Military Deployment

Periodic Occupational and Environmental Monitoring Summary (POEMS):
Camp Leatherneck and vicinity, Afghanistan

Calendar Years: (2014 to 2016)

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

PURPOSE: This POEMS documents the Department of Defense (DoD) assessment of occupational and environmental health (OEH) risk for Camp Leatherneck and vicinity that includes: Camps Leatherneck (Tombstone); Barber; Viking, ABC, Achabetti; Afghan national Police (ANP) Hill; Antonik; Aries 2; Badger; Bishop; Bolan; Boldak; Bouresches; Calero (Shorbak); Chosin; Dangar; Dayton; Delmar; Didgori; Duluth; Edinburgh; Eiffel; El Haam; El Paso; Enguri; Eredvi; Ertoba; Faizel; Fulod (Fulad, Sangin); Gettysburgh; Habib; Hanson (Sher Wali); Honeycutt; Januup; Juno; Kelly; Kems Bazaar; Khalil; Kopp; Kodori; Kunjik; Lambadand (Lamba Dand); Lazika; Mahafiz; Marjah (Marjeh); Maywand; Mehraj; Meis (Ward); Moose; Musa Qualah District Center (DC) (Musa Qa'ah DC, Musa Qa'eh); Orbi; Ouellette (Padnick); Musa Qualah (Mirage); Palacio; Paserlay; Pleiku; Price (Provincial Supply Point (PSP) North); Quarta; Reilly; Sacramento; Saenz; Said Abdul Khalil; Saipan; Shar Ghazay (Shir Ghazy); Shukvani; Shurakay; Silab; Sommerville; Wakil Wazir; and Tarbett; Patrol Bases (PB) 7171; Azziz Ullah; Bandini; Beatley; Beirut; Camel; Compton; Deh Karez; Dehanna Station; Detroit; Garrett; Grand Rapids; Griffin; Grosse Pointe; Judge; Khearase; Kimmel; Kunjak; Lakeside; Lambert; Long Beach; Mahar; Mcelhiney; Muller; Hue City; Reading (Tulsa); Rogers; Salaam Bazaar; Salaor Lara; San Jose; Savannah; Shanfield; Sockalosky; Sofia; South Boston; Talibjan; Tijuana; Troy; Typhoon 3; Typhoon 4; Typhoon 5; Wilson; and Zaehringer; and Combat Outposts (COP) Ape Marcie; Azadi; Coutu; Dakota; Himaal; Huskers; Mangal (Mangool); Now Zad (Cafaretta); Padlek; Panda Ridge; Afghanistan Police Provincial Police Headquarters (AP PPHQ); Seattle; Shamal District Center; and Yazzie. It presents a qualitative summary of OEH risks identified at this location and their potential medical implications. The report is based on information collected from 24 June 2014 through 31 December 2016 to include deployment OEH surveillance sampling and monitoring data (e.g., air, water, and soil), field investigation and health assessment reports, as well as country and area-specific information on endemic diseases.

This assessment assumes that environmental sampling at Camp Leatherneck and vicinity during this period was performed at representative exposure points selected to characterize health risks at the population-level. Due to the nature of environmental sampling, the data upon which this report is based may not be fully representative of all the fluctuations in environmental quality or capture unique occurrences. While one might expect health risks pertaining to historic or future conditions at this site to be similar to those described in this report, the health risk assessment is limited to 24 June 2014 through 31 December 2016.

The POEMS can be useful to inform healthcare providers and others of environmental conditions experienced by individuals deployed to Camp Leatherneck and vicinity during the period of this assessment. However, it does not represent an individual exposure profile. Individual exposures depend on many variables such as; how long, how often, where and what someone is doing while working and/or spending time outside. Individual outdoor activities and associated routes of exposure are extremely variable and cannot be identified from or during environmental sampling. Individuals who sought medical treatment related to OEH exposures while deployed should have exposure/treatment noted in their medical record on a Standard Form (SF) 600 (Chronological Record of Medical Care).

SITE DESCRIPTION:

Camp Leatherneck and vicinity is located in the Helmand province. Camp Bastion is the main British outpost in Afghanistan and was established in April 2006. The base is divided into two main parts, Bastion 1 and Bastion 2, and is adjoined to Camp Leatherneck (formerly Camp Tombstone) and the
Afghan National Army Camp Shorabak. Bastion 2 includes two tenant camps, Camp Barber and Camp Viking. The remaining sites included in this POEMS are located in the vicinity of Camp Leatherneck. Potential environmental contamination sources may include wind-blown sand, commercial industry, agricultural and vehicle emissions. Typical military operations, including exhaust from vehicles, aircraft and generators, fueling operations, and other local sources including burning of waste (incinerator and burn pit) will also contribute to the ambient environment at these locations.

**SUMMARY:** Conditions that may pose a Moderate or greater health risk are summarized in Table 1. Table 2 provides population based risk estimates for identified OEH conditions at Camp Leatherneck and vicinity. As indicated in the detailed sections that follow Table 2, controls established to reduce health risk were factored into this assessment. In some cases, e.g., ambient air, specific controls are noted, but not routinely available/feasible.
## Table 1: Summary of Occupational and Environmental Conditions with MODERATE or Greater Health Risk

