental contact. The likelihood of exposure to an active case varies with the overall incidence and the degree of contact with the local population, particularly those living in conditions of crowding and poverty. Tuberculin skin test (TST) conversion rates may be elevated over baseline for personnel with prolonged close exposure to local populations. A TST screening to detect latent infection may be warranted in personnel with a history of prolonged close exposure to local populations. Tuberculosis is evaluated as part of the Post Deployment Health Assessment (PDHA).

6.4.2 Meningococcal meningitis

Low: Potential health risk to U.S. personnel is Low year round. However, the health risk may be elevated during cooler months. Asymptomatic colonization and carriage of meningococcal bacteria are common worldwide, including within U.S. military populations; rare symptomatic cases may occur periodically in military populations, regardless of geographic location. Neisseria meningitidis group A predominates regionally. Meningococcal meningitis is potentially a very severe disease typically requiring intensive care; fatalities may occur in 5-15% of cases.

6.4.3 Short-term health risks:

Moderate (tuberculosis) to **Low** (for meningococcal meningitis). Confidence in the health risk estimate is High (NCMI 2011).

6.4.4 Long-term health risks:

None identified based on available data.

6.5 Soil-contact Diseases

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

Moderate: Potential risk to U.S. personnel is Moderate with transmission generally limited to the warmer months. Soil-transmitted helminths, including hookworms that infect humans (*Ancylostoma duodenale, Necator americanus*), *Strongyloides stercoralis*, and hookworms that infect animals (the cause of cutaneous larva migrans), are parasitic worms that live in soil contaminated with human or animal feces. Larvae can penetrate intact skin and cause human infection. Animals (including dogs, cats, and raccoons) shed hookworm species into the soil that can also penetrate human skin. When animal-shed hookworm larvae penetrate human skin, they leave a reddened, inflamed subcutaneous track as they burrow, giving rise to the name cutaneous larva migrans. Hookworms that infect animals typically cannot complete their life cycle in humans and remain in the skin without causing systemic symptoms. A small number of cases (less than 1% per month attack rate) could occur among personnel with direct skin exposure to soil contaminated with human or animal feces (including sleeping on bare ground, walking barefoot). Initial skin symptoms typically are mild and are not debilitating. However, systemic symptoms of fever, cough, abdominal pain, nausea, and diarrhea may develop weeks to months after initial infection with hookworm or *Strongyloides*. Chronic intestinal infection may persist for months to years, with low-level or intermittent intestinal symptoms, anemia, and weight loss. More severe infections with high worm burden may be debilitating in some cases.

6.5.2 Short-term and Long-term health risks:

Short-term health risks:
Moderate: The risk assessment for soil-transmitted helminths (hookworm, strongyloidiasis, and cutaneous larva migrans) is Moderate. Confidence in the risk estimate is medium.

Long-term health risks:
Moderate: The risk assessment for soil-transmitted helminths (hookworm, and strongyloidiasis~~)~~ and cutaneous larva migrans) is Moderate. Confidence in the risk estimate is medium.

6.6 Animal-Contact Diseases

6.6.1 Rabies

Moderate: Potential health risk to U.S. personnel is Moderate year round. Rabies is transmitted by exposure to virus-laden saliva of an infected animal, typically through bites. Prevalence in feral and wildlife populations are well above U.S. levels due to the lack of organized control programs. Personnel bitten by potentially infected reservoir species may develop rabies in the absence of appropriate prophylaxis. The circumstances of the bite should be considered in evaluating individual health risk; in addition to dogs and cats, bats or wild carnivores should be regarded as rabid unless proven otherwise. General Order 1B mitigates rabies risk by prohibiting contact with or adoption or feeding of feral animals. Very severe illness with near 100% fatality rate can occur in the absence of post-exposure prophylaxis. Typically the time period from exposure to the onset of symptoms is 2 – 12 weeks, but can rarely take several years. Rabies mitigation measures at Camp Dwyer included rodent,

cat, dog, and carnivorous mammal tracking, rodent control using traps and rodenticide, and administration of post-exposure prophylaxis when appropriate.

6.6.2 Anthrax

Low: Potential health risk to U.S. personnel is Low year round. Anthrax is a naturally occurring infection of livestock and wild herbivores with a worldwide distribution. Rare cases (less than 0.1% per month attack rate) could occur among personnel with occupational-type exposure to livestock or wild herbivores, hides, wool products from these species, as well as handling or consumption of undercooked meat. In the absence of such exposures, the health risk is essentially zero. Inhalation cases raise the possibility of weaponized agent. Cutaneous and gastrointestinal anthrax are the most common forms of naturally occurring anthrax. The health risk of naturally acquired inhalation (pulmonary) anthrax is remote. Cutaneous anthrax typically requires 1 to 7 days of supportive care with subsequent return to duty; gastrointestinal anthrax typically requires hospitalization, and has a high fatality rate if untreated. Inhalation anthrax is very severe, often requiring intensive care; fatalities may occur even in treated cases.

