DEPARTMENT OF THE ARMY
US ARMY INSTITUTE OF PUBLIC HEALTH
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MCHB-IP-RDE

21 MAR 2012

MEMORANDUM FOR Office of the Command Surgeon (LTC (b) (6)), U.S. Central Command, 7115 South Boundary Boulevard, MacDill Air Force Base, FL 33621-5101

SUBJECT: Deployment Occupational and Environmental Health Surveillance Sample Report, Airborne Particulate Matter, Phoenix, Afghanistan, 15 August-27 December 2011, U_AFG_PHOENIX_IP_A25_20111227

1. The enclosed report details the assessment of particulate matter (PM) air samples collected by 1437th Medical Detachment personnel, Phoenix, Afghanistan, 15 August-27 December 2011.

2. The samples were collected for airborne PM less than 2.5 micrometers in diameter ($PM_{2.5}$) and analyzed for a set of metals typically found in PM. The $PM_{2.5}$ was identified as an acute hazard during the assumed exposure timeframe. Based on the samples and associated exposure information assessed in the enclosed report, the tactical risk estimate for $PM_{2.5}$ is **low**. No metals were identified as acute hazards.

FOR THE DIRECTOR:

(b) (6)

Encl

Portfolio Director, Health Risk Management

CF: (w/encl)
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U.S. ARMY PUBLIC HEALTH COMMAND
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Deployment Occupational and Environmental Health Surveillance Sample Report,
U_AFG_PHOENIX_IP_A25_20111227
Health Risk Management Portfolio

Airborne Particulate Matter, Phoenix, Afghanistan

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Preventive Medicine Surveys: 40-5f1

ACKNOWLEDGEMENTS

Deployment Occupational and Environmental Health Surveillance Sample Report Airborne Particulate Matter Phoenix, Afghanistan 15 August-27 December 2011 U_AFG_PHOENIX_IP_A25_20111227

1 References

See Appendix A for a list of references.

2 Purpose

This report provides the U.S. Army Public Health Command (USAPHC), Army Institute of Public Health (AIPH) assessment of the laboratory analytical results and exposure information associated with the samples collected by 1437th Medical Detachment on 15 August-27 December 2011 at Phoenix, Afghanistan according to the U.S. Department of Defense deployment occupational and environmental health (DOEH) surveillance requirements. The assessment serves several purposes. It identifies DOEH hazards that may be related to acute health effects that could occur in personnel during their deployment. It provides an official record of observed exposure conditions for use in future site evaluations. It identifies whether or not there is a potential for chronic health concerns which may require additional characterization. Finally, this report includes preventive steps to reduce or eliminate occupational and environmental exposures and surveillance and/or sampling recommendations, as necessary.

3 Scope

The assessment of sample results and exposure information in this report follows the process published in the USAPHC Provisional (Prov) Technical Guide (TG) 230 "Environmental Health Risk Assessment and Chemical Exposure Guidelines for Deployed Military Personnel, June 2010 Revision." The assessment is based on limited data representing a specific time period and assesses short-term exposure risks only. Therefore, this report cannot be used alone to estimate the risk of chronic health effects from exposures. In addition, this assessment does not address all DOEH hazards to which U.S. personnel may be exposed.

4 Laboratory Analysis

Filters used to collect deployment air samples of particulate matter (PM) are shipped to the USAPHC, AIPH and weighed to determine particulate mass and calculate ambient concentrations. The USAPHC, AIPH laboratory also analyzes the PM for a standard set of metals typically found in PM. The complete analytical sample results can be viewed in the Defense Occupational and Environmental Health Readiness System (DOEHRS). Log into the DOEHRS and search for the samples using the DOEHRS sample identification numbers (IDs) provided in appendix B.

5 Exposure Setting

Table 2 contains information about the sampling location, environmental conditions, and associated potential population exposure. The information was provided on the field data sheets and/or exposure assessment worksheets submitted with the samples unless otherwise noted. Correction and clarification of exposure assumptions by the sampling unit is encouraged.