<table>
<thead>
<tr>
<th>Short-term health risks &amp; medical implications:</th>
<th>Long-term health risks &amp; medical implications:</th>
</tr>
</thead>
<tbody>
<tr>
<td>The following hazards may be associated with potential acute health effects in some personnel during deployment at Camp Leatherneck and vicinity that includes: Camps Leatherneck (Tombstone); Barber; Viking, ABC, Achabetti; Afghan national Police (ANP) Hill; Antonik; Aries 2; Badger; Bishop; Bolan; Boldak; Bouresches; Galero (Shorbak); Chosin; Dangar; Daytonia; Delmar; Didgori; Duluth; Edinburgh; Effel; El Haam; El Paso; Enguri; Eredvi; Ertoba; Faizel; Fulod (Fulad Sangin Fulod); Gettysburgh; Habib; Hanson (Sher Wali); Honeycutt; Januup; Juno; Keely; Kems Bazaar; Khalil; Kopp; Kodori; Kunjik; Lambadand (Lamba Dand); Lazika; Mahafiz; Marjah (Marjeh); Maywand; Mehraj; Meis (ward); Moose; Musa Qualah District Center (DC) (Musa Qal'ah DC); Obi; Ouellute (Padnick); Musa Qualah ( Mirage); Palacio; Paserlay; Pleiku; Price (Provincial Supply Point (PSP) North); Qura; Reilly; Sacramento; Saenz; Said Abdul Khalil; Saipan; Shar Ghazay (Shir Ghazy); Shukvani; Shurakay; Silab; Somerville; Wakil Wazir; and Tarbatt; Patrol Bases (PB) 7171; Azizz Ullah; Bandini; Beatley; Beirut; Carmel; Compton; Deh Karez; Dehannya Station; Detroit; Garrett; Grand Rapids; Griffin; Grosse Pointe; Judge; Khearse; Kimmel; Kunjak; Lakeside; Lambert; Long Beach; Mahar; Mcelhiney; Muller; Hue City; Reading (Tulsa); Rogers; Salaar Bazaar; Salaor Lara; San Jose; Savannah; Shanfield; Sockalosky; Sofia; South Boston; Talibian; Tijuana; Troy; Typhoon 3; Typhoon 4; Typhoon 5; Wilson; and Zaehring; and Combat Outposts (COP) Ape Marcie; Azadi; Coutu; Dakota; Himal; Huskers; Mangal (Mango); Now Zad (Caferetta); Padlek; Panda Ridge; Afghanistan Police Provincial Police Headquarters (AP PPHQ); Seattle; Shamal District Center; and Yazzie;</td>
<td>The following hazards may be associated with potential chronic health effects in some personnel during deployment at Camp Leatherneck and vicinity that includes: Camps Leatherneck (Tombstone); Barber; Viking, ABC, Achabetti; Afghan national Police (ANP) Hill; Antonik; Aries 2; Badger; Bishop; Bolan; Boldak; Bouresches; Galero (Shorbak); Chosin; Dangar; Daytonia; Delmar; Didgori; Duluth; Edinburgh; Effel; El Haam; El Paso; Enguri; Eredvi; Ertoba; Faizel; Fulod (Fulad Sangin Fulod); Gettysburgh; Habib; Hanson (Sher Wali); Honeycutt; Januup; Juno; Keely; Kems Bazaar; Khalil; Kopp; Kodori; Kunjik; Lambadand (Lamba Dand); Lazika; Mahafiz; Marjah (Marjeh); Maywand; Mehraj; Meis (ward); Moose; Musa Qualah District Center (DC) (Musa Qal'ah DC); Obi; Ouellute (Padnick); Musa Qualah ( Mirage); Palacio; Paserlay; Pleiku; Price (Provincial Supply Point (PSP) North); Qura; Reilly; Sacramento; Saenz; Said Abdul Khalil; Saipan; Shar Ghazay (Shir Ghazy); Shukvani; Shurakay; Silab; Somerville; Wakil Wazir; and Tarbatt; Patrol Bases (PB) 7171; Azizz Ullah; Bandini; Beatley; Beirut; Carmel; Compton; Deh Karez; Dehannya Station; Detroit; Garrett; Grand Rapids; Griffin; Grosse Pointe; Judge; Khearse; Kimmel; Kunjak; Lakeside; Lambert; Long Beach; Mahar; Mcelhiney; Muller; Hue City; Reading (Tulsa); Rogers; Salaar Bazaar; Salaor Lara; San Jose; Savannah; Shanfield; Sockalosky; Sofia; South Boston; Talibian; Tijuana; Troy; Typhoon 3; Typhoon 4; Typhoon 5; Wilson; and Zaehring; and Combat Outposts (COP) Ape Marcie; Azadi; Coutu; Dakota; Himal; Huskers; Mangal (Mango); Now Zad (Caferetta); Padlek; Panda Ridge; Afghanistan Police Provincial Police Headquarters (AP PPHQ); Seattle; Shamal District Center; and Yazzie;</td>
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<tr>
<td>Food/waterborne diseases (e.g., bacterial diarrhea, hepatitis A, typhoid/paratyphoid fever, diarrhea-cholera, diarrhea-protozoal, brucellosis, hepatitis E); other endemic diseases (malaria, cutaneous leishmaniasis (acute), Crimean-Congo hemorrhagic fever, sandfly fever, scrub typhus (mite-borne), leptospirosis, Tuberculosis (TB), rabies, Q fever, soil transmitted helminthes (hookworm, strongyloidiasis, cutaneous larva migrans); and heat stress. For food/waterborne diseases (e.g., bacterial diarrhea, hepatitis A, typhoid/paratyphoid fever, diarrhea-cholera, diarrhea-protozoal, brucellosis, hepatitis E), if ingesting local food and water, the health effects can temporarily incapacitate personnel (diarrhea) or result in prolonged illness (hepatitis A, typhoid/paratyphoid fever, brucellosis, hepatitis E). Risks from food/waterborne diseases may have been reduced with preventive medicine controls and mitigation, which includes hepatitis A and typhoid fever vaccinations and only drinking from approved water sources in accordance with standing CENTCOM policy. For other vector-borne endemic diseases (malaria, cutaneous leishmaniasis (acute), Crimean-Congo hemorrhagic fever, sandfly fever, scrub typhus (mite-borne)), these diseases may constitute a significant risk due to exposure to biting vectors; risk reduced to ‘Low’ by proper wear of the treated uniform, application of repellent to exposed skin, bed net use, and appropriate chemoprophylaxis, as well as minimizing areas of standing water and other vector-breeding areas. For water contact diseases (leptospirosis) activities involving extensive contact with surface water increase risk. For respiratory diseases (TB), personnel in close-quarter conditions could have been at risk for person-to-person spread. Animal contact diseases (rabies, Q fever), pose year-round risk. For soil transmitted helminthes (hookworm, strongyloidiasis, cutaneous larva migrans), risk may have been reduced by limiting exposure to soil contaminated with human or animal feces (including not sleeping on bare ground, and not walking barefoot). For heat stress, risk can be greater during months of April through October, and greater for susceptible persons including those older than 45, of low fitness level, unacclimatized, or with underlying medical conditions, and those under operational constraints (equipment, PPE, vehicles). Risks from heat stress may have been reduced with preventive medicine controls, work-rest cycles, proper hydration and nutrition, and mitigation.</td>
<td>Air quality: For inhalable coarse particulate matter less than 10 micrometers in diameter (PM10) from environmental dust (including incinerators), the PM10 overall short-term health risk was not evaluated due to insufficient data for analysis. For inhalable fine particulate matter less than 2.5 micrometers in diameter (PM2.5) from environmental dust (including incinerators), the PM2.5 overall short-term health risk was not evaluated due to insufficient data for analysis. However, the Camp Leatherneck and vicinity area is a dust-prone desert environment with a semi-arid climate, also subject to vehicle traffic. Consequently, exposures to PM10 and PM2.5 may vary, as conditions may vary, and may result in mild to more serious short-term health effects (e.g., eye, nose or throat and lung irritation) in some personnel while at this site, particularly exposures to high levels of dust such as during high winds or dust storms. For PM10 and PM2.5, certain subgroups of the deployed forces (e.g., those with pre-existing asthma/cardio-pulmonary conditions) are at greatest risk of developing notable health effects. Incinerators existed at Camp Leatherneck and vicinity; however, the PM10 and the PM2.5 overall short-term health risks specifically for incinerators were not evaluated due to no reports and no environmental samples collected near incinerators provided for analysis—see Section 10.7. Where incinerators exist, exposures may vary, and exposures to high levels of PM10 and PM2.5 from smoke may result in more serious short-term health effects (e.g., eye, nose or throat and lung irritation) in some personnel and certain subgroups. Although most short-term health effects from exposure to particulate matter and incinerator smoke should have resolved post-deployment, providers should be prepared to consider the relationship between deployment exposures and current complaints. Some individuals may have sought treatment for acute respiratory irritation while at Camp Leatherneck and vicinity. Personnel who reported with symptoms or required treatment while at site(s) with burn pit activity should have exposure and treatment noted in medical record (e.g., electronic medical record and/or on a Standard Form (SF) 600 (Chronological Record of Medical Care).</td>
</tr>
</tbody>
</table>
Camp Leatherneck and vicinity:

Air quality: For inhalable fine particulate matter less than 2.5 micrometers in diameter (PM$_{2.5}$) from environmental dust (including incinerators), the overall long-term health risk was not evaluated due to insufficient data for analysis. Inhalable coarse particulate matter less than 10 micrometers in diameter (PM$_{10}$) from environmental dust (including incinerators) was not evaluated for long-term health risk due to insufficient data for analysis and no available health guidelines. However, the Camp Leatherneck and vicinity area is a dust-prone desert environment with a semi-arid climate, also subject to vehicle traffic, and conditions may have varied. Incinerators existed at Camp Leatherneck and vicinity; however, the PM$_{10}$ and the PM$_{2.5}$ overall long-term health risks specifically for incinerators were not evaluated due to no reports and no environmental samples collected near incinerators provided for analysis—see Section 10.7. However, incinerator exposures may vary, as conditions may have varied. For inhalational exposure to high levels of dust containing PM$_{10}$ and PM$_{2.5}$, such as during high winds or dust storms, and for exposures to incinerator smoke, it is considered possible that some otherwise healthy personnel, who were exposed for a long-term period to dust and particulate matter, could develop certain health conditions (e.g., reduced lung function, cardiopulmonary disease). Personnel with a history of asthma or cardiopulmonary disease could potentially be more likely to develop such chronic health conditions. While the dust and particulate matter exposures and exposures to incinerators are acknowledged, at this time there were no specific recommended, post-deployment medical surveillance evaluations or treatments. Providers should still consider overall individual health status (e.g., any underlying conditions/susceptibilities) and any potential unique individual exposures (such as burn pits/barrels, incinerators, occupational or specific personal dosimeter data) when assessing individual concerns. Certain individuals may need to be followed/evaluated for specific occupational exposures/injuries (e.g., annual audiograms as part of the medical surveillance for those enrolled in the Hearing Conservation Program; and personnel covered by Respiratory Protection Program and/or Hazardous Waste/Emergency Responders Medical Surveillance).
### Table 2. Population-Based Health Risk Estimates - Camp Leatherneck and vicinity\(^1,2\)