6.6.3 Q-Fever

Moderate: Potential health risk to U.S. personnel is Moderate 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.

6.6.4 H5N1 avian influenza

Low: Potential health risk to U.S. personnel is Low. Although H5N1 avian influenza (AI) is easily transmitted among birds, bird-to-human transmission is extremely inefficient. Human infections have occurred on a very rare basis and have been associated with activities involving close, direct contact with infected poultry, such as plucking, slaughter, or other handling. There is no health risk from consumption of properly cooked poultry products. Human-to-human transmission appears to be exceedingly rare, even among relatively close contacts. Extremely rare cases (less than 0.01% per month attack rate) could occur. Incidence could result in very severe illness with fatality rate higher than 50 percent in symptomatic cases.

6.6.5 Short-term health risks:

Low to Moderate: Low short-term health risk for H5N1 avian influenza, and anthrax due to rare occurrence to Moderate for rabies, and Q-fever). Confidence in the health risk estimate is High (NCMI 2011).

6.6.6 Long-term health risks:

Low: The long term risk for rabies is Low.

7 Venomous Animal/Insect

All information was taken directly from the Clinical Toxinology Resources web site (http://www.toxinology.com/) from the University of Adelaide, Australia. The species listed below have home ranges that overlap the location of Camp Dwyer, and may present a health risk if they are encountered by personnel. See Section 9 for more information about pesticides and pest control measures.

7.1 Spiders

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

7.2 Scorpions

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

- *Compsobuthus rugosulus, Compsobuthus tofti, Mesobuthus caucasicus, Mesobuthus eupeus, Mesobuthus macmahoni, Orthochirus afghanus, Orthochirus bicolor, Orthochirus danielleae, Orthochirus erardi, Orthochirus heratensis, Orthochirus pallidus, Orthochirus scrobiculosus,* There are a number of dangerous Buthid scorpions, but also others known to cause minimal effects only. Without clinical data it is unclear where this species fits within that spectrum. Severe envenoming possible, potential lethality and systemic effects unknown.

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

7.3 Snakes

- *Echis multisquamatus* (central Asian saw-scaled viper), Severe envenoming possible, potentially lethal. Bites may cause moderate to severe coagulopathy and haemorrhagins causing extensive bleeding.

- Hemorrhis ravergieri (Spotted Whip Snake), and Telescopus rhinopoma (Indian Desert Cat Snake): Mild venom is most likely to produce minor local pain and swelling only. Bites require symptomatic treatment only.

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

- Psammophis lineolatus (Teer snake): Unlikely to cause significant envenoming. Bites require symptomatic treatment only.

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

7.4 Short-term health risk:

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

7.5 Long-term health risk:

None identified.

8 Heat/Cold Stress

Camp Dwyer has a dry climate ranging from 30 ^{O}F- 100 ^{O}F, with yearly highs above 100^{O}F. Summers are hot and dry with low humidity. Winters last from October to March.

8.1 Heat

8.1.1 Short-term health risk:

Low to High: High health risk of heat injury in unacclimatized personnel from April – October, Moderate in March and November and Low from December – February. The risk of heat injury is reduced through preventive measures. Because the occurrence of heat stress/injury is strongly dependent on operational factors (work intensity and clothing), confidence in the health risk estimate is low.

8.1.2 Long-term health risk:

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. Confidence in these risk estimates is low.

Long-term health implications from heat injuries are rare but can occur, especially resulting from more serious injuries such as heat stroke. It is possible that high heat in conjunction with various chemical exposures can increase long-term health risks, though specific scientific evidence is not conclusive.

8.2 Cold

Even on warm days there can be a significant drop in temperature after sunset by as much as 40 °F. There is a risk of cold stress/injury when temperatures fall below 60 °F, which can occur from September – April. The health risk assessment for non-freezing cold injuries (chilblain, trench foot, and hypothermia) is Low based on historical temperature and precipitation data. As with heat stress/injuries, cold stress/injuries are largely dependent on operational and individual factors instead of environmental factors alone. With protective measures in place the health risk assessment is low for cold stress/injury; confidence in the health risk estimate is low.

8.2.1 Short-term and Long-term health risks:

Low: The risk of cold injury is low. Confidence in this risk estimate is low.

9 Noise

9.1 Continuous

There were several stand-alone generators located throughout Camp Dwyer generating a continuous noise exposure. Workers on or adjacent to flight lines are further exposed to significant noise levels from aircraft. Vehicles also provide a source of occupational exposure to noise. Combat support hospital clinical staffs are exposed to noise when transporting patients from helicopters. Workers are provided appropriate protective equipment when and where needed.