Table 2. Exposure Information

Questions About Exposure	Information Provided and Assumptions
Why was this sample/sample set collected?	Tower 14: Received complaints of poor sanitation practices of a brick maker outside the camp walls. Brick maker has been reportedly draining waste materials in water onto the street and blowing out bad air in the direction of camp. A Trans and burn barrels: Routine sampling of Ambient Air Pathway as described in the OEHSA dated 6 February 2007.
What population is exposed and how?	The majority of the camp is exposed to ambient air. The area near the brick maker consists of guard towers and transient living area. The A trans motor pool is located central to the Troop Medical Clinic and rhino bus area. The burn barrels are approximately 700 meters from a living area.
What is the timeframe under consideration?	Although personnel will be deployed to this location for approximately 1 year, only the timeframe of August-December between the first and last sample dates is being assessed.
Where was the sample/sample set collected?	Tower 14: The sample was collected by guard tower 14 located near the transient living area. A Trans: this sample was collected at the motor pool. Burn Barrels: This sample was collected near the secret document burn barrels.
What is known about location, activity, setting and potential sources of contamination that may affect exposure?	Tower 14: Brick maker causing pollution outside the wire A Trans: Vehicles are consistently serviced at this area and dust is being disrupted although dust abatement is practiced. A majority of personnel frequent this area due to medical, personal, and travel needs. Burn Barrels: Paper documents are consistently burned into this area in open burn barrels. Located near the connex yard and training area which a majority of the personnel occupy on a sporadic basis. Offices are being built approximately 300 meters from this area.

6 Prescreen

Table 3 shows whether parameters are identified as potential hazards because their peak single sample concentrations are greater than their most health-protective screening level USAPHC (Prov) TG 230 military exposure guidelines (MEGs). Potential hazards are further assessed to determine if they are acute hazards. Parameters analyzed but not shown in Table 3 are not considered hazards. The prescreening is conducted as described in USAPHC (Prov) TG 230, section 3.4.3. The sample results were compared to MEGs on 7 February 2012.

Table 3. Results of Prescreen

Parameter	Detections/Samples	Peak Single Sample Concentration (µg/m^3)	1-year Negligible MEG (µg/m^3)	Result
$PM_{2.5}$	51/51	416	15	Retain as potential hazard
Cadmium	1/51	0.016835	0.0068493	Retain as potential hazard

Legend: µg/m^3 = micrograms per cubic meter

7 Acute Risk Assessment

7.1 Acute Screen

Table 4 shows whether parameters identified as potential hazards after prescreening are considered acute hazards because their peak sample day concentrations are greater than their acute screening MEGs. Acute hazards are further assessed to estimate the tactical risk from exposure to these parameters in the ambient air. The acute screening is conducted as described in USAPHC (Prov) TG 230, section 3.4.5.1.

Table 4. Results of Acute Screen

Parameter	Peak Sample Day Concentration (µg/m^3)	Screening MEG (µg/m^3)	Result
$PM_{2.5}$	416	24 hour Negligible MEG: 65	Retain as acute hazard
Cadmium	0.016835	14 day Negligible MEG: 0.020548	Exclude as acute hazard

Legend: µg/m^3 = micrograms per cubic meter

7.2 Hazard Severity

Table 5 summarizes the hazard severity levels determined by comparing the peak and average sample day concentrations of the acute hazards to the appropriate MEGs. The peak concentration is intended to represent the worst exposure conditions and the average concentration is intended to represent typical exposure conditions. Hazard severity is determined using USAPHC (Prov) TG 230, section 3.4.5.2.

Table 5. Hazard Severity

Parameter	Concentration ($\mu g/m^3$)	Comparison MEGs ($\mu g/m^3$)	Hazard Severity
$PM_{2.5}$	Peak: 416	Is ≥ 24-hour Marginal MEG: 250, but < 24-hour Critical MEG: 500	Marginal
	Average: 119	Is > 24-hour Negligible MEG: 65, but < 24-hour Marginal MEG: 250	Negligible

Legend: $\mu g/m^3$ = micrograms per cubic meter

7.3 Hazard Probability

Tables 6 and 7 summarize the hazard probability determinations for each acute hazard. Refer to USAPHC (Prov) TG 230, section 3.4.5.3 for additional information about hazard probability scoring methodology.

Table 6. Hazard Probability Scoring for $PM_{2.5}$

Concentration ($\mu g/m^3$)	Hazard Probability Scoring for Exposure Factors				Hazard Probability
	Degree of Exposure	Represent-ativeness of Sample Data	Duration of Exposure	Rate of Exposure	
Peak: 416	Score 2: Concentration is at or between the 25th and 75th percentiles of the severity range	Score 2: Field data adequately estimate population exposure.	Score 1: Field exposure duration to MEG exposure duration ratio is <1 (Personnel will not be exposed to the ambient air at this site for 24 continuous hours).	Score 2: Typical exertion (no information to indicate otherwise).	Total Score 7: Seldom
Average: 119	Score 2: Concentration is at or between the 25th and 75th percentiles of the severity range	Score 2: Field data adequately estimate population exposure.	Score 1: Field exposure duration to MEG exposure duration ratio is <1 (Personnel will not be exposed to the ambient air at this site for 24 continuous hours).	Score 2: Typical exertion (no information to indicate otherwise).	Total Score 7: Seldom