<table>
<thead>
<tr>
<th>Source of Identified Health Risk(^3)</th>
<th>Unmitigated Health Risk Estimate(^4)</th>
<th>Control Measures Implemented</th>
<th>Residual Health Risk Estimate(^4)</th>
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<tbody>
<tr>
<td><strong>AIR</strong></td>
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<tr>
<td>Particulate matter less than 10 micrometers in diameter (PM(_{10}))</td>
<td>Short-term: Data were insufficient to characterize health risk. Daily levels vary, acute health effects (e.g., upper respiratory tract irritation) more pronounced during days with elevated PM levels. More serious effects are possible in susceptible persons (e.g., those with asthma/pre-existing respiratory diseases).</td>
<td>Limiting strenuous physical activities when air quality is especially poor; and actions such as closing tent flaps, windows, and doors.</td>
<td>Short-term: Data were insufficient to characterize health risk. Daily levels vary, acute health effects (e.g., upper respiratory tract irritation) more pronounced during days with elevated PM levels. More serious effects are possible in susceptible persons (e.g., those with asthma/pre-existing respiratory diseases).</td>
</tr>
<tr>
<td>Particulate matter less than 2.5 micrometers in diameter (PM(_{2.5}))</td>
<td>Long-term: No health guidelines</td>
<td></td>
<td>Long-term: No health guidelines</td>
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<tr>
<td><strong>ENDEMIC DISEASE</strong></td>
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<td>Foodborne / Waterborne (e.g., diarrhea-bacteriological)</td>
<td>Short-term: Data were insufficient to characterize health risk. Because Camp Leatherneck and vicinity is situated in a dusty semi-arid desert environment, a majority of the time mild acute (short term) health effects are anticipated. Elevated levels may produce mild eye, nose, or throat irritation in some personnel and pre-existing health conditions (e.g., asthma, or cardiopulmonary diseases) may be exacerbated.</td>
<td>Limiting strenuous physical activities when air quality is especially poor; taking actions such as closing tent flaps, windows, and doors.</td>
<td>Long-term: Data were insufficient to characterize health risk. A small percentage of personnel may be at increased risk for developing chronic conditions. Particularly those more susceptible to acute effects (e.g., those with asthma/pre-existing respiratory diseases).</td>
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<tr>
<td>Arthropod Vector Borne</td>
<td>Long-term: Data were insufficient to characterize health risk. A small percentage of personnel may be at increased risk for developing chronic conditions. Particularly those more susceptible to acute effects (e.g., those with asthma/pre-existing respiratory diseases).</td>
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<td>Water-Contact (e.g., wading, swimming)</td>
<td>Short-term: Moderate for leptospirosis</td>
<td>Preventive measures include proper wear of treated uniform, application of repellent to exposed skin, bed net use, minimizing areas of standing water and appropriate chemoprophylaxis.</td>
<td>Short-term: Low for leptospirosis.</td>
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<td></td>
<td>Long-term: No data available</td>
<td></td>
<td>Long-term: No data available</td>
</tr>
<tr>
<td>Source of Identified Health Risk</td>
<td>Unmitigated Health Risk Estimate</td>
<td>Control Measures Implemented</td>
<td>Residual Health Risk Estimate</td>
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<td><strong>Respiratory</strong></td>
<td>Short-term: Variable; Moderate for tuberculosis (TB) to Low for meningococcal meningitis and Middle East respiratory syndrome coronavirus (MERS-CoV). Long-term: No data available.</td>
<td>Providing adequate living and work space; medical screening.</td>
<td>Short-term: Low Long-term: No data available</td>
</tr>
<tr>
<td><strong>Animal Contact</strong></td>
<td>Short-term: Variable; Moderate for rabies, Q-fever to Low for anthrax, and avian influenza. Long-term: Low (Rabies)</td>
<td>Prohibiting contact with, adoption, or feeding of feral animals IAW U.S. Central Command (CENTCOM) General Order (GO) 1C. Risks are further reduced in the event of assessed contact by prompt post-exposure rabies prophylaxis IAW The Center for Disease Control's (CDC) Advisory Committee on Immunization Practices guidance.</td>
<td>Short-term: No data available Long-term: No data available</td>
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<tr>
<td><strong>Soil-transmitted</strong></td>
<td>Short-term: Moderate for soil transmitted helminthes (hookworm, strongyloidiasis, cutaneous larva migrans). Long-term: No data available</td>
<td>Risk was reduced to Low by limiting exposure to soil contaminated with human or animal feces (including sleeping on bare ground, and walking barefoot).</td>
<td>Short-term: Low Long-term: No data available</td>
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<tr>
<td><strong>VENOMOUS ANIMAL/INSECTS</strong></td>
<td>Short-term: Low; If encountered, effects of venom vary with species from mild localized swelling (e.g., Latrodectus dahlia) to potentially lethal effects (e.g. Echis carinatus multisquamatus). Long-term: No data available</td>
<td>Risk reduced by avoiding contact, proper wear of uniform (especially footwear), and proper and timely treatment.</td>
<td>Short-term: Low Long-term: No data available</td>
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<tr>
<td><strong>HEAT/COLD STRESS</strong></td>
<td>Short-term: Variable; Risk of heat injury is extremely high for April – October, and Low for all other months. Long-term: Low; The long term risk was Low. However, the risk may be greater to certain susceptible persons—those older (i.e., greater than 45 years), in lesser physical shape, or with underlying medical/health conditions.</td>
<td>Work-rest cycles, proper hydration and nutrition, and Wet Bulb Globe Temperature (WBGT) monitoring.</td>
<td>Short-term: Variable; Risk of heat injury in unacclimatized or susceptible personnel is Moderate for April – October and Low for all others Long-term: Low; The long term risk is Low. However, the risk may be greater to certain susceptible persons—those older (i.e., greater than 45 years), in lesser physical shape, or with underlying medical/health conditions.</td>
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<td><strong>Heat</strong></td>
<td>Short-term: Low risk of cold stress/injury.</td>
<td>Risks from cold stress reduced with protective measures such as use of the buddy system, limiting exposure during cold weather, proper hydration and nutrition, and proper</td>
<td>Short-term: Low risk of cold stress/injury. Long-term: Low; Long-term health implications from cold injuries are rare but can occur, especially from more serious injuries such as frost bite.</td>
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<tr>
<td><strong>Cold</strong></td>
<td>Long-term: Low; Long-term health implications from cold injuries are rare but can occur, especially from more serious injuries such as frost bite.</td>
<td></td>
<td>Long-term: Low; Long-term health implications from cold injuries are rare but can occur, especially from more serious injuries such as frost bite.</td>
</tr>
<tr>
<td>Source of Identified Health Risk</td>
<td>Unmitigated Health Risk Estimate</td>
<td>Control Measures Implemented</td>
<td>Residual Health Risk Estimate</td>
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<tr>
<td>Unique Incidents/Concerns</td>
<td></td>
<td>wear of issued protective clothing.</td>
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<tr>
<td>Burn Pits</td>
<td>Short-term: Two regulated medical waste incinerators are present at Camp Bastion; however, there are no reports or sampling data in the vicinity of the incinerators. Consequently, the PM$<em>{10}$ and the PM$</em>{2.5}$ overall short-term health risks specifically for incinerators were not evaluated – see Section 10.7. Because Camp leatherneck and vicinity is situated in a dusty semi-arid desert environment, a majority of the time mild acute (short term) health effects are anticipated; certain peak levels may produce mild eye, nose, or throat irritation in some personnel and pre-existing health conditions (e.g., asthma, or cardiopulmonary diseases) may be exacerbated.</td>
<td>Risks reduced by limiting strenuous physical activities when air quality was especially poor; and action such as closing tent flaps, windows, and doors. Other control measures included locating burn pits downwind of camps, increased distance from troop populations, and improved waste segregation and management techniques.</td>
<td>Short-term: Two regulated medical waste incinerators are present at Camp Bastion; however, there are no reports or sampling data in the vicinity of the incinerators. Consequently, the PM$<em>{10}$ and the PM$</em>{2.5}$ overall short-term health risks specifically for incinerators were not evaluated – see Section 10.7. Because Camp leatherneck and vicinity is situated in a dusty semi-arid desert environment, a majority of the time mild acute (short term) health effects are anticipated; certain peak levels may produce mild eye, nose, or throat irritation in some personnel and pre-existing health conditions (e.g., asthma, or cardiopulmonary diseases) may be exacerbated. Long-term: Two regulated medical waste incinerators are present at Camp Bastion; however, there are no reports or sampling data in the vicinity of the incinerators. Consequently, the PM$<em>{10}$ and the PM$</em>{2.5}$ overall long-term health risks specifically for incinerators were not evaluated – see Section 10.7. Exposure to burn pit smoke is variable. Exposure to high levels of PM$<em>{10}$ and PM$</em>{2.5}$ in the smoke may be associated with some otherwise healthy personnel, who were exposed for a long-term period, possibly developing certain health conditions (e.g., reduced lung function, cardiopulmonary disease). Personnel with a history of asthma or cardiopulmonary disease could potentially be more likely to develop such chronic health conditions.</td>
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</tbody>
</table>
1 Discussion of Health Risks at Camp Leatherneck and vicinity, Afghanistan by Source