9.1.1 Short-term health risks:

Low to Moderate: Moderate risk for personnel working near major noise sources. Low risk to the majority of personnel working near major noise sources who wear proper hearing protection with a low confidence level due to limited data.

9.1.2 Long-term health risks:

Low to High: Moderate to High risk for personnel not wearing hearing protection (dependent on magnitude, frequency and duration of exposures). Low risk for personnel working near major noise sources who wear proper hearing protection.

9.2 Impulse

No impulse noise evaluations conducted, not evaluated.

9.2.1 Short-term and Long-term health risks:

Not Evaluated. No available impulse noise evaluation. No identified health risks.

10 Unique Incidents/Concerns/Occupational Hazards

10.1 Potential environmental contamination sources

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

In the OEHSA, several activities at Camp Dwyer were identified; Vehicle/Heavy Equipment Maintenance, Aircraft Maintenance, Communications Electronics Maintenance, Generator Maintenance, Concrete Production, Petroleum Distribution, and Airfield Construction and maintenance.

The activities can be associated with a low to moderate risk, based on exposure to physical, dermal and inhalation hazards. A moderate risk was identified from noise and industrial chemicals during Vehicle/Heavy Equipment Maintenance, however proper protective equipment would reduce the risk to low. Moderate risk was identified for exposure to dust at the concrete plant, but protective equipment would reduce the risk to low. Exposure to JP-8 at Petroleum Distribution was identified as a moderate risk, but with protective equipment, the risk would be reduced.

10.1.1 Short-term and Long-term health risks

Low: Low risk if protective equipment is used during industrial activities at Camp Dwyer.

10.2 Fuel/petroleum products/industrial chemical spills

There is a central fuel point at Camp Dwyer with JP-8 stored above ground. The central fuel farm has good secondary containment.

At the flight line, there is above ground storage of JP-8. The flight line fuel farm has good secondary containment.

At the Central Asia Development Group (CADG) concrete lot, there is diesel fuel stored above ground for use by CADG only.

In 2010, 30 gallons of engine oil spilled at the Supply Management Unit lot. The contaminated soil was removed by a contractor.

10.2.1 Short-term and Long-term health risks

Low: Low risk risk with a low confidence level.

10.3 Waste Sites/Waste Disposal:

Solid waste was collected from trash receptacles, transferred to dumpsters, and transported to the burn pit by garbage trucks. At the burn pits, the solid waste was disposed of via open burning. Burn pits are addressed separately in section 10.5. Items prohibited from the burn pit were sorted from waste prior to burning. Plastic bottles and aluminum cans were recycled. Tires and steel were placed at a site adjacent to the burn pit. Hazardous waste was stored in a hazardous waste yard.

There is a medical waste incinerator located at Camp Dwyer in the hazardous waste storage area. It incinerates 200 to 500 pounds of regulated medical waste a day. It has a 20 foot smoke stack.

10.3.1 Short-term and Long-term health risks

Not Evaluated. Not enough data available to support a risk assessment.

10.4 Pesticides/Pest Control:

There were reports of rodents, termites and filth flies on site, which were controlled through the application of rodenticides and pesticides. There were no reports that indicated accidents, misuse, misapplication or other hazards associated with rodenticide or pesticide use. Chemical rodenticides and pesticides that were used at Camp Dwyer include Final Blox, Final Place Packs, Contrac Blox, Amdro Fire Ant Bait, Maxforce Ant FC Bait Station, Termidor SC, Maxforce Fly Bait, Maxforce Fly Spot, Golden Malrin Fly Bait, and Summit BTI Briquets.

There were reports of stray dogs, cats, rabbits, chickens, and mice at Camp Dwyer. Vector Control was conducted by DynCorp.

10.4.1 Short-term and Long-term health risks

Low: Health risk is Low. Confidence in the health risk assessment is low.

10.5 Burn Pit

As of 18 February 2011, there were two open burn pits located in the northeast part of Camp Dwyer. The January and February 2011 OEHSA described the burn pits to be approximately 40 feet by 40 feet. The trash was burned daily with the amount varying due to changing levels of activity. In 2009 and 2011 limited air samples were collected at the burn pits. In 2010, soil samples were collected at the burn pits. Personnel may have experienced notable eye, nose, and throat irritation and some respiratory effects. Significant aerobic activity would have increased risk.