Legend: $\mu g/m^3$ = micrograms per cubic meter

7.4 Tactical Risk Estimate

Table 7 summarizes the acute risk assessment for exposure to each of the acute hazards. The tactical risk estimate was determined using the USAPHC (Prov) TG 230, Table 3-1 “Military Risk Assessment Matrix.” The tactical risk estimates are color-coded consistent with the black, red, amber, green system described in Department of the Army Field Manual 1-02 "Operational Terms and Graphics."

Table 7. Risk Assessment Summary

Parameter	Type of Exposure	Hazard Severity	Hazard Probability	Tactical Risk Estimate
$PM_{2.5}$	Peak	Marginal	Seldom	Low
	Average	Negligible	Seldom	Low
Other Metals	None identified as acute hazards.			

8 Conclusion

Based on the sample results and associated exposure information assessed in this report, the tactical risk estimate for $PM_{2.5}$ is **low**. No metals were identified as acute hazards. Refer to USAPHC (Prov) TG 230, Table 3-2 for the potential consequences to military operations and force readiness associated with this risk levels.

9 Limitations

9.1 Field Data Quality

Field data provided with the samples were adequate.

Ten of the 61 samples were invalid due to sample malfunction, flow differential, damage media and battery failure.

9.2 Sample Receipt at USAPHC Laboratory

The sample set was packaged correctly.

9.3 Laboratory Data Quality

No laboratory data quality issues associated with this sample set were identified.

Some parameters in this data set are flagged with a J code (^{J}). This code indicates an estimated value that was detected above the Method Detection Limit but below the Method Reporting Limit (also known as Limit of Quantitation or Practical Quantitation Limit).

9.4 Risk Assessment

Parameter concentrations on days with multiple samples were averaged together to determine a single concentration for the day.

If a parameter was not detected in all samples, half of the laboratory reporting limit was used to calculate an average.

10 Recommendations and Notes

Maintain communication with USAPHC, AIPH points of contact (POCs) and continue standard surveillance of airborne PM and metals in accordance with defined Occupational and Environmental Health Site Assessment (OEHSA) Exposure Pathways and sampling plans for your location.

An OEHSA was completed for Phoenix, Afghanistan in January 2010. Per the OEHSA, collect ambient PM air samples from sites that best represent exposures at least once every 6 days to better characterize conditions over time.

11 Points of Contact

The USAPHC, AIPH POCs for this assessment are Mr. (b) (6) and Ms. (b) (6). Mr. (b) (6) may be contacted at e-mail (b) (6) and Ms. (b) (6) may be contacted at e-mail (b) (6) or DSN (b) (6) or commercial (b) (6).

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Environmental Scientist
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Appendix A

References

Department of Defense. 2004. Department of Defense Directive 6490.02E, *Comprehensive Health Surveillance*. http://www.dtic.mil/whs/directives/corres/pdf/649002Ep.pdf

Department of Defense. 2006. Department of Defense Instruction 6490.03, *Deployment Health*. http://www.dtic.mil/whs/directives/corres/pdf/649003p.pdf

Department of the Army. 2006. Field Manual 5-19, *Composite Risk Management*. https://rdl.train.army.mil/soldierPortal/atia/adlsc/view/public/23137-1/FM/5-19/TOC.HTM

Department of the Army. 2004. Field Manual 1-02, *Operational Terms and Graphics*. https://rdl.train.army.mil/soldierPortal/atia/adlsc/view/public/11444-1/FM/1-02/toc.htm

U.S. Army Public Health Command (Provisional). 2010. Technical Guide 230, *Chemical Exposure Guidelines for Deployed Military Personnel*. http://phc.amedd.army.mil/PHC%20Resource%20Library/TG230.pdf