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

The ProUCL version 5.0 software package was used for statistical analyses (Reference 5). Means are followed by standard deviation (SD). Risk characterization was based on the 95 percent upper confidence level of the arithmetic mean (95% UCL) or the arithmetic mean depending on the quality and quantity of the data being evaluated. The sample mean is an uncertain estimate of the true mean of the population exposure point concentration (PEPC). The 95% UCL reduces the uncertainty inherent in the sample mean and states with a higher level of confidence that the mean PEPC is no greater than the 95% UCL.

2 Air

2.1 Site-Specific Sources Identified

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

Particulate matter (PM) is a complex mixture of extremely small particles suspended in the air. The PM includes solid particles and liquid droplets emitted directly into the air by sources such as: power plants, motor vehicles, aircraft, generators, construction activities, fires, and natural windblown dust. The PM can include sand, soil, metals, volatile organic compounds (VOC), allergens, and other compounds such as nitrates or sulfates that are formed by condensation or transformation of combustion exhaust. The PM composition and particle size vary considerably depending on the source. Generally, PM of health concern is divided into two fractions: PM$_{10}$, which includes coarse particles with a diameter of 10 micrometers or less, and fine particles less than 2.5 micrometers (PM$_{2.5}$), which can reach the deepest regions of the lungs when inhaled. Exposure to excessive PM is linked to a variety of potential health effects.

2.3 Particulate matter, less than 10 micrometers (PM$_{10}$)

2.3.1 Exposure Guidelines:

<table>
<thead>
<tr>
<th>Exposure Guidelines</th>
<th>PM$_{10}$ (micrograms per cubic meter, μg/m$^3$)</th>
<th>Long-term PM$_{10}$ MEG (μg/m$^3$):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short Term (24-hour)</td>
<td>• Negligible MEG = 250</td>
<td>• Not defined and not available.</td>
</tr>
<tr>
<td></td>
<td>• Marginal MEG = 420</td>
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<td></td>
<td>• Critical MEG = 600</td>
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</tbody>
</table>

2.3.2 Sample data/Notes:

A three valid PM$_{10}$ air samples was collected at Camp Tombstone and PB Wilson from 12 April to 14 October 2016. The 24-hour PM$_{10}$ concentration ranged from 12 μg/m$^3$ to 67 μg/m$^3$. The data were insufficient to characterize health risk associated with PM$_{10}$ exposure.

2.3.3 Short-term health risks:

Not evaluated.

2.3.4 Long-term health risk:

Not evaluated—no available health guidelines. The U.S. Environmental Protection Agency (EPA) has retracted its long-term standard (National Ambient Air Quality Standards, NAAQS) for PM$_{10}$ due to an inability to clearly link chronic health effects with chronic PM$_{10}$ exposure levels.

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

2.4.1 Exposure Guidelines:

<table>
<thead>
<tr>
<th>Exposure Guidelines</th>
<th>PM$_{2.5}$ (μg/m$^3$):</th>
<th>Long-term (1 year) PM$_{2.5}$ MEGs (μg/m$^3$):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short Term (24-hour)</td>
<td>• Negligible MEG = 65</td>
<td>• Negligible MEG = 15</td>
</tr>
<tr>
<td></td>
<td>• Marginal MEG = 250</td>
<td>• Marginal MEG = 65.</td>
</tr>
<tr>
<td></td>
<td>• Critical MEG = 500</td>
<td></td>
</tr>
</tbody>
</table>

2.4.2 Sample data/Notes:
A single valid PM$_{2.5}$ air sample was collected at Camp Antonik on 14 May 2016. The 24-hour PM$_{2.5}$ concentration was 75 μg/m$^3$. The data were insufficient to characterize health risk associated with PM$_{2.5}$ exposure.

2.4.3 Short- and Long-term health risks:

**Not evaluated.**

### 2.5 Airborne Metals

#### 2.5.1 Sample data/Notes:

Camp Antonik: A single valid PM$_{10}$ airborne metal sample was collected on 14 May 2016. No metals were detected in the single sample.

Camp Tombstone: A total of two valid PM$_{2.5}$ airborne metal samples were collected on 26 April 2016 and 12 October 2016. None of the detected metals were above respective 1 year negligible MEGs.

Camp Wilson: A single valid PM$_{10}$ airborne metal sample was collected on 24 June 2016. No metals were detected in the single sample.

#### 2.5.2 Short-and Long-term health risks:

**None identified based on the available sampling data.**

### 2.6 Volatile Organic Compounds (VOC)

#### 2.6.1 Sample data/Notes:

No valid volatile organic chemical (VOC) air samples were collected from Camp Leatherneck and vicinity during the 24 June 2014 through 31 December 2016 time frame.

#### 2.6.2 Short and long-term health risks:

**Not Evaluated.**

### 3 Soil

#### 3.1 Site-Specific Sources Identified

#### 3.2 Sample data/Notes:

No valid surface soil samples were collected since the previous POEMS (2007-2014), to assess OEH health risk to deployed personnel. The primary soil contamination exposure pathways are dermal contact and dust inhalation. Typical parameters analyzed for included semi volatile organic compounds (SVOCs), heavy metals, polychlorinated biphenyls (PCBs), pesticides, herbicides. If the contaminant was known or suspected, other parameters may have been analyzed for (i.e., Total petroleum hydrocarbons (TPH) and polycyclic aromatic hydrocarbons (PAH) near fuel spills). For the risk assessment, personnel are assumed to remain at this location for 6 months to 1 year.
3.3 Short-term health risk:

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

3.4 Long-term health risk:

**Not Evaluated**

## 4 Water

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

### 4.1 Drinking Water: Bottled or Packaged Water

#### 4.1.1 Site-Specific Sources Identified

There were multiple bottled water brands at Camp Leatherneck. These bottled water brands included Aria®, Cristal®, and Kinley® (Reference 6).