From the limited data available, the $PM_{2.5}$ exposure at the burn pit is similar to the general $PM_{2.5}$ exposure at Camp Dwyer. Air samples were collected adjacent to the burn pits in 2009 and 2011. In 2009, nine $PM_{2.5}$ samples were collected in October. In 2011, a single $PM_{2.5}$ sample was obtained in January. Since the $PM_{2.5}$ samples were limited to a single month in 2009, and a single sample in 2011, a risk assessment was not possible solely on burn pit samples. In October 2009, the minimum $PM_{2.5}$ concentration detected at the burn pit was 42 µg/m^3, the average was 144 µg/m^3, and the maximum was 226 µg/m^3. In 2011, the single burn pit $PM_{2.5}$ sample had a concentration of 140 µg/m^3. The peak $PM_{2.5}$ sample from the burn pit samples, 226 µg/m^3, was less than the peak general $PM_{2.5}$ sample, 422 µg/m^3 collected at Camp Dwyer. The average $PM_{2.5}$ concentration in the October 2009 burn pit samples, 144 µg/m^3, was above the general $PM_{2.5}$ sample average, 134 µg/m^3, but both were greater than the marginal long term $PM_{2.5}$ MEG of 65 µg/m^3 and less than the marginal $PM_{2.5}$ short term $PM_{2.5}$ MEG of 250 µg/m^3. No PM_{10} samples, metals in air information, or organics in air samples were obtained at the Dwyer burn pits. There is not enough data to determine an inhalation risk from exposure to the Camp Dwyer burn pits.

In 2010, 11 soil samples were collected at the burn pits. Sixteen chemicals were detected that do not have soil MEGs. The detected chemicals in the Camp Dwyer burn pit soil samples were primarily pesticides (herbicides, fungicides, and insecticides). All of the pesticides detected without soil MEGs were (analytical) J-flagged values, meaning they were detected below the method detection limit (MDL). Only one chemical 2-Nitrophenol was detected in one sample with a concentration of 0.359 mg/kg, above its 1-year negligible soil MEG of 0.0227 mg/kg. The average population exposure point concentration (PEPC) for 2-Nitrophenol in the burn pit samples was 0.259 mg/kg. It was not possible to assign a severity to the 2-Nitrophenol exposure due to the lack of a marginal soil MEG. The long term risk level from 2-Nitrophenol in the 2010 burn pit soil samples was not able to be determined. A

chemical related to 2-Nitrophenol, 4-Nitrophenol, was also detected at the burn pit; however, 4-Nitrophenol does not have a soil MEG. The Agency for Toxic Substances and Disease Registry Public Health Statement for Nitrophenols lists 2-Nitrophenol and 4-Nitrophenol as chemicals used to produce fungicides. Other than the 16 substances that did not have soil MEGs, and 2-Nitrophenol, all chemicals detected in the burn pit soil samples were below their 1 year negligible soil MEG. The overall long term risk level was unable to be determined for burn pit soil at Camp Dwyer.

While not specific to Camp Dwyer, the consolidated epidemiological and environmental sampling studies on burn pits that have been conducted to date were unable to say whether an association does or does not exist between exposures to emissions from the burn pits and long-term health effects (Institute of Medicine 2011). The committee's review of the literature and the data suggests that service in Iraq or Afghanistan (i.e., a broader consideration of air pollution than exposure only to burn pit emissions) might 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.

10.5.1 Short-term and Long-term health risks

Not Evaluated. Not enough data were available to support a health risk assessment on exposure to the burn pit.

11 References[2]

1. Agency for Toxic Substances and Disease Registry (ATSDR) Public Health Statement for Nitrophenols, July 1992.

2. Casarett and Doull's Toxicology: the Basic Science of Exposures, Chapter 2- Principles of Toxicology; Fifth Edition, McGraw Hill, New York.

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

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

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

6. DoD MESL Data Portal: https://mesl.apgea.army.mil/mesl/.Some of the data and reports used may be classified or otherwise have some restricted distribution.

7. Goldman RF. 2001. Introduction to heat-related problems in military operations. *In*: Textbook of military medicine: medical aspects of harsh environments Vol. 1, Pandolf KB, and Burr RE (Eds.), Office of the Surgeon General, Department of the Army, Washington DC.

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

9. Joint Staff Memorandum (MCM) 0028-07, Procedures for Deployment Health Surveillance, 2007.

10. National Center for Medical Intelligence (NCMI). 2011. Defense Intelligence Report: (U) Baseline Infectious Disease Risk Assessment CENTCOM: Afghanistan. Defense Intelligence Agency, https://www.intelink.gov/ncmi/index.php.

11. Occupational and Environmental Health Site Assessment (OEHSA) Camp Dwyer, Afghanistan, 2011.

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

12. USA PHC TG230, June 2010 Revision.

13. USACHPPM 2008 Particulate Matter Factsheet; 64-009-0708, 2008.

12 Where Do I Get More Information?

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