Appendix B

Sample Identification Information

DOEHRS Sample ID	Sample ID Reported on Field Data Sheet	Sample Site	Date and Time Sample Collected	Sampling Duration	Sample Invalid (Yes/No) Reason for Invalid Sample
00006710	AFG_PHOENI_11355_PM2.5DPS	Camp Phoenix	2011/12/21 1450	1440.0 min	No
00006715	AFG_PHOENI_11330_PM2.5DPS	Camp Phoenix	2011/11/26 1330	1440.0 min	No
00006719	AFG_PHOENI_11336_PM2.5DPS	Camp Phoenix	2011/12/02 1400	1440.0 min	No
00005H92	AFG_PHOENI_11227_PM2.5DPS		2011/08/15 1400	1440.0 min	No
00005H98	AFG_PHOENI_11227_PM2.5DPS	A Trans	2011/08/15 1400	1440.0 min	No
00005H9F	AFG_PHOENI_11233_PM2.5DPS	A Trans	2011/08/21 1000	1440.0 min	No
00005H9G	AFG_PHOENI_11233_PM2.5DPS		2011/08/21 1000	1440.0 min	No
00005H9L	AFG_PHOENI_11239_PM2.5DPS	A Trans	2011/08/28 1000	1440.0 min	No
00005H9Z	AFG_PHOENI_11239_PM2.5DPS		2011/08/28 1000	1440.0 min	No
00005HA6	AFG_PHOENI_11245_PM2.5DPS	A Trans	2011/09/02 1000	1440.0 min	No

DOEHRS Sample ID	Sample ID Reported on Field Data Sheet	Sample Site	Date and Time Sample Collected	Sampling Duration	Sample Invalid (Yes/No) Reason for Invalid Sample
00005HA9	AFG_PHOENI_11245_PM2.5DPS		2011/09/02 1000	1440.0 min	No
00005HAA	AFG_PHOENI_11251_PM2.5DPS		2011/09/08 1400	1374.0 min	No
00005HAB	AFG_PHOENI_11251_PM2.5DPS	A Trans	2011/09/08 1400	1441.0 min	No
00005OS1	AFG_PHOENI_11258_PM2.5DPS	A Trans	2011/09/15 1400	1440.0 min	No
00005OS5	AFG_PHOENI_11258_PM2.5DPS	Burn Pit	2011/09/15 1400	1440.0 min	No
00005OU5	AFG_PHOENI_11265_PM2.5DPS	A Trans	2011/09/22 1400	1440.0 min	No
00005OU7	AFG_PHOENI_11265_PM2.5DPS	Burn Barrels	2011/09/22 1400	1440.0 min	No
00005OUD	AFG_PHOENI_11270_PM2.5DPS	Burn Barrels	2011/09/27 1400	1440.0 min	No
00005OUJ	AFG_PHOENI_11270_PM2.5DPS	A Trans	2011/09/27 1400	1440.0 min	No

DOEHRS Sample ID	Sample ID Reported on Field Data Sheet	Sample Site	Date and Time Sample Collected	Sampling Duration	Sample Invalid (Yes/No) Reason for Invalid Sample
00005OUQ	AFG_PHOENI_11276_PM2.5DPS	Burn Barrels	2011/10/03 1400	1440.0 min	No
00005OUV	AFG_PHOENI_11276_PM2.5DPS	A Trans	2011/10/03 1400	1440.0 min	No
00005OUX	AFG_PHOENI_11276_PM2.5DPS	Tower 14	2011/10/03 1400	828.0 min	Sample Malfunction
00005OV3	AFG_PHOENI_11288_PM2.5DPS	A Trans	2011/10/15 1400	1440.0 min	No
00005OV7	AFG_PHOENI_11282_PM2.5DPS	A Trans	2011/10/09 1400	1440.0 min	Sample Malfunction
00005OVD	AFG_PHOENI_11282_PM2.5DPS	Tower 14	2011/10/09 1400	1440.0 min	No
00005OX1	AFG_PHOENI_11282_PM2.5DPS	Burn Barrels	2011/10/09 1400	1440.0 min	Flow Differential
00005OX3	AFG_PHOENI_11XXX_PM2.5DPS	Burn Barrels	2011/10/15 1400	1440.0 min	No
00005OX6	AFG_PHOENI_11XXX_PM2.5DPS	Tower 14	2011/10/15 1400	1440.0 min	No
00005WLI	AFG_PHOENI_11318_PM2.5DPS	Burn Barrels	2011/11/14 1400	1440.0 min	No
00005WLK	AFG_PHOENI_11306_PM2.5DPS	Burn Barrels	2011/11/02 1100	1440.0 min	No