#### 4.1.2 Sample data/Notes:

To assess the potential for adverse health effects to troops, the following assumptions were made about dose and duration: A conservative (protective) assumption was that personnel routinely ingested 5 L/day of bottled water for up to 365 days (1-year). It was further assumed that control measures were not used.

No valid bottled water samples were available for analysis.

#### 4.1.3 Short-term and long-term health risk:

**Not evaluated.**

### 4.2 Non-Drinking Water: Disinfected

#### 4.2.1 Site-Specific Sources Identified

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

To assess the potential for adverse health effects to troops the following assumptions were made about dose and duration: All U.S. personnel at this location were expected to remain at this site for approximately 1 year. A conservative (protective) assumption is that personnel routinely consumed less than 5L/day of non-drinking water for up to 365 days (1-year). It is further assumed that control measures and/or personal protective equipment were not used.

Camp Antonik: A single valid disinfected bulk water (Non-Drinking) sample collected on 25 February 2016 was evaluated for this health risk assessment. No chemicals were detected at levels above the short or long-term MEGs.

Camp Tombstone: A single valid disinfected bulk water (Non-Drinking) sample collected on 13 May 2016 was evaluated for this health risk assessment. No chemicals were detected at levels above the short or long-term MEGs.

4.2.3 Short and long-term health risks:

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

### 5 Military Unique

#### 5.1 Chemical Biological, Radiological Nuclear (CBRN) Weapons

No specific hazard sources were documented in the Defense Occupational and Environmental Health Readiness System (DOEHRS) from 24 June 2014 to 31 December 2016 (Reference 1).

#### 5.2 Depleted Uranium (DU)

No specific hazard sources were documented in the DOEHRS from 24 June 2014 to 31 December 2016 (Reference 1).

#### 5.3 Ionizing Radiation

No specific hazard sources were documented in the DOEHRS from 24 June 2014 to 31 December 2016 (Reference 1).

#### 5.4 Non-Ionizing Radiation

No specific hazard sources were documented in the DOEHRS from 24 June 2014 to 31 December 2016 (Reference 1).

### 6 Endemic Diseases

This document lists the endemic diseases reported in the region, its specific health risks and severity and general health information about the diseases. CENTCOM Modification (MOD) 12 (Reference 7) lists deployment requirements, to include immunizations and chemoprophylaxis, in effect during the timeframe of this POEMS.
6.1 Foodborne and Waterborne Diseases

Foodborne and waterborne diseases in the area are transmitted through the consumption of local food and water. Local unapproved food and water sources (including ice) are heavily contaminated with pathogenic bacteria, parasites, and viruses to which most U.S. Service Members have little or no natural immunity. Effective disease surveillance has been improved to cover the majority of the country since 2009. There is still underreporting of specific disease incidence. Diarrheal diseases are expected to temporarily incapacitate a very high percentage of U.S. personnel within days if local food, water, or ice is consumed. Hepatitis A and typhoid fever infections typically cause prolonged illness in a smaller percentage of unvaccinated personnel. Vaccinations are required for DoD personnel and contractors. In addition, although not specifically assessed in this document, significant outbreaks of viral gastroenteritis (e.g., norovirus) and food poisoning (e.g., *Bacillus cereus, Clostridium perfringens, Staphylococcus* spp.) may occur. Key disease risks are summarized below:

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

6.1.1 Diarrheal diseases (bacteriological)

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

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

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

6.1.3 Polio

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

6.1.4 Short-term Health Risks:

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

6.1.5 Long-term Health Risks:

**None identified based on available data.**

### 6.2 Arthropod Vector-Borne Diseases

During the warmer months, the climate and ecological habitat support populations of arthropod vectors, including mosquitoes, ticks, mites, and sandflies. Significant disease transmission is sustained countrywide, including urban areas. Malaria, the major vector-borne health risk in Afghanistan, is capable of debilitating a high percentage of personnel for up to a week or more. Mitigation strategies were in place and included proper wear of treated uniforms, application of repellent to exposed skin, and use of bed nets and chemoprophylaxis (when applicable). Additional methods included the use of pesticides, reduction of pest/breeding habitats, and engineering controls.

#### 6.2.1 Malaria

**High, mitigated to Low:** Potential unmitigated risk to U.S. personnel is High during warmer months (typically April through November) but reduced to Low with mitigation measures. Malaria incidents are often associated with the presence of agriculture activity, including irrigation systems and standing water, which provide breeding habitats for vectors. A small number of cases may occur among personnel exposed to mosquito (Anopheles spp.) bites. Malaria incidents may cause debilitating febrile illness typically requiring 1 to 7 days of inpatient care, followed by return to duty. Severe cases may require intensive care or prolonged convalescence.

#### 6.2.2 Leishmaniasis

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

#### 6.2.3 Crimean-Congo hemorrhagic fever

**High, mitigated to Low:** Unmitigated risk is High, but reduced to Low with mitigation measures. Crimean-Congo hemorrhagic fever occurs in a small number of cases (less than 1% per month attack rate) and is transmitted by tick bites or occupational contact with blood or secretions from infected animals. The disease typically requires intensive care with fatality rates from 5% to 50%.

#### 6.2.4 Sandfly fever

**Moderate, mitigated to Low:** Sandfly fever has a Moderate risk with potential disease rates from 1% to 10% per month; under worst case conditions disease rates can be as high as 50%. Mitigation
measures reduced the risk to low. The disease is transmitted by sandflies and occurs more commonly in children though adults are still at risk. Sandfly fever disease typically resulted in debilitating febrile illness requiring 1 to 7 days of supportive care followed by return to duty.

6.2.5 Plague

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

6.2.6 Typhus-miteborne (scrub typhus)

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

6.2.7 West Nile fever

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

6.2.9 Short-term health risks:

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

6.2.10 Long-term health risks:

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

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

6.3.1 Leptospirosis

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

6.3.2 Short-term health risks:

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

6.3.3 Long-term health risks:

None identified based on available data.

6.4 Respiratory Diseases

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

**Moderate, mitigated to Low:** Potential health risk to U.S. personnel is Moderate, mitigated to Low, year round. Transmission typically requires close and prolonged contact with an active case of pulmonary or laryngeal TB, although it also can occur with more incidental contact. Individuals with prolonged indoor exposure to the local population are at increased risk for latent TB infection.

6.4.2 Meningococcal meningitis

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

6.4.3 Middle East respiratory syndrome coronavirus (MERS-CoV)

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

6.4.4 Short-term health risks:

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

6.4.5 Long-term health risks:

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

6.5 Animal-Contact Diseases

6.5.1 Rabies

**Moderate, mitigated to Low:** Rabies posed a year-round moderate risk. Occurrence in local animals was well above U.S. levels due to the lack of organized control programs. Dogs are the primary reservoir of rabies in Afghanistan, and a frequent source of human exposure. Rabies is transmitted by exposure to the virus-laden saliva of an infected animal, typically through bites, but could occur from scratches contaminated with the saliva. A U.S. Army Soldier deployed to Afghanistan from May 2010 to May 2011 died of rabies in New York on 31 August 2011 (Reference 8). Laboratory results indicated the Soldier was infected from contact with a dog while deployed. Although the vast majority (>99%) of persons who develop rabies disease will do so within a year after a risk exposure, there have been rare reports of individuals presenting with rabies disease up to six years or more after their last known risk exposure. Mitigation strategies included command emphasis of CENTCOM GO 1C, reduction of animal habitats, active pest management programs, and timely treatment of feral animal scratches/bites.
6.5.2 Anthrax

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

6.5.3 Q-Fever

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

6.5.4 Avian influenza

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

6.5.5 Short-term health risks:

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

6.5.6 Long-term health risks:

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

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

**Moderate, mitigated to Low:** Potential health risk to U.S. personnel is Moderate during warmer months (typically March through November) when vector activity is highest. Mitigation measures reduced the risk to low. 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* spp. More severe infections with high worm burden may be debilitating in some cases. Rates of infection in U.S. personnel will be highly variable, depending on specific local environmental conditions. Rates of
infection in U.S. personnel are expected to be less than 1 percent per month in most locations. However, rates in some focal areas with heavily contaminated soil could exceed 1 percent per month.

6.6.1 Short-term health risks:

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

6.6.2 Long-term health risks:

None identified based on available data.

### 7 Venomous Animals

All information was taken directly from the Armed Forces Pest Management Board (Reference 9) and the Clinical Toxinology Resources website from the University of Adelaide, Australia (Reference 10). The species listed below have home ranges that overlap the location of Camp Leatherneck and vicinity, and may present a health risk if they are encountered by personnel. See Section 9 for more information about pesticides and pest control measures.

#### 7.1 Spiders

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

#### 7.2 Scorpions

- *Androctonus amoreuxii*, 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.

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

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

#### 7.3 Snakes

- *Echis carinatus multisquamatus* (central Asian saw-scaled viper), *Echis carinatus sochureki* (Sochurek’s saw-scaled viper), and *Gloydius halys* (Haly’s Pit Viper): Severe envenoming possible, potentially lethal. Bites may cause moderate to severe coagulopathy and haemorrhagins causing extensive bleeding.

- *Eristocophis mcmahoni* (McMahon's Viper): Severe envenoming possible, potentially lethal.
Venom shows strong hemorrhagic activity. Mild to Moderate neurotoxic effects may occur.

- *Pseudocerastes persicus* (Persian horned viper): 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. *Latrodectus dahlia*) to potentially lethal effects (e.g., *Echis carinatus multisquamatus*). See effects of venom above. Mitigation strategies included avoiding contact, proper wear of uniform (especially footwear), and timely medical treatment. Confidence in the health risk estimate is low (Reference 4, Table 3-6).

7.5 Long-term health risk:

None identified.

### 8 Heat/Cold Stress

#### 8.1 Heat

Summer (June - September) monthly mean daily maximum temperatures range from 95 degrees Fahrenheit (°F) to 108 °F with an average temperature of 104 °F based on historical climatological data from the U.S. Air Force Combat Climatology Center, 14th Weather Squadron. The health risk of heat stress/injury based on temperatures alone is Low (< 78 °F) November – March, and extremely high (≥ 88°F) from April – October. However, work intensity and clothing/equipment worn pose greater health risk of heat stress/injury than environmental factors alone (Reference 11). Managing risk of hot weather operations included monitoring work/rest periods, proper hydration, and taking individual risk factors (e.g., acclimation, weight, and physical conditioning) into consideration. Risk of heat stress/injury was reduced with preventive measures.

8.1.1 Short-term health risk:

**Low to High, mitigated to Low**: The risk of heat injury was reduced to low through preventive measures such as work/rest cycles, proper hydration and nutrition, and monitoring Wet Bulb Globe Temperature (WBGT). Risk of heat injury in unacclimatized or susceptible populations (older, previous history of heat injury, poor physical condition, underlying medical/health conditions), and those under operational constraints (equipment, PPE, vehicles) is Extremely High from April – October, and Low from November – March. Confidence in the health risk estimate is low (Reference 4, Table 3-6).

8.1.2 Long-term health risk:

**Low**: The long-term risk is Low. However, the risk may be greater for certain susceptible persons—those older (i.e., greater than 45 years), in lesser physical shape, or with underlying medical/health conditions. Long-term health implications from heat injuries are rare but may occur, especially from more serious injuries such as heat stroke. It is possible that high heat in conjunction with various chemical exposures may increase long-term health risks, though specific scientific evidence is not conclusive. Confidence in these risk estimates is medium (Reference 4, Table 3-6).
8.2 Cold

8.2.1 Short-term health risks:

Winter (December - March) mean daily minimum temperatures range from 32 °F to 51 °F with an average temperature of 43 °F based on historical climatological data from the U.S. Air Force Combat Climatology Center, 14th Weather Squadron. Because even on warm days a significant drop in temperature after sunset by as much as 40 °F can occur, there is a risk of cold stress/injury from October – March. The risk assessment for Non-Freezing Cold Injuries (NFCI), such as chilblain, trench foot, and hypothermia, is Low based on historical temperature and precipitation data. Frostbite is unlikely to occur because temperatures rarely drop below freezing. However, personnel may encounter significantly lower temperatures during field operations at higher altitudes. As with heat stress/injuries, cold stress/injuries are largely dependent on operational and individual factors instead of environmental factors alone (Reference 11).