DOEHRS Sample ID	Sample ID Reported on Field Data Sheet	Sample Site	Date and Time Sample Collected	Sampling Duration	Sample Invalid (Yes/No) Reason for Invalid Sample
00005WLL	AFG_PHOENI_11312_PM2.5DPS	Tower 14	2011/11/08 1400	1440.0 min	No
00005WLS	AFG_PHOENI_11318_PM2.5DPS	A Trans	2011/11/14 1400	1260.0 min	No
00005WM7	AFG_PHOENI_11324_PM2.5DPS	Tower 14	2011/11/20 1400	1440.0 min	No
00005WMN	AFG_PHOENI_11294_PM2.5DPS	A Trans	2011/10/21 1000	1440.0 min	No
00005WO9	AFG_PHOENI_11300_PM2.5DPS	Burn Barrels	2011/10/27 1015	1440.0 min	Yes-Flow Differential
00005WOA	AFG_PHOENI_11300_PM2.5DPS	A Trans	2011/10/27 1400	1440.0 min	No
00005WUX	AFG_PHOENI_11294_PM2.5DPS	Tower 14	2011/10/21 1400	1440.0 min	Yes-Battery Failure
00005WVA	AFG_PHOENI_11300_PM2.5DPS	Tower 14	2011/10/27 1400	1440.0 min	Yes-Flow Differential
00005WVK	AFG_PHOENI_11312_PM2.5DPS	A Trans	2011/11/08 1000	1440.0 min	No
00005WVQ	AFG_PHOENI_11306_PM2.5DPS	Tower 14	2011/11/02 1600	1440.0 min	Yes-Damaged Sampling Media

DOEHRS Sample ID	Sample ID Reported on Field Data Sheet	Sample Site	Date and Time Sample Collected	Sampling Duration	Sample Invalid (Yes/No) Reason for Invalid Sample
00005WW1	AFG_PHOENI_11312_PM2.5DPS	Burn Barrels	2011/11/08 1430	1440.0 min	No
00005WW3	AFG_PHOENI_11324_PM2.5DPS	Burn Barrels	2011/11/20 1400	1440.0 min	No
00005WW8	AFG_PHOENI_11318_PM2.5DPS	Burn Barrels	2011/11/14 1400	1440.0 min	No
00005WWC	AFG_PHOENI_11324_PM2.5DPS	A Trans	2011/11/20 1400	1440.0 min	No
00005WWL	AFG_PHOENI_11294_PM2.5DPS	Burn Barrels	2011/10/21 1400	1440.0 min	No
00005WWT	AFG_PHOENI_11306_PM2.5DPS	A Trans	2011/11/02 1600	1440.0 min	No
000066Y6	AFG_PHOENI_11336_PM2.5DPS	Camp Phoenix	2011/11/02 1445	1440.0 min	Yes-Flow Differential
000066YR	AFG_PHOENI_11336_PM2.5DPS	Camp Phoenix	2011/11/02 1345	1440.0 min	No
000066Z0	AFG_PHOENI_11343_PM2.5DPS	Camp Phoenix	2011/11/09 1230	1440.0 min	Yes-Sample Malfunction

DOEHRS Sample ID	Sample ID Reported on Field Data Sheet	Sample Site	Date and Time Sample Collected	Sampling Duration	Sample Invalid (Yes/No) Reason for Invalid Sample
0000670L	AFG_PHOENI_11330_PM2.5DPS	Camp Phoenix	2011/11/26 1300	1440.0 min	No
0000670N	AFG_PHOENI_11330_PM2.5DPS	Camp Phoenix	2011/11/26 1330	1440.0 min	No
0000670Q	AFG_PHOENI_11343_PM2.5DPS	Camp Phoenix	2011/12/02 1400	1440.0 min	No
0000670S	AFG_PHOENI_11343_PM2.5DPS	Camp Phoenix	2011/12/09 1345	1440.0 min	No
0000670T	AFG_PHOENI_11348_PM2.5DPS	Camp Phoenix	2011/12/14 0930	1440.0 min	No
0000670V	AFG_PHOENI_11348_PM2.5DPS	Camp Phoenix	2011/12/14 1400	1440.0 min	No
0000670Y	AFG_PHOENI_11355_PM2.5DPS	Camp Phoenix	2011/12/21 1400	1440.0 min	No
0000671D	AFG_PHOENI_11348_PM2.5DPS	Camp Phoenix	2011/12/14 1400	1440.0 min	No
0000671G	AFG_PHOENI_11360_PM2.5DPS	Camp Phoenix	2011/12/26 1500	1440.0 min	No
0000671N	AFG_PHOENI_11361_PM2.5DPS	Camp Phoenix	2011/12/27 1630	1440.0 min	No
0000671W	AFG_PHOENI_11361_PM2.5DPS	Camp Phoenix	2011/12/27 1600	1440.0 min	No