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

8.1.2 Long-term health risk:

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

9 Noise

9.1 Continuous

No specific hazard sources were documented in the DOEHRS from 24 June 2014 through 31 December 2016.

9.1.1 Short and long-term health risks:

Not evaluated

9.2 Impulse

No specific hazard sources were documented in the DOEHRS from 24 June 2014 through 31 December 2016.

9.2.1 Short-term and Long-term health risks:

Not evaluated.

10 Unique Incidents/Concerns

10.1 Potential environmental contamination sources

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

10.2 Waste Sites/Waste Disposal

Hazardous waste from Camp Leatherneck is removed from site by contractors monthly. Regulated Medical Waste (RMW) is sent to Camp Bastion for disposal in two RMW incinerators. The burn pit at Camp Leatherneck has not been operational since July 2013. All ash from the burn pit has been buried 16 feet underground (Reference 6).

The black and grey water at Camp Leatherneck is pumped from collection and holding tanks throughout the base and transported to the far east of the camp past the rotary wing flight line and pumped into a canal that flows to the east (Reference 6).

10.3 Fuel/petroleum products/industrial chemical spills

No specific hazard sources were documented in the DOEHRS from 24 June 2014 through 31 December 2016 timeframe.

10.3.1 Short-term and Long-term health risks:

Not evaluated.

10.4 Pesticides/Pest Control:

The health risk of exposure to pesticide residues is considered within the framework of typical residential exposure scenarios, based on the types of equipment, techniques, and pesticide products that have been employed, such as enclosed bait stations for rodenticides, various handheld equipment for spot treatments of insecticides and herbicides, and a number of ready-to-use (RTU) methods such as aerosol cans and baits. The control of rodents required the majority of pest management inputs, with the acutely toxic rodenticides staged as solid formulation lethal baits placed in tamper-resistant bait stations indoors and outdoors throughout cantonment areas. Nuisance insects, including biting and stinging insects such as bees, wasps, and ants, also required significant pest management inputs. Use of pesticides targeting against these pests generally involved selection of compounds with low mammalian toxicity and short-term residual using pinpoint rather than broadcast application techniques. A total of two monthly pesticide application reports in the DOEHRS data portal for Camp Leatherneck list the usage of pesticides on the site. For each pesticide product applied during this period, the EPA approved label has been archived, providing a framework how each pesticide handled and applied (see below).

10.4.1 Rodenticides

Brodifacoum was used to control rodents.
10.4.2 Insecticides

Insecticides used to control ants, fleas, flies, and mosquitoes include: Bacillus thuringiensis subspecies israelensis, ß-Cyfluthrin, bifenthrin, fipronil, hydramethylnon, imidacloprid, lambda-cyhalothrin, and Z-9-Tricosene.

10.4.3 Short-term and Long-term health risks

**Low:** Long term health risk is Low. Confidence in the health risk assessment is medium (Reference 4, Table 3-6).

10.5 Asbestos

No specific hazard sources were documented in the DOEHRS from 24 June 2014 through 31 December 2016 timeframe.

10.5.1 Short-term and Long-term health risks:

**Not evaluated.**

10.6 Lead Based Paint

No specific hazard sources were documented in the DOEHRS from 24 June 2014 through 31 December 2016 timeframe.

10.6.1 Short-term and Long-term health risks:

**Not evaluated.**

10.7 Burn Pit

Hazardous waste from Camp Leatherneck is removed from site by contractors monthly. Regulated Medical Waste is sent to Camp Bastion for disposal in two RMW incinerators. The burn pit at Camp Leatherneck has not been operational since July 2013. All ash from the burn pit has been buried 16 feet underground (Reference 6).

While not specific to Camp Leatherneck and vicinity, the consolidated epidemiological and environmental sampling and studies on burn pits that have been conducted as of the date of this publication have been unable to determine whether an association does or does not exist between exposures to emissions from the burn pits and long-term health effects (Reference 12). The Institute of Medicine committee’s (Reference 12) review of the literature and the data suggests that service in Iraq or Afghanistan (i.e., a broader consideration of air pollution than exposure only to burn pit emissions) may be associated with long-term health effects, particularly in susceptible (e.g., those who have asthma) or highly exposed subpopulations, such as those who worked at the burn pit. Such health effects would be due mainly to high ambient concentrations of PM from both natural and anthropogenic sources, including military sources. If that broader exposure to air pollution turns out to be relevant, potentially related health effects of concern are respiratory and cardiovascular effects and cancer. Susceptibility to the PM health effects could be exacerbated by other exposures, such as stress, smoking, local climatic conditions, and co-exposures to other chemicals that affect the same biologic or chemical processes. Individually, the chemicals measured at burn pit sites in the study were generally below concentrations of health concern for general populations in the United States.
However, the possibility of exposure to mixtures of the chemicals raises the potential for health outcomes associated with cumulative exposure to combinations of the constituents of burn pit emissions and emissions from other sources.
11 References


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


4. USAPHC TG230, June 2013 Revision.


### 12 Where Do I Get More Information?

If a provider feels that the Service member’s or Veteran’s current medical condition may be attributed to specific OEH exposures at this deployment location, he/she can contact the Service-specific organization below. Organizations external to DoD should contact Deputy Assistant Secretary of Defense for Health Readiness Policy and Oversight (HRP&O).

<table>
<thead>
<tr>
<th>Organization</th>
<th>Phone</th>
<th>Website</th>
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<tbody>
<tr>
<td>DoD Health Readiness Policy and Oversight (HRP&amp;O)</td>
<td>(800) 497-6261</td>
<td><a href="https://health.mil/Military-Health-Topics/Health-Readiness">https://health.mil/Military-Health-Topics/Health-Readiness</a></td>
</tr>
</tbody>